

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

UPDATED DESIGN REPORT
(REF. NO. 1627/2)

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MOUNT POLLEY PROJECT
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SECTION 1.0 - INTRODUCTION

1.1 PROJECT DESCRIPTION

The Mount Polley Project is located in central British Columbia, approximately 56 kilometres north-east of Williams Lake, as shown on Figure 1.1. The nearest settlement is the community of Likely, on the northern tip of Quesnel Lake.

The project derives its name from Mount Polley, a low mountain with a peak elevation of 1260 metres, approximately 300 metres above the surrounding terrain. Mount Polley is situated on a topographic ridge with Polley Lake to the east and Bootjack Lake to the southwest. The site is accessible by paved road from Williams Lake to Morehead Lake and then by gravel forestry road for the final 12 kilometres.

The Mount Polley open pit mine contains an estimated 82.3 million tonnes of copper and gold ore in three ore bodies. After loading in the pit, the ore will be hauled to the crusher where it will be crushed. The ore is then transported to the nearby concentrator where it will be processed by selective flotation to produce a copper-gold concentrate at a rate of approximately 17,808 tonnes per day (6.5 million tonnes per year). Approximately 92.6 million tonnes of waste rock will be stored immediately east of the Millsite.

The mill tailings will be discharged as a slurry into the Tailings Storage Facility which has been designed to provide environmentally secure storage of the solid waste. 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. No surface discharge of any process solution from the tailings facility is required or anticipated.



1.2 SCOPE OF REPORT

This report is an updated version of the original Tailings Storage Facility design report (Knight Piésold Ref. No. 1625/1). This report has been prepared in response to modifications to the embankment design, review comments and concerns, and the addition of detailed geological and geotechnical information gathered during the Stage Ia/Ib construction program.

This report also contains as-built information for the Stage Ia/Ib tailings embankments, seepage collection ponds, basin liners, sediment ponds and other details.

The updated design is based on the following :

- Results of geotechnical investigations at the Tailings Storage Facility.
- Evaluation of construction materials.
- Revised water balance and initial process water supply requirements.
- Updated requirements for operations, on-going construction and for final reclamation.

The Tailings Storage Facility comprises a valley impoundment that will initially allow storage of water required for mill start-up. Tailings discharge from the embankments will commence in early June, 1997. In its final configuration, the facility will comprise a side-hill impoundment centred 5 km southeast of the ore bodies. The overall site plan is shown on Dwg. No. 1625.200.



SECTION 2.0 - SITE CHARACTERISTICS

2.1 HYDROMETEOROLOGY

2.1.1 General

Long and short-term climate records are available for a number of locations in the area. Likely (with 6 years of record) and Horsefly (with 11 years) are located in similar terrain within 40 km of the site. The project area is subject to a relatively temperate climate with warm summers and cool winters. The precipitation is well distributed throughout the year.

The mean annual temperature at Likely, the nearest station, is 4.0° C with an extreme maximum of 33.9° C and an extreme minimum of -37° C. At Quesnel, with approximately 70 years of record, extremes are 40.6° C and -46.7° C. Frost free days in the area range from 199 at Horsefly Lake (elevation 788 m) to 244 at Barkerville (elevation 1244 m).

2.1.2 Precipitation and Evaporation

Precipitation data at the site is limited and thus mean precipitation records for climatologically similar stations in the area were used to estimate mean annual site precipitation values. The mean annual precipitation at Likely is 699.7 mm and at Barkerville (with over 70 years of record) is 1043.9 mm. Precipitation for the site is expected to fall within this range. Data for Likely, Barkerville and the site are presented in Table 2.1. A coefficient of variation of 0.16 was determined from regional values which translates to a standard deviation of 121 mm. These conditions were applied to the tailings facility and nearby areas.

A mean annual precipitation of 755 mm was determined for the Tailings Storage Facility based on the above. The waste dumps, pit areas and Millsite, (all at higher elevations) 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 was determined by applying an orographic factor of 1.07285 to the values for the Tailings Storage Facility. The orographic factor is consistent with elevation correlations developed in previous studies. This data is summarized on Table 2.2.

An annual evaporation rate of 423 mm at the site has been assumed to be constant for all years of operation and precipitation conditions. The evaporation rate should be monitored and any changes can be incorporated in the design, as required.

2.1.3 Runoff Coefficients

The water balances include runoff coefficients based on average precipitation conditions only. The runoff coefficients are summarized below:

Component Description	Runoff Coefficient (%)		
	Dry	Average	Wet
Unprepared Tailings Basin	20	24	29
Tailings Beach	90	90	90
Open Pit	45	50	55
Millsite (Disturbed)	65	70	75
Waste Rock Dumps	58	60	62
Undisturbed Catchments	20	24	29

2.1.4 Storm Events

Intensity-duration-frequency curves have been developed for the site on the basis of data obtained from the Rainfall Frequency Atlas for Canada (RFAC), and these are shown on Figure 2.1. Probable maximum precipitation values for the site have also been estimated, as shown on Table 2.3. As outlined in the RFAC the 1 and 6 hour values are not influenced by orographic factors, while the 24 hour and 10 day values are significantly

affected. A conservative orographic factor of 1.5 was used to evaluate the storm events at the higher elevations.

The 10 day PMP storm event value of 406 mm was estimated by assuming a ratio of 10 day to 1 day PMP of 2.0. This value was used in the evaluation of embankment storage requirements.

2.2 REGIONAL GEOLOGY

The Mount Polley site is located in an alkalic intrusive complex in the Quesnel Trough, a 35 km wide north-west trending volcanic sedimentary belt of regional extent.

The rock units are segmented into blocks by several faults, including an inferred north westerly trending normal fault that extends along Polley Lake. The predominant structure of the region is northwest trending and dipping steeply to the northeast.

The topography is generally subdued and the area has been glaciated. Surficial deposits of well graded dense glacial till are common throughout the region and are typically present in greater thickness in topographic lows. Bedrock exposures are common at higher elevations.

Detailed descriptions of bedrock and overburden geology are presented in Section 5.0.

2.3 SEISMICITY

2.3.1 Regional Seismicity

Mount Polley is situated within the interior of B.C., an area of historically low seismicity. The site is located within the Northern B.C. (NBC) source zone, close to the boundary with the Southeastern B.C. (SBC) source zone, as defined by Basham et al (1982). Basham assigns a maximum earthquake magnitude of 5.0 for the NBC zone, which is one-half magnitude higher than the observed maximum magnitude of 4.5. Similarly, a maximum



magnitude of 6.5 has been set for the SBC zone, based on historic earthquake data.

There has been much debate in recent years concerning the possibility of a large interplate earthquake of magnitude 8 or 9 along the Cascadia subduction zone. However, such an event would be located at over 400 km west of the project and therefore is unlikely to have a significant impact at the site. Southwest of the site lies the Northern Cascades region where a maximum earthquake magnitude of 7.5 has been estimated, based on historic seismic records and geologic data (Leader Lake Seismic Risk Assessment). This potential source zone lies at a minimum distance of about 200 km and, as above, is therefore unlikely to have a significant impact at the site.

2.3.2 Seismic Design Parameters

A seismic hazard assessment for the site has been completed using both probabilistic and deterministic methods. Seismic ground motion parameters for both the Design Basis Earthquake (DBE) and Maximum Design Earthquake (MDE) have been determined.

The probabilistic analysis was carried out by the Pacific Geoscience Centre based on the method presented by Cornell (1968). The results are:

Return Period (Years)	100	200	475	1000
Maximum Ground Acceleration (g)	0.021	0.028	0.037	0.046
Maximum Ground Velocity (m/sec)	0.043	0.056	0.077	0.094

Four potential source zones were considered for estimation of the maximum ground acceleration at the site for the deterministic analysis. These source zones are the Northern B.C., Southeastern B.C., Northern Cascades and Cascadia Subduction Zones, described in Section 2.3.1. The results are tabulated below together with the maximum magnitude and minimum epicentral distance for each zone:

Source Zone	Maximum Magnitude	Epicentral Distance (km)	Maximum Acceleration (g)
Northern B.C.	5.0	0	0.13
Southeastern B.C.	6.5	40	0.13
Northern Cascades	7.5	200	0.04
Cascadia Subduction Zone	9.0	450	0.08

The Northern B.C. magnitude 5.0 earthquake corresponds to a worst case event occurring directly beneath the site with a focal depth of 20 km. Maximum accelerations were calculated using the ground motion attenuation relationship given by Idriss (1993), using the Mean +1 standard error relationship. Based on this, a Maximum Credible Earthquake (MCE) of $M=6.5$ causing a bedrock acceleration of 0.13 g has been assigned to the site.

Selection of appropriate design earthquakes for the Tailings Storage Facility is based on criteria given by the Canadian Dam Safety Association's "Dam Safety Guidelines for Existing Dams". These criteria are given on Table 2.4. A "LOW" consequence category has been assessed for the Tailings Storage Facility as discussed in Section 6.1.2. For closure and post-closure conditions a conservative "HIGH" consequence category has been adopted for design.

The seismic ground motions adopted and implications for design are summarized below:

- The Design Basis Earthquake (DBE) for operations will be taken as the 1 in 475 year return period event. This corresponds to a maximum firm ground acceleration of 0.037 g and maximum ground velocity of 0.077 m/sec. These parameters will be used for the design of all earthwork structures. These values are also recommended for the design of all site buildings and structures,



consistent with the National Building Code of Canada. The above ground motion parameters place the site in seismic zone 0 for acceleration and zone 1 for velocity, ($Z_a < Z_v$).

- The Maximum Design Earthquake (MDE) for closure of the Tailings Storage Facility shall conservatively be taken as 50% of the MCE. This MDE corresponds to approximately the 1 in 2500 year return period event, based on extrapolation of data from the probabilistic analysis. This event gives a maximum firm ground acceleration of 0.065 g and has been adopted for the design of the embankment for post-closure conditions.

Due to the dense nature of the overconsolidated foundation soils at the site, the amplification of seismic waves as they propagate from bedrock to the ground surface will not be significant. Case studies have shown that ground motion amplification is negligible through dense soil deposits overlying bedrock. Therefore, maximum bedrock ground motion parameters have been used for design.



SECTION 3.0 - TAILINGS CHARACTERISTICS

3.1 PROCESS DESCRIPTION

Mount Polley tailings will be produced from conventional milling of copper and gold ore. The anticipated tailings stream from the mill to the tailings storage facility will be as follows:

- Solids throughput: 17,808 tpd (6.5 million tonnes per year)
- Percent solids: 35 percent
- Solids specific gravity: 2.78

The tailings slurry will be deposited from a series of spigots situated along the inside crest of the embankment. During initial discharge from the Stage Ib Main Embankment, tailings will be deposited into stored make-up water. A steep submerged beach with an estimated slope of 15 to 20 percent is expected to develop from the coarser tailings fraction. Finer tailings particles will be transported further before settling. The overall slope of the tailings solids is expected to be about 1.5 percent. (The tailings beach slopes have been estimated from experience at other mines and are based on the results presented in the publication "Tailings Beach Slopes" by B. H. Conlin.) The tailings beach is expected to emerge from the water after about 4 to 5 months of filling at the throughput rate of 17,808 tpd and assuming an initial dry density of 1.1 tonnes/cubic metre.

After the tailings beach has emerged, a sandy beach will develop as the coarser tailings fraction settles more rapidly adjacent to the embankment. The average beach slope above water will be about 1.5 percent. The finer tailings particles will be transported further out into the supernatant pond before settling at a minimum anticipated slope of about 0.25 percent. Overall, the tailings solids are assumed to have an average slope of about 0.5 percent.



3.2 PHYSICAL CHARACTERISTICS

Coastech Research Inc. conducted preliminary metallurgical testwork on samples of drill core in 1989. A laboratory testing program was conducted on tailings samples obtained from this work. Selected information is summarized below.

- The tailings are comprised predominantly of silt (64 percent) and fine sand (30 percent) with a trace of clay (6 percent). It is non-plastic, yellow grey in colour and has a solids specific gravity of 2.78.
- A series of settling tests were completed at slurry solids contents ranging from 25 to 45 percent. The tailings particles settled rapidly and a pronounced segregation of coarse to fine material was observed. The colloidal clay fraction remained suspended in the supernatant water for several days.
- The tailings initially settled to relatively low dry densities generally in the range of 0.9 to 1.1 tonnes/m³. Consolidation caused by evaporative drying resulted in final dry densities of approximately 1.3 tonnes/m³.
- The initial volume of water recovered from the tailings depends on the initial solids content of the slurry. At 35 percent solids, the initial water recovery was about 64 percent of the total water in the slurry.
- The vertical permeability of the settled tailings varied from 1.0×10^{-5} and 2.0×10^{-5} cm/s. The horizontal permeability is expected to be significantly greater due to segregation of the soil particles. In practice, the permeability of deposited tailings will be reduced due to on-going consolidation.
- Particle settling velocities were measured as part of the hydrometer test on the silt and clay sized fraction. The data are used for calculating friction losses in slurry pipelines.

Detailed results of this testwork was presented in the "Tailings Storage Facility Design Report" (Knight Piésold Ref. No. 1625/1). More recently, MET Engineers Ltd. as



part of the overall metallurgical testing for the project conducted additional testwork on the tailings. The results of this testwork are summarized below.

- Tailings will be separated into two streams at the mill; the finer Slime Tails and the coarser Sand Tails.
- The Slime tails will make up about 57 percent of the tailings stream. The Sand Tails will make up the remaining 43 percent.
- The Slime Tails are comprised of about 85 to 90 percent well graded silt. The remaining 10 to 15 percent is comprised of clay sized particles (estimated from gradation limits).
- The Sand Tails are comprised of about 26 percent fine sand and about 70 to 74 percent coarse silt (estimated from gradation limits).
- The Bulk Tailings, estimated by combining the Slime and Sand Tails, comprise about 13 percent fine sand, 77 to 82 percent silt and 5 to 10 percent clay sized particles (estimated from gradation limits).

The gradation limits of the Slime, Sand and Bulk tailings are shown on Figure 3.1.

3.3 GEOCHEMICAL CHARACTERISTICS

Geochemical testwork on a locked cycle tailings sample was conducted in 1989 by Coastech Research Inc. The testwork included the following:

- Determination of net acid generating potential
- Special Waste Test using acetic acid
- ASTM waste extraction test using carbonic acid

The acid base accounting procedures used were based on recommendations by the U.S. Environmental Protection Agency. The method includes an evaluation of the balance between acid producing components (primarily pyrite) and acid consuming



components (carbonates and other rock types with neutralizing capabilities). The results of this testwork are as follows:

Sulphur (percent)	Paste pH	Acid Potential (kg CaCO ₃ /t)	Neutralization Potential (kg CaCO ₃ /t)	Net Neutralization Potential (kg CaCO ₃ /t)
0.02	8.22	0.6	24.6	24.0

These results indicate that the tailings are not acid producing and have a significant net neutralization potential.

A special waste classification test was conducted in accordance with the procedure published by the B.C. Ministry of the Environment, entitled "B.C. Special Waste List". The test indicates that the tailings from the locked cycle tests do not exceed the B.C. Waste Management Branch regulations for special wastes.

In addition to the special waste test, an ASTM waste extraction test using carbonic acid at pH 5.5 was carried out. The test uses carbonic acid for leaching of the tailings and is a more realistic indication of actual long term water leachable constituents under slightly acidic rainfall. The test showed very low levels of water leachable constituents in the extract, all at concentrations below the lower range concentration for the pollution control objectives for final effluent discharge.

Detailed results of the geochemical characteristics of the tailings were presented in the "Tailings Storage Facility Design Report" (Knight Piésold Ref. No. 1625/1).

SECTION 4.0 - SITE SELECTION

A selection and evaluation of alternative tailings disposal sites was carried out in 1989 and included a comparative assessment of the following factors:

- Capacity and filling characteristics.
- Surface hydrology and downstream water usage.
- Hydrogeology and groundwater flows.
- Aesthetics and visual impact.
- Foundation conditions and construction requirements.
- Closure and reclamation requirements.
- Capital and operating costs.

Three possible tailings disposal sites were identified and designated as Areas A, B and C. A preliminary site investigation program was conducted at each site to evaluate the environmental impacts as well as design and construction constraints. Results of initial site investigations for each site were presented in the 1990 Knight Piésold "Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility" and are not repeated in this report. The three sites are:

- Area A - A cross-valley impoundment located immediately south-east of Bootjack Lake, in the Bootjack Creek Valley.
- Area B - A sidehill impoundment located between the south ends of Polley and Bootjack Lakes, within the upper catchment of the Edney Creek Tributary.
- Area C - A cross-valley impoundment located between the north ends of Polley and Bootjack Lakes, just west of the Frypan Lake in the 6 k creek swamp.

The evaluation included environmental, design, operational and economic factors. Although Area A is closest to the mill, it was judged the least favourable because it would have required two cross-valley embankments near the outlet of Bootjack Lake and would have significantly impacted the Bootjack Creek catchment. Area C,



located on a natural divide, would also require a cross-valley impoundment and would have impacted both the Bootjack and Polley Lake catchments. Area B was deemed the preferred site because it will provide secure tailings storage that would meet all environmental and closure requirements at the least cost. Further, it would minimize potential impacts to both Polley and Bootjack Lake catchments and would keep mine tailings and any leachate confined to the Edney Creek Tributary watershed.



SECTION 5.0 - GEOLOGICAL AND GEOTECHNICAL CONDITIONS

5.1 GENERAL

Numerous site investigations were conducted during Stage Ia/Ib construction in 1996 and early 1997 for various reasons, including:

- Test pit excavations to identify suitable embankment fill materials in potential borrow sources. (The Original Borrow Area is located within the facility, on the east side; the Alternate Borrow Area is located downstream of the Main Embankment, above the topsoil stockpile; the Future Borrow Area is located downstream of the facility, adjacent to the east end of the Main Embankment.)
- Borehole investigations to define maximum borrow area depth in the Original and Future Borrow Areas.
- Groundwater Monitoring Well drilling around the perimeter of the Tailings Storage Facility for long term groundwater quality monitoring.
- Test pit excavations to delineate the extent of the basin liners.
- Test pit excavations to investigate potential sand deposits for use as filter sand in the embankment drains.
- Borehole investigations to accompany the installation of instrumentation in the Main Embankment foundation soils.
- Cone Penetration Test (CPT) investigations to further investigate the Main Embankment foundation soils.

The tailings area geological and geotechnical conditions have been confirmed using information collected from these investigations and from work conducted in 1989 and 1995. The investigation locations are shown in plan on Dwg. No. 1627.001



and the interpretations are shown in section on Dwg. Nos. 1627.002 to 1627.012. A summary of the recent geological investigations is presented on Table 5.1 and summary logs are included in Appendix A. A discussion of the site investigations and the geological and geotechnical conditions at the Tailings Storage Facility is presented below.

5.2 SITE INVESTIGATIONS

5.2.1 Previous Investigations

Results from site investigations conducted prior to 1996 have been used in the compilation of the geological and geotechnical data. Site investigations conducted prior to 1996 are summarized below.

1989 Test Pit Investigations

Test pits were excavated throughout the Main and Perimeter Embankment footprints and within the tailings basin during the initial site investigations. Shallow subsurface foundation conditions and potential borrow sources were evaluated. Results from these investigations are presented in the Knight Piésold document "Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility, 1990".

1989 Diamond Drillhole Investigations

Seven diamond drillholes were completed at the Tailings Storage Facility as part of the overall site condemnation and exploration program. The investigations included tri-cone drilling of the overburden and diamond drilling in bedrock. Packer permeability testing was also conducted. Results from these investigations are also presented in the Knight Piésold document "Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility, 1990".



1995 Test Pit Investigations

Numerous test pits were excavated at the proposed sites for the Main and Perimeter Embankments, tailings basin, seepage control pond, pipeline road and Millsite as part of the final design investigations. Results from these investigations are presented in the "Report on 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility" (Knight Piésold Ref. No. 1623/1) and "Response to Review Comments on Tailings Embankment Design" (Knight Piésold Ref. No. 1625/6).

5.2.2 Recent Investigations

Additional geological and geotechnical information was obtained from site investigations conducted during the 1996 and 1997 construction programs. Recent investigations include the following:

1996 Test Pit Investigations

Numerous test pits were excavated during the 1996 construction program with track mounted excavators provided by North American Construction. The test pits were excavated to evaluate shallow subsurface soil conditions for the following reasons:

- Basin Liners – Test pits were excavated to determine the limits of the glacial till liner within the tailings basin. As a result of the investigations, the Upper and Lower Basin Liners were delineated immediately upstream of the Main Embankment, as shown on Figure 5.1. As part of the investigations, the thickness of the surficial glacial till was identified and the permeability of the underlying glaciolacustrine / glaciofluvial soil units was evaluated. The basin liners are shown on Sections 1, 3, 4, 6 and 10.
- Borrow Areas – Test pits were excavated to evaluate glacial till borrow sources for construction of the Stage I embankments. Most of the test



pits were located in the Original Borrow Area. Additional investigations were conducted at the Alternate and Future Borrow Areas. Soil samples were tested at the on-site laboratory. The results are discussed in Section 6.4.2. The Original Borrow Area is shown on Sections 5, 6 and 7.

- Filter Sand - Test pits were excavated to investigate local sandy deposits. Samples were collected and laboratory tests were conducted to evaluate the suitability of the materials as filter sand for use in the embankment drains. Two areas were investigated, including the small hill at the west edge of the Reclaim Barge Channel and the ridge to the east of the Perimeter Embankment.

1996 Vibrating Wire Piezometer Installations

A total of six vibrating wire piezometers were required in the foundation soils at the Main Embankment. Two piezometers were installed in boreholes at each of the three Main Embankment monitoring planes (boreholes 96-A1, 96-B1 and 96-C1). The boreholes were advanced to a maximum depth of 16.5 metres using solid and hollow stem augers. Standard Penetration Testing (SPT) was conducted during the drilling of the each borehole, including continuous sampling for the first 10 metres. Split spoon samples were analyzed at the on-site laboratory. The borehole locations are shown on Dwg. No. 1627.001 and are included on Section 3. The drill rig was operated by Peace Drilling and Research. R.E. Graham Engineering supervised the drilling and piezometer installations. The R.E. Graham field report and test hole logs are provided in Appendix B1.

1996 CPT Program and Pressure Relief Well Installations

A CPT (cone penetration testing) program was conducted at the Main Embankment to obtain continuous profiles of soil types and information on densities and pore pressures in the foundation soils. The CPT program was also conducted to investigate low SPT N-values encountered in a saturated,



non-plastic silt layer during the drilling for the 1996 Vibrating Wire Piezometer Installations. The CPT investigations confirmed that the low N-values were due to drilling disturbance and not weak foundation soils. After the CPT holes were completed, a second hole was drilled using a solid stem auger to confirm soil types and permit soil sampling. Four auger holes were drilled to serve as Pressure Relief Wells. The holes were hydraulically connected to the embankment foundation drains by backfilling with filter sand. The drilling was completed by Mud Bay Drilling and the CPT investigations were conducted by Cone Tec, under the direction of Knight Piésold. The results of these investigations are presented in the Cone Tec field report, included in Appendix B2. (In addition to the Pressure Relief Wells, Pressure Relief Trenches were excavated and backfilled with gravelly sand.)

1996 Groundwater Monitoring Well Installations

The 1996 groundwater monitoring well installation program was conducted in November, 1996. The purpose of the program was to drill and install groundwater monitoring wells around the Tailings Storage Facility. Wells were installed in higher permeability zones in both overburden and bedrock. The wells will be used for long-term monitoring of groundwater quality. The program comprised drilling through the overburden and into bedrock at six locations around the perimeter of the Tailings Storage Facility. Three locations around the mine site were also drilled. The drilling was completed using an air rotary rig, operated by Drillwell Enterprises. Standard Penetration Testing (SPT) and sampling was conducted within the overburden at 10 or 20 foot intervals. Bedrock chip samples (for condemnation analysis) were collected at 10 foot intervals. Details of this investigation are presented in the report "1996 Groundwater Monitoring Well Installation Program" (Knight Piésold Ref. No. 1628/4).

1997 Test Pit Investigations

The 1997 test pit investigations were completed in January 1997. The purpose of the investigations was to further delineate near surface glacial till borrow



sources for embankment from the Original and Alternate Borrow Areas and to evaluate the potential of the Future Borrow Area. The test pits were excavated to depths up to 6.7 metres. The test pits investigations were completed using a track mounted excavator owned and operated by North American Construction. Soil samples collected during the investigations were analyzed at the on-site laboratory.

1997 Borehole Investigations

The 1997 borehole investigations were also completed in January, 1997. The purpose of the investigations was to define the maximum borrow depth by identifying the maximum depth of the glacial till in the Original Borrow Area. The investigations included solid stem and hollow stem augering in 28 boreholes. Split spoon sampling was conducted and the boreholes were terminated at a maximum depth of 17 m. The drill rig was owned and operated by Geotech Drilling. Soil samples collected from the auger flights and from the split spoons were analyzed at the on-site laboratory.

The borrow area test pits and boreholes are shown in plan on Dwg. No. 1627.001 and on Sections 5, 6, 7 and 8.

5.3 SUMMARY

A geologic summary has been prepared from the above listed investigations and laboratory test data. The main purpose of the geological summary is to define the surficial overburden conditions, such as the continuity of the surficial glacial till and the location and extent of the underlying sedimentary units. In summary, the geology of the tailings basin is characterized by four units:

Surficial (Ablation) Till Unit

A surficial layer of glacial till underlies all areas of the tailings basin investigated to date. This glacial till is typically comprised of 50 to 65 percent sandy silt (passing the No. 200 sieve). The surficial till unit is believed to be a melt-out or Ablation



Till. It is commonly slightly weathered, firm to stiff, and wet over the top 0.5 to 1.0 metres in the lower areas of the tailings basin. The till is very stiff and is moist to very moist below 1.0 to 2.0 metres depth and at higher elevations. No appreciable fissuring was observed in the surficial till unit, likely due to the shallow groundwater table, which is typically less than 0.3 metres below the ground surface.

The thickness of the surficial till varies, but generally thins from north (4 to 6 metres) to south (2 to 3 metres) along the valley, as shown on Sections 1, 4, 7, 8, and 10. The surficial till unit may pinch out completely downslope (southeast) of the Main Embankment Seepage Collection Pond, as shown on Sections 1, 4, and 10. In-situ field and laboratory permeability testing on the surficial till unit typically yielded results in the order of 10^{-8} to 10^{-9} cm/s. The till thickness appears to exceed 2 metres throughout most of the tailings basin.

Areas where the surficial (Ablation) till is thinner (less than 2 metres) are shown on Figure 5.1. One design criteria for the tailings basin was that a minimum thickness of 2 metres of surficial glacial till must be present or a low permeability soil liner was to be constructed (as discussed in Section 6.2.2). Figure 5.1 indicates that the surficial (Ablation) till unit is less than 2 metres thick at two sections of the Main Embankment, including the right abutment (approx. Ch. 16+00 to Ch. 16+75) and at the bottom of the basin (approx. Ch. 19+50 to Ch. 21+50). As a result, a glacial till basin liner was required in these areas. The locations of the as-built basin liners are also shown on Figure 5.1.

Glaciolacustrine/Glaciofluvial Unit

A glaciolacustrine/glaciofluvial sedimentary unit underlies the surficial glacial till. This unit is primarily comprised of glaciolacustrine layers (silt, some clay), with lesser fine grained glaciofluvial layers (sand). The glaciolacustrine/glaciofluvial sequence thickens from west to east and from north to south and terminates at El. 928 m (approx.). It is not present along the right abutment where the surficial till directly overlies bedrock. The glaciolacustrine/glaciofluvial sequence also appears to transform from a continuous sequence near the Main Embankment into thin (0.5 to 3.0 metre) layers within the glacial till unit to the northwest. The



glaciolacustrine/ glaciofluvial sequence is generally 6 to 8 metres thick at the west and increases to as much as 25 metres thick towards the eastern edge of the tailings basin.

The glaciolacustrine/glaciofluvial sequence consists predominantly of interbedded layers of silt with either clay or fine sand. The glaciolacustrine (silt, clay) sediments are often highly over-consolidated and very stiff to hard. The glaciolacustrine unit has a low permeability as a result of the fine-grained composition. Within the glaciolacustrine sediments, occasional seams of fine sand with only a trace of silt are present. These seams vary in thickness from 0.1 metres to greater than 3 metres.

One continuous sandy unit was identified below the surficial glacial till over the 450 metre stretch (approx. Ch. 16+50 to Ch. 21+00) directly beneath or immediately upstream of the Stage Ib Main Embankment footprint, as shown on Figure 5.2 and Section 3. The sandy unit is characterized as fine-grained, containing 20 to 40 percent coarse silt. The permeability value of this unit is estimated to be 10^{-5} to 10^{-6} cm/s, based on the results of gradation analyses.

Additional test pit and borehole investigations have shown that the sandy unit terminates just downstream of the upstream toe of the Main Embankment, except for a 225 metre stretch between Ch. 16+50 and Ch. 18+75. In this area, the sandy unit grades into a fine to medium grained sand and contains localized areas of coarser gravelly sand. The permeability value of this coarser unit is estimated to be 10^{-4} to 10^{-5} cm/s. During investigations, groundwater was seeping into excavations in this material and some of the excavation walls were unstable when exposed, indicating that the unit is likely a confined aquifer. Two foundation drains, one pressure relief trench and one pressure relief well were extended into the sandy unit to help contain groundwater flows in this area. Groundwater Monitoring Well GW96-9 was also advanced into this unit just downstream of the ultimate toe of the Main Embankment.

Test pit investigations showed that the glaciofluvial sand unit extends upstream into the Tailings Storage Facility for approximately 200 metres before it grades into a



lower permeability silt unit or is overlain by more than 2 metres of surficial glacial till, as shown on Sections 4 and 10. Laboratory testwork on samples of the glaciolacustrine/glaciofluvial materials from further upstream of the Main Embankment (such as the sediment layers exposed in some areas of the Reclaim Barge Channel) have shown that the material is primarily silt with variable clay content and occasional narrow seams of coarse silt with trace to some fine sand.

During drilling of groundwater monitoring well GW96-1 near the Perimeter Embankment Seepage Collection Pond, the surficial glacial till was found to have a minimum thickness of 5 metres, as shown on Section 8. Below this, the glaciolacustrine sequence consists of a 3 metre thick layer of firm to stiff, low permeability silts with variable clay content and thin silty sand laminations. No higher permeability layers were observed in this unit. The glaciolacustrine sequence is in turn underlain by 19 metres of glacial till. Just east of the Perimeter Embankment, in groundwater monitoring well GW96-2, the glaciolacustrine unit is 7.5 metres thick and is overlain by 11 m of glacial till. The glaciolacustrine sequence consists primarily of silt with rare thin (5 to 30 mm) fine to medium grained sand laminations.

A 10 to 13 metre thick sequence of high permeability glaciofluvial sands and gravels was encountered at depths of 27 and 32 metres in groundwater monitoring wells GW96-1 and GW96-2. This unit overlies a Basal Till unit (discussed below). The higher permeability sandy gravel unit is not connected to the tailings impoundment and is therefore not considered to be a significant potential seepage pathway due to the thick layer of low permeability surficial till and glaciolacustrine sediments above this zone.

Basal Till

The glaciolacustrine/glaciofluvial sequence is underlain by a very dense, well graded silt and sand glacial till unit believed to be a basal till. The basal till unit dips and thickens slightly from west to east and north to south, likely following bedrock topography. It is typically 10 to 20 metres thick., massive, highly



consolidated and contains some gravel and trace to some clay. The basal till has a low permeability, estimated to be less than 10^{-6} cm/s.

Bedrock

At the Main Embankment, the bedrock surface dips from west to east across and more gently from north to south, as shown on Sections 1, 3, 4, 5, 6 and 9. Bedrock drops off quickly to the west and is present less than 1 metre below surface on the ridge at the right abutment. The bedrock surface is greater than 30 m deep at the left abutment and bedrock permeabilities will not greatly influence potential seepage from the Tailings Storage Facility because of the thick cover of low permeability overburden soils.

Bedrock at the tailings basin is predominantly a red-brown sedimentary conglomerate unit composed of hematitically altered volcanic tuffs and fragmentals. It is moderately to highly weathered near the surface, but weathering decreases with depth. Results from the 1989 condemnation drilling indicated that rock quality was typically poor to fair, with the top 7 to 15 m often very poor to poor and improving with depth. The unit appeared to be free of large fault fractures and measured permeabilities were typically 10^{-6} cm/s or lower.

A coarse-grained syenite intrusive unit underlies much of the hill up-slope (west) of the Bootjack-Morehead Connector Road, as observed in groundwater monitoring wells GW96-5 and MP89-236. The unit is massive and is generally free of large fractures. Rock quality ranged from fair to good. Smaller isolated units of mudstone, sandstone and basalt were also identified.



SECTION 6.0 - TAILINGS STORAGE FACILITY DESIGN

6.1 DESIGN BASIS AND CRITERIA

6.1.1 General

The principal objectives for the design of the Tailings Storage Facility are to ensure that regional groundwater and surface water flows are not adversely affected during mining operations and in the long term, and also to permit effective reclamation at mine closure.

The principal requirements of the design are to:

- Provide permanent, secure, and total confinement of all solid waste materials within an engineered storage facility.
- Control, collect and remove free draining liquids from the tailings for recycling as process water to the maximum practical extent.
- Include monitoring features for all aspects of the facility to ensure performance goals are achieved.
- Develop the facility in stages to distribute capital expenditure over the life of the project.

The design basis and operating criteria for the Tailings Storage Facility are based in part on appropriate and conservative design parameters from hazard classification, seismic data, hydrological studies and geotechnical site investigations and on review comments by the Ministry of Employment and Investment (MEI). The design basis and operating criteria for all aspects of the design, construction and operations are presented on Table 6.1. Provisions for water management are also included.



6.1.2 Consequence Classification

A hazard classification for the Tailings Storage Facility has been assessed to establish design flood and seismic criteria. The hazard classification is based on the Canadian Dam Safety Association's (CDSA) "Dam Safety Guidelines for Existing Dams", which states that "Tailings dams and their appurtenant structures must be protected against the same hazards and to the same extent as embankment dams...". Details of each consequence category and the corresponding potential consequences of failure are presented on Table 6.2.

A "LOW" hazard classification or consequence category has been assessed for the Tailings Storage Facility, as discussed in Section 2. This implies that the consequences of failure consist of a low economic loss and low environmental impact. In accordance with the "LOW" hazard classification, a Design Basis Earthquake (DBE) corresponding to the 1 in 475 year return period event (which corresponds to the National Building Code of Canada standard) has been adopted for design of the facility during operations. For closure and post-closure conditions, a conservative "HIGH" consequence category has been assigned.

The embankment has been designed to accommodate a maximum design earthquake (MDE) corresponding to 50% of the maximum credible earthquake (MCE) and the probable maximum flood (PMF) flood event.

6.1.3 Tailings Storage Capacity

The tailings storage facility depth-area-capacity-filling rate relationships are presented on Figure 6.1. The projected filling rate and rate of rise for the tailings are based on an average annual production rate of 6.5 million tonnes (17,808 tpd). Figure 6.1 indicates that after approximately 3 years of operation the tailings surface area is sufficiently large that the on-going rate of rise is less than 3 metres per year.

The tailings facility has been designed to contain 84.5 million tonnes of tailings solids at an average dry density of 1.28 tonnes/m³ (1.1 tonnes/m³ for Year 1, 1.2 tonnes/m³ for Year 2, and 1.3 tonnes/m³ for Years 3 through 13) with an assumed flat tailings surface.

The filling schedule and anticipated staged construction sequence is shown on Figure 6.2. In addition to the flat tailings surface, provisions for the following have been incorporated into the design:

- Up to 2.5 million cubic metres of process (reclaim) water.
- An emergency storage volume of at least 0.68 million cubic metres for the design storm event.
- An additional one metre of freeboard for wave run-up.

The emergency storage volume of 0.68 million cubic metres will be available on the tailings surface at start-up and during on-going operations. It is required to contain the anticipated runoff from the 24-hour probable maximum precipitation (PMP) storm event centred on the tailings facility and the catchment area immediately above the facility. A minimum of one metre of freeboard will be available above the PMP runoff volume inside the facility for wave run-up and emergency flood storage. The projected runoff from a 10-day PMP event is approximately 1.36 million cubic metres, which can also be completely contained within the basin. As adequate storage capacity will always be available within the tailings basin for complete containment of the PMP events, an emergency spillway will not be required during operations.

6.1.4 Reclaim Water Storage Capacity

The Tailings Storage Facility includes the provision to store up to 2.5 million cubic metres of reclaim water on top of the tailings surface. This water will be required prior to mill start-up and to supply the milling process during the cold winter months when surface runoff is at a minimum.



An evaluation of the extent and depth of the supernatant pond was previously completed for various tailings slopes during operations. The results indicated that there would be sufficient flexibility within the operating plan to ensure adequate storage volume on the tailings surface.

An average tailings beach slope of 0.5% has been assumed, although slopes adjacent to the upstream face of the embankment are typically in the range of 1 to 2 percent. The steeper beach adjacent to the embankment will provide a sandy zone for construction of on-going raises and for control of the phreatic surface in the embankment.

6.1.5 Staged Development

The tailings embankments have been designed for staged development during operations in order to minimize initial capital expenditures and to maintain an inherent flexibility to allow for variations in operation and production throughout the life of the mine.

The Stage Ia embankment was constructed to El. 927 metres in late 1996. The embankment was raised to Stage Ib El. 934 metres in early 1997. Stage Ib provides adequate water storage for mill start-up, plus tailings storage for approximately the first year of production along with the required freeboard. The final embankment is projected to reach El. 965 metres.

On-going requirements for embankment construction are shown on Figure 6.2 and on Dwg. No. 1625.111. Staged embankment fill quantities are presented on Table 6.3. The Stage II and III embankment raises will each provide incremental storage capacity for approximately one year of production. The Stage IV raise and each of the successive raises have been designed to provide incremental storage capacity for approximately two years of operation. On-going evaluation during operations will provide the basis for determining whether annual raises are more expedient for staged expansion of the facility.



All raises after Stage Ib will require the placement of fill on tailings beaches. A coarse bearing layer of sandy gravel or rockfill will be included, as required, for the initial construction on the tailings beaches. The low rate of rise of the tailings surface and the provision of an upstream drainage system will promote drainage and consolidation in order to enhance fill placement on the tailings beaches.

On-going raises of the tailings embankments may incorporate cycloned sand extracted from the bulk tailings stream. This option will be evaluated during the initial years of operation.

It will be possible to expand the tailings storage facility if the ore reserves are increased above the currently projected 84.5 million tonnes. Embankment raises above the proposed final crest elevation of El. 965 metres would be constructed as required by incorporating a downstream extension of the embankment toe. In addition to an increased storage capacity for the facility this would also ensure that embankment stability is maintained. Detailed stability analyses must be performed in the design of all future embankment raises.

6.2 TAILINGS BASIN PREPARATION

6.2.1 Foundation Preparation

Foundation preparation requirements for the embankment footprints, seepage collection ponds, basin liners, borrow areas, topsoil stockpiles, reclaim barge channel and site roads include clearing, stripping and topsoil stockpiling. Sub-excavation and replacement may be required in soft, saturated areas of the embankment footprints.

Topsoil stripped from the embankment footprint and from the tailings basin, where required, will be stored in the topsoil stockpile, adjacent to the Alternate Borrow Area, as shown on Dwg. No. 1625.201.



6.2.2 Basin Liners

As discussed in Section 5.0, most of the tailings basin is blanketed by naturally occurring low permeability glacial till which functions as an in-situ soil liner. However, an area of thin near surface glacial till with underlying glaciofluvial sediments was identified just upstream of the Main Embankment footprint. This is where the glacial till basin liners were constructed. A basin liner was constructed where the thickness of the surficial glacial till unit was less than 2 metres and the underlying materials were estimated to have permeability values greater than 10^{-6} cm/s.

The extent of the basin liners was confirmed during the 1996 site investigations. The Upper and Lower Basin Liners were delineated immediately upstream of the Main Embankment, as shown on Figures 5.1 and 5.2 and on Dwg. No. 1627.201.

The imported glacial till basin liner is connected to the Main Embankment core zone and extends onto existing dense low permeability glacial till that is at least 2 meters thick. The original design requirement specified that the liner was to be placed and compacted in three 150 mm thick lifts and then covered with a 300 mm thick layer of random fill as protection from frost penetration and equipment traffic. The frost protection was later increased to 450 mm for the Lower Basin Liner. In addition, an extra 750 mm of low permeability glacial till was mounded over the backfilled investigation test pits within both basin liner areas. The upstream edge of the Lower Basin Liner was keyed into the existing surficial glacial till materials. The details of the basin liner are shown on Dwg. No. 1625.202.

The basin liner materials were tested as part of the overall QA/QC program. In general, the liner materials comprised well graded silty sand glacial till placed and compacted wet of the Standard Proctor Optimum Moisture Content. The test results on the basin liner materials will be presented in the Stage Ia/Ib construction report.



6.2.3 Sediment Control Structures

Sediment control measures were included to prevent turbid surface runoff from impacting the environment downstream of the Tailings Storage Facility during basin stripping and early embankment construction. The Main Embankment Seepage Collection Pond was constructed first to provide primary sediment control during basin stripping and early embankment construction. Once the embankment foundation was prepared and embankment fill placement started, the Main Embankment became the primary sediment control feature.

6.3 EMBANKMENT CONSTRUCTION

6.3.1 General

The final configuration of the Tailings Storage Facility will include the Main, Perimeter and South Embankments. The Main and Perimeter Embankments are zoned earthfill structures with low permeability glacial till core zones, chimney drains, upstream drains and a downstream random fill zone. The South Embankment is a zoned earthfill water retaining structure that also includes a Chimney Drain. Future embankment construction may also incorporate waste rock from open pit development.

The tailings embankments have been designed for staged expansion during operations in order to minimize initial capital expenditures and to maintain an inherent flexibility to allow for variations in operation and production throughout the life of the mine. The embankments will be expanded using downstream and centreline construction techniques during the first two years. Further expansion of the Main and Perimeter Embankments will involve modified centreline methods, whereas the South Embankment will be constructed by downstream and centreline methods.



6.3.2 Foundation Conditions

Geotechnical investigations confirmed that the foundation materials at the embankments generally comprise surficial glacial till overlying a dense glaciofluvial/glaciolacustrine deposit. After foundation preparation was completed (including topsoil removal) most of the foundation soils were found to be dense, low permeability glacial till. However, some localized areas of the Main Embankment footprint contained soft, saturated glacial till which was removed prior to fill placement. At the Perimeter Embankment, a layer of saturated sand and silt was also removed from a small area of the embankment foundation to expose suitable low permeability glacial till.

The prepared embankment foundations were inspected by the Engineer and written foundation approval was required before fill placement was allowed to commence.

A system of foundation drains was installed in the Main Embankment foundation to improve the foundation conditions and enhance the dewatering of near surface soils. This system was installed to permit drainage during the early stages of construction. Pressure relief wells and pressure relief trenches connected to the foundation drains were included to depressurize the underlying glaciofluvial deposits to enhance the stability of the embankment. The foundation drains are discussed in detail in Section 6.3.6. The details of the pressure relief wells and trenches are shown on Dwg. Nos. 1625.210 and 211.

6.3.3 Borrow Areas

The tailings embankments will be constructed predominantly from glacial till borrowed locally at the Tailings Storage Facility. Most of the glacial till used for Stage Ia and Ib embankment construction was taken from the Original Borrow Area which is located within the facility, on the east side. Additional material was taken from the Alternate Borrow Area, located downstream of the Main Embankment, above the topsoil stockpile and from



the Future Borrow Area, located downstream of the facility, adjacent to the east end of the Main Embankment. The borrow areas are shown on Dwg. No. 1625.201.

In some sections of the Original Borrow Area, the glacial till materials were completely removed, exposing higher permeability soils. As a result, a low permeability glacial till basin liner was constructed over the exposed areas.

Glacial till materials present at lower elevations within the Tailings Storage Facility will not be accessible once impoundment filling commences. Therefore, the Alternate and Future Borrow Areas will continue to be developed for future embankment expansions. Waste rock from open pit development may also be utilized in the downstream shell zone (Zone C).

6.3.4 Stage Ia/Ib Embankments

The Stage Ia Main Embankment construction was completed to El. 927 metres in December, 1996. Stage Ia was completed as a water retaining dam to store the 1997 freshet runoff. Approximately 85 percent of the Stage Ib Perimeter Embankment was also completed in 1996.

The Stage Ib Main and Perimeter Embankment construction was completed to El. 934 meters in March, 1997. Stage Ib will provide sufficient storage capacity to contain all mine site runoff, additional make-up water, as required, from the Polley Lake Pumping System, and for approximately one year of tailings production.

The Stage Ia/Ib Main Embankment consists of an upstream core zone (Zone S) and a downstream zone (Zone B) and a Chimney Drain. Zone S is comprised of well graded, low permeability glacial till. The specification for Zone S originally required glacial till placement and compaction in maximum 300 mm lifts to 95 percent of the Modified Proctor maximum dry density. However, after construction started, it became apparent that this compaction standard was unattainable due to high in-situ moisture contents.



To account for this, a design change was made to the Zone S fill specification. The revised specification required that the fill be compacted to 98 percent of the Standard Proctor maximum dry density, with a moisture content less than 2 percent wet of the optimum moisture content, or as required to meet the compaction specification.

The downstream zone for the embankment (Zone B) is also comprised of well graded glacial till. The specification for Zone B originally required placement and compaction of glacial till (with the inclusion of some coarser material) in maximum 600 mm lifts to 90 percent of the Modified Proctor maximum dry density. However, coarser materials were not located in the borrow areas and the Zone B fill placement specification was subsequently revised to coincide with the revised Zone S specifications. During construction, both Zone S and B fill was placed in thin lifts (typically 100 to 150 mm) using scrapers and record testing was conducted every 300 mm for Zone S and 600 mm for Zone B.

The Chimney Drain is comprised of filter sand (minimum continuous width 1 metre) with Longitudinal and Outlet Drains for conveyance. The Longitudinal and Outlet Drains include filter sand, filter fabric, drain gravel and perforated CPT pipe.

The Stage Ib Perimeter Embankment is a homogeneous fill embankment comprised of Zone S glacial till placed and compacted in maximum 300 mm lifts to 98 percent of the Standard Proctor maximum dry density. The Perimeter Embankment also has a Chimney Drain which will be installed during Stage II construction.

6.3.5 Seepage Collection Ponds

The Main Embankment Seepage Collection Pond, located immediately downstream of the Main Embankment, was completed at the start of the Stage Ia construction program. The Perimeter Embankment Seepage Collection Pond was excavated during Stage Ib construction in 1997.



The seepage collection ponds will collect water from the embankment drain systems and from local runoff. The solutions will be recycled back into the Tailings Storage Facility. Details of the Main and Perimeter Embankment Seepage Collection Ponds are shown on Dwg. Nos. 1625.213 and 214.

6.3.6 Embankment Drainage Provisions

The following embankment drainage provisions have been incorporated to facilitate drainage of the tailings mass and to control the phreatic surface within the embankments:

Foundation Drains - Four foundation drains were installed with individual conveyance pipes for Stage Ia/Ib Main Embankment as shown on Dwg. No. 1625.210. The drains, which run parallel to the embankment axis, consist of perforated CPT tubing placed in a drain gravel surround which is encapsulated by filter fabric. The conveyance pipework for the drains runs into the Drain Monitoring Sump. At least two additional foundation drains will be included in future embankment raises.

Chimney Drain System - A Chimney drain has been included in the Main Embankment and is planned for both the Perimeter Embankment and the South Embankment. The chimney drains will provide a contingency drainage measure for control of the phreatic surface in the embankment and will also function as a crack stopper downstream of the core zone.

As illustrated on Dwg. Nos. 1625.111, 1625.207 and 1625.236, the Chimney Drain System includes the following components:

- Longitudinal Drains - The Longitudinal Drains are located at the bottom of the Chimney Drain. They are the collector drains and consist of perforated CPT tubing placed in a drain gravel surround encapsulated by filter fabric. The drain gravel and filter fabric are



surrounded by filter sand. A proper filter relationship exists between the filter sand and the drain rock.

- Outlet Drains - The Outlet Drains consist of perforated CPT tubing placed in a drain gravel surround encapsulated by filter fabric. The drain gravel and filter fabric are surrounded by filter sand. The Main and Perimeter Embankments each include three Outlet Drains, which slope from the Longitudinal Drain at a minimum of one percent. For Stage Ia/Ib, the Outlet Drains were terminated at the downstream face of the Main Embankment, and will ultimately be connected to the Drain Monitoring Sumps.
- Chimney Drains - The Chimney Drains extend vertically above the Longitudinal Drains and consist of Type B filter sand.

The Longitudinal Drains were constructed by excavating a trench in placed and compacted embankment glacial till fill or in dense natural ground. The Outlet Drains were constructed by excavating a trench in placed and compacted Zone B glacial till. The Chimney Drain was installed by various methods, including placing and compacting the filter sand in a vertical trench and/or in a mound. The construction techniques were closely monitored to ensure that the filter sand was not contaminated.

The Chimney Drain System at the Main Embankment was installed to El. 920 metres during Stage Ia construction. It was extended to El. 929 meters during Stage Ib construction in 1997 and will be further extended to El. 934 meters during Stage II construction in 1998. Future extensions will be included depending on the operational performance of the embankments, and on the type of construction materials which are incorporated in ongoing stages. The Longitudinal Drain was extended to El. 930.5 meters during the Stage Ib construction in 1997. Filter sand was mounded over the Longitudinal Drain sections above El. 929 metres. The drain gravel and Type B filter sand were processed at the mine site and at the rock borrow area.



The Perimeter and South Embankment Chimney Drain systems will be identical to the Main Embankment. They will be installed during future construction programs.

Upstream Toe Drain System - Upstream toe drains will be included along the full length of the embankment at selected elevations during future staged expansions. The locations and elevations of the drains will be reviewed after an observation period during operations when parameters such as the tailings characteristics, available borrow materials and the performance of the facility have been established.

It is presently anticipated that the Upstream Toe Drain System will initially include a Longitudinal Drain and will be similar to the Chimney Drain System. Conveyance pipework which penetrates the embankment core zone will comprise solid HDPE pipe with seepage collars bedded in concrete and installed in the abutments in dense natural ground. The details and elevation of future core zone pipe penetrations will be finalized during the detailed design for the staged expansions. The Toe Drain conveyance pipe downstream of the Main Embankment ultimate toe was installed during Stage Ia/Ib construction.

On-going embankment expansions may incorporate cycloned sand for the upstream fill, should an acceptable and economic product be produced. Additional drainage measures will be added as required, based on the behaviour of the materials and the performance of the facility.

Preliminary details of the Upstream Toe Drain System are shown on Dwg. Nos. 1625.111 and 1625.236.

6.3.7 Staged Expansions

The anticipated staged expansions for the embankments are shown on Dwg. No. 1625.111. The staged expansions will incorporate a combination of



centreline and modified centreline construction methods and will utilize glacial till, cycloned sand and random fill for the various embankment zones. The specific requirements for the random fill zones will be determined after construction and operation of the first phase of the project. The on-going embankment raises must be re-evaluated during mine operations to ensure that adequate storage capacity and embankment freeboard are maintained throughout the life of the mine.

The embankment drainage systems will also be extended during on-going embankment expansions as required. Outlet drains and pipework will include suitable levels of redundancy to compensate for minor embankment settlements or earthquake induced deformation.

The design will be reviewed on an on-going basis. Modifications to drainage systems will be incorporated as required based on operating experience, monitoring records and availability of various embankment construction materials.

6.4 CONSTRUCTION MATERIALS

6.4.1 General

The predominant construction material for Stage Ia/Ib construction was a well graded glacial till which was borrowed locally, with the majority of the material coming from within the tailings impoundment. Lesser quantities of sand and gravel were required for the drains. As there are no nearby sand and gravel deposits, the required materials were produced from on-site crushing and screening operations.

During Stage Ia/Ib construction, materials were continually evaluated based on testwork completed in the on-site laboratory, in-situ field tests conducted with a nuclear densometer, and on visual inspections.



6.4.2 Stage Ia/Ib Laboratory Testwork

Glacial till deposits within the tailings basin were sampled during the site investigation programs prior to the detailed design of the facility. Laboratory testing on selected samples included index testing to characterize the materials, specialized testing to evaluate the compaction characteristics, and permeability and shear strength testing to provide data for embankment design and analyses. Results from the earlier laboratory index testing are summarized on Table 6.4. Results from additional effective strength, compaction and permeability testwork are presented on Table 6.5.

In addition to the earlier laboratory testwork, extensive testing was conducted as part of the overall QA/QC program for Stage Ia/Ib construction. Prior to starting fill placement, numerous control tests were conducted in the on-site laboratory on samples obtained from the borrow areas, after stripping and grubbing was completed. The results of the control tests for glacial till from the Original, Alternate and Future Borrow areas are shown on Tables 6.6, 6.7 and 6.8, respectively. The median values are summarized as follows:

Parameter	Borrow Area		
	Original	Alternate	Future
Gravel Content (%)	11.4	21.1	24.2
Sand Content (%)	35.7	31.8	35.7
Silt Content (%)	43.4	39.7	36.2
Clay Content (%)	9.5	7.5	4.0
Moisture Content (%)	12.5	11.4	11.6
Plastic Limit, PL (%)	16.5	15.1	---
Liquid Limit, LL (%)	24.4	24.0	---
Plastic Index, PI (%)	8.9	8.4	---
Liquidity Index, LI (%)	-0.11	-0.37	---
Maximum Dry Density (kg/m ³)	2057.5	2025.0	---
Optimum Moisture Content (%)	9.7	10.5	---
Specific Gravity	2.73	2.7	---
Lab Permeability (cm/s)	1.8E-09	---	---



Plots of the median gradation limits for all three borrow areas are shown on Figure 6.3.

After fill placement commenced and it was confirmed that the fill would be placed wet of optimum, additional testwork was conducted to determine the relationship between moisture content and the undrained shear strength of the glacial till. The results of this testwork are shown on Figure 6.4.

Detailed results of all laboratory testwork conducted for the Stage Ia/Ib QA/QC program will be presented in the Stage Ia/Ib Construction Report.

6.4.3 Construction Materials for Future Raises

It is anticipated that either glacial till or non-acid generating rockfill materials from the mining operation will be selectively incorporated in the shell zones of the embankments for future raises. Local glacial till materials will continue to be exploited for the low permeability core zone, and adequate filters and transition zones will also need to be incorporated in future raises.

6.5 QA/QC PROCEDURES

6.5.1 General

The quality assurance (QA) and quality control (QC) procedures are described in detail in the Site Inspection Manual (Knight Piésold Ref. No. 1625/2). Knight Piésold has directed the QA/QC testing for Stage Ia/Ib construction and will continue to direct the QA/QC testing for the future embankment expansions.

Laboratory testing required for the QA/QC program includes the following:

- Moisture Content (ASTM D2216).
- Particle Size Distribution (ASTM D422).

- Laboratory Compaction (ASTM D1557).
- Specific Gravity (ASTM D854).
- Atterberg Limits (ASTM D4318).
- Field Density (ASTM D2167).
- Laboratory and Field Air Entry Permeameter (LAEP or FAEP).
- Field Density by Nuclear Methods (ASTM D2922).
- Moisture Content by Nuclear Methods (ASTM D3017).

Detailed testing frequencies and schedules are outlined in the Site Inspection Manual.

Technical Specifications developed for the Work are described in the document "Tailings Storage Facility and Ancillary Works" (Knight Piésold, Ref. No. 1625/3), which includes for:

- Basin clearing, stripping and topsoil stockpiling.
- The evaluation of prepared subgrade and removal of unacceptable foundation soils (if any).
- The evaluation of the extent of the basin liner and basin liner fill placement inspection. (Basin liner limits and borrow materials were based on control tests, including particle size analysis, permeability, field density and moisture-density relationship.)
- Embankment fill placement, including setting out and grade control (survey) requirements, control and record testing schedule, fill acceptance criteria (as above), equipment requirements, geotextile selection (as needed), compaction specifications, etc.
- Supply and installation of geotechnical instrumentation, including vibrating wire piezometers, read out equipment and monitoring huts, survey monuments, flow monitoring equipment, etc.



- Installation of groundwater monitoring wells, including materials and procedures.

6.5.2 Supervision, Inspection and Testing

Knight Piésold personnel were on site for full time supervision, inspection and testing duties during Stage Ia/Ib construction. Key items addressed by Knight Piésold included foundation inspection and approval prior to fill placement, assessment of borrow material suitability, inspection of fill placement procedures, in-situ testing of the placed fill for moisture content and density, record and control testing at the required frequencies, and monitoring of all construction instrumentation.

As a result of the prolonged construction season, Stage Ia/Ib construction was completed under winter conditions. Embankment construction restarted in late November, 1996 and Stage Ia was completed by mid-December, 1996. The subsequent Stage Ib embankment raise occurred from mid January to mid March, 1997. During the two cold weather construction periods, additional Knight Piésold personnel were present to ensure that the design objectives were achieved in spite of the freezing conditions. Additional inspections included close monitoring of the borrow areas to ensure that unsuitable or frozen material was not hauled to the embankments. If any frozen material was inadvertently placed on the embankments, it was removed and replaced with non-frozen glacial till. Smaller work areas were developed, both on the embankments and in the borrow areas to reduce the exposure time to freezing conditions.

6.5.3 QA/QC Results

Results of the Stage Ia/Ib QA/QC program will be presented in detail in the Construction Report. In summary, the QA/QC results have shown that the design objectives were achieved. The fill materials fit within the specified gradation envelopes and density and moisture content values were



acceptable. Median values for the glacial till fill placed at the Main and Perimeter Embankments (taken from the record samples) are as follows:

Parameter	Zone S	Zone B
Gravel Content (%)	17.3	18.7
Sand Content (%)	31.4	34.5
Silt Content (%)	41.3	38.4
Clay Content (%)	10.0	8.5
Moisture Content (%)	11.6	10.7
Plastic Limit, PL (%)	14.9	14.7
Liquid Limit, LL (%)	24.4	22.0
Plastic Index, PI (%)	9.7	8.0
Liquidity Index, LI (%)	-0.30	-0.45
Maximum Dry Density(kg/m ³)	2080.0	2085.0
Optimum Moisture Content (%)	9.9	9.7
Specific Gravity	2.74	2.74
Lab Permeability (cm/s)	9.5E-10	1.1E-09

Results of the record tests for Zones S and B are shown on Tables 6.9 and 6.10 and plots of the median results for the particle size distributions are shown on Figure 6.5.

6.6 TAILINGS CONSOLIDATION ANALYSES

6.6.1 General

On-going consolidation of the tailings deposit is an important consideration for the design and construction of the facility during operations and at closure. Consolidation occurs continuously within the tailings deposit during deposition, and will continue after completion of operations until all excess pore pressures have dissipated. Expulsion of pore fluids during consolidation produces settlement of the tailings surface and a corresponding increase in the average density of the deposit.

A one-dimensional finite element computer model developed by Knight Piésold Ltd. was used to predict the magnitude and rate of tailings settlement



and the corresponding average tailings density. This model used variable coefficients of consolidation, a void ratio versus effective stress relationship, an actual or predicted tailings deposition rate and large strain consolidation theory.

Analyses have been performed to predict tailings surface settlements and average densities during operations and at closure.

6.6.2 Parameters and Assumptions

The following parameters and assumptions were incorporated into the consolidation model:

- Void ratio vs. effective stress and coefficient of consolidation vs. effective stress relationships were based on data for tailings materials which exhibit similar settling characteristics to the Mount Polley tailings. The selected parameters are considered representative of the tailings which comprise approximately 10 to 15% fine sand, 85 to 90% fines and have a specific gravity of about 2.75.
- An initial settled dry density of 1.0 tonnes/m^3 was used, based on the results of laboratory settling tests for a Mount Polley tailings slurry with approximately 35% solids content.
- A daily production rate of 17,800 tonnes of dry tailings was assumed until closure. Tailings deposition was assumed to be carried out continuously over a 13 year operating period.
- The tailings are assumed to be deposited in horizontal layers across the entire tailings impoundment.
- An impermeable (no flow) boundary condition was modelled at the base of the tailings due to the presence of the underlying low permeability glacial till foundation and basin liner material.



- Evaporative losses from the exposed tailings surface were ignored. Surface desiccation of the tailings will further assist in consolidation and densification of the deposit, particularly after closure when tailings deposition has ceased and the supernatant pond has been removed.

6.6.3 Results

Estimates of tailings surface elevation and average dry density have been computed for a 13 year operating period. An average dry density of approximately 1.1 tonnes/m³ was predicted after the first year of operation. The average dry density will likely increase to 1.2 to 1.3 tonnes/m³ and will be maintained until closure. The density of the deposit will increase more rapidly once tailings deposition ceases and self-weight consolidation continues. This would be assisted by surface desiccation due to evaporation.

The tailings deposit will remain partially consolidated during operations and for a period of time after closure until all excess pore water pressures have dissipated. The actual time taken for complete consolidation will be dependent on the in-situ consolidation characteristics of the tailings.

6.7 EMBANKMENT SETTLEMENT

6.7.1 General

Settlement of the embankment fill material occurs progressively as the embankment raises extend over the tailings beaches. Analyses have been carried out to predict the magnitude of these settlements using the one-dimensional finite element computer model described in Section 6.6. Surcharge loading has been applied to represent construction of overlying embankment raises in addition to on-going deposition and consolidation of the tailings. Analyses have been carried out to predict embankment settlements after each on-going staged expansion.



Two tailings columns were evaluated at increasing distance from the Stage Ib embankment crest, as shown on Figure 6.6 and are summarized as follows:

- Column A - 6 metres of tailings overlain by Stages IV to VIII.
- Column B - 30 metres of tailings overlain by Stages VII and VIII.

Void ratio vs. effective stress and coefficient of consolidation vs. effective stress relationships for the tailings beach materials were based on data for similar coarse tailings from existing tailings facilities. An initial settled dry density of 1.2 tonnes/m³ was adopted for the beach tailings, which will consolidate more rapidly than the tailings slimes within the facility.

Tailings will be discharged into stored make-up water in the initial year of operations. Lateral segregation of tailings and beach development will be limited during this time and tailings deposited adjacent to the embankment will consist of a mixture of bulk tailings material. This material will likely not consolidate as rapidly as the coarser beach tailings. The average degree of consolidation of this initial "bulk" tailings zone has also been predicted. Parameters used for the tailings consolidation analyses described in Section 6.6 were adopted to represent these tailings and are considered conservative.

6.7.2 Results

Estimates of embankment settlements have been made for staged expansions up to the final Stage VIII crest at El. 965 metres. These represent the maximum settlements at the deepest section of the embankment.

The "bulk" tailings adjacent to the Stage Ib embankment crest will be approximately 50% consolidated prior to construction of the Stage II raise. A resulting settlement of about 0.3 metres is expected during construction of Stage II onto these "bulk" tailings. This settlement will occur during initial placement of the coarse bearing layer on the tailings and during placement of the remaining fill. Consolidation will occur rapidly during fill placement and the underlying tailings are predicted to be over 90% consolidated immediately

after construction. These "bulk" tailings do not have a significant effect on predicted embankment settlements because the compressibility of this material is likely to be higher than the coarser beach tailings only at low effective stresses. Due to confinement from additional tailings, effective stresses will increase in this underlying material. Therefore, the compressibility of these tailings will be similar to the overlying beach tailings by the time on-going embankment raises are constructed.

For the staged expansions, the majority of the settlement for both Columns A and B occurs during placement of embankment fill, as described above. A coarse bearing layer (where necessary) and fill placement during construction routinely compensates for these initial tailings settlements. Excess pore pressures generated in the tailings during fill placement dissipate rapidly and the degree of consolidation is typically 70 to 90% by the end of construction of each raise.

Embankment settlements after construction of each raise in Column A will be negligible (less than 0.1 metres) and the underlying tailings will be consolidated shortly after each raise. Settlements for Column B are also expected to be minor, approximately 0.6 metres and 0.2 metres after construction of Stages VII and VIII, respectively. It was assumed that only one toe drain located at the upstream shoulder of the Stage Ib crest was available to assist in the drainage and dissipation of excess pore pressures in the tailings for these analyses. If required, additional toe drains will be incorporated to allow increased consolidation in the tailings mass. Therefore, settlements are likely to be even smaller than those predicted above.

On-going settlements due to additional embankment raises generally reduce as the tailings become less compressible at the high confining pressures from the overlying fill. Settlements will also vary laterally along the embankment crest due to the variable thickness of the underlying tailings. The minor settlements given above correspond to maximum values in the deepest section of the facility and therefore differential settlements will not be significant.



On-going fill placement during staged expansion of the embankment routinely compensates for settlement of the embankment crest. Sloping internal embankment zones and the chimney drain will deform slightly but will result in only a very slight flattening of the embankment drainage system. This will not reduce the efficiency or integrity of the system.

6.8 STABILITY ANALYSIS

6.8.1 General

Embankment stability analyses were conducted using the limit equilibrium computer program SLOPE/W. This program performs a systematic search to obtain the minimum factor of safety from a number of potential slip surfaces. Factors of safety were computed using Bishop's Simplified Method of Slices.

Downstream Stability - Analyses were performed to investigate the downstream stability of the final Main Embankment for the following conditions:

- Static conditions during operations and post-closure. Minimum acceptable factors of safety of 1.3 (during operations) and 1.5 (post-closure) have been adopted for these cases.
- Earthquake (pseudostatic) loading during operations and post-closure. The stability of the embankment under earthquake loading was analyzed by applying a horizontal seismic coefficient (acceleration) to the potential sliding mass. Factors of safety greater than 1.0 imply that there will be no deformations of the embankment initiated by earthquake loading. For conditions during operations, the Design Basis Earthquake was used (as determined by the hazard classification for the Tailings Storage Facility). The Maximum Design Earthquake was used for post-closure (long-term) conditions.

- Post-liquefaction (residual tailings strength) condition. A minimum acceptable factor of safety of 1.1 is considered appropriate for this condition.

The tailings were assumed to be partially consolidated during operations (based on the results of the consolidation analysis) and an appropriate undrained shear strength was assigned to the tailings. Tailings effective strength parameters were used for the long-term post-closure condition when complete consolidation has been achieved.

During operations, the tailings beach and upstream embankment drainage systems will ensure that the phreatic surface is kept away from the upstream face of the embankment. However, a worst case condition with an elevated phreatic surface within the embankment core zone was also evaluated.

Upstream Stability - The upstream stability of the Main Embankment has also been evaluated for Stage Ib (during storage of make-up water) and at closure for the final embankment configuration.

The influence of construction pore pressures on embankment stability has also been considered.

6.8.2 Material Parameters and Assumptions

The following parameters and assumptions were used in the stability analyses:

- Bulk unit weights for the embankment and foundation materials are based on testwork conducted on representative samples as part of the 1995 geotechnical investigations. The results were originally presented in the "Report on 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility" (Knight Piésold Ref. No. 1623/1). An average bulk unit weight for the tailings deposit adjacent to the embankment was estimated from the results of the consolidation



analysis. The cycloned sands (Zone CS) were assigned a typical value for this material.

- Partially consolidated tailings during operations were assigned typical undrained shear strengths ranging from 10 kPa to 55 kPa at depth. For fully consolidated tailings an average effective friction angle of 30° was adopted. These are based on lower bound strengths from in-situ Shear Vane and Cone Penetration Testing obtained at other mine sites for similar tailings materials.
- Effective strength parameters for the embankment fill and foundation materials were obtained from consolidated-undrained triaxial testwork performed on representative samples obtained during the 1995 geotechnical investigations and reported in the "Report on 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility" (Knight Piésold Ref. No. 1623/1). A summary of these results is included on Table 6.11. The downstream shell zone has conservatively been assumed to comprise glacial till materials only, and no additional strength allowance has been included for rockfill materials which will likely be incorporated.
- An undrained shear strength of 85 kPa was adopted to represent the strength of the top two metres of the Stage Ib foundation soils. This value is based on the lower third bound strength obtained from the 1996 cone penetration tests, (Conetec Field Report, July 31, 1996).
- An effective friction angle of 26° was used to represent the strength parameters of the top two metres of the Final Embankment foundation soils. These strength parameters account for long-term consolidation conditions of the foundation soils. This value was based on the consolidated undrained triaxial testwork performed on glacial till samples. These samples were obtained during the 1995 geotechnical investigations and reported in the "Report on 1995 Geotechnical



Investigations for Mill Site and Tailings Storage Facility" (Knight Piésold Ref. No. 1623/1).

- An effective friction angle of 32° was adopted for the cycloned sands (Zone CS), which is considered conservative for this material.
- An undrained shear strength of 10 kPa was conservatively adopted to represent the residual (post-liquefaction) strength of the tailings. This is based on lower bound values obtained for similar tailings and is also consistent with lower bound data presented by Seed (1990) for the residual undrained shear strength of sand.
- An average effective friction angle of 30° was adopted to represent the coarse beach tailings beach underlying on-going embankment raises. These coarser, more free draining tailings will consolidate rapidly. Modelling has shown that these tailings achieve complete consolidation shortly after placement of the embankment raise.
- The location of the phreatic surface has been estimated from steady-state seepage analyses. The details are provided in Section 6.9.
- A hydrostatic pore pressure of 1.5 metres above ground was applied to the foundation soils on the downstream side of the embankment. This piezometric condition has been added to simulate baseline artesian pore water pressures within the foundation materials. This value is based on the initial readings from the foundation piezometers, the pore pressure dissipations from the cone penetration tests and the observation of the nearby groundwater well. A sensitivity analysis to check the stability for various hydrostatic pore pressures has been calculated.

The geometry, material parameters and location of the phreatic surface for the stability analyses are illustrated on Figure 6.7.



6.8.3 Results of Analyses

Downstream Stability - For the static case during operations a minimum factor of safety of 1.4 was calculated. This value will increase after closure as tailings consolidation continues with a corresponding gain in strength. Once a minimum factor of safety of 1.5 is obtained it is no longer dependent on tailings strength and the potential slip surface is located within the embankment. The minimum factor of safety for the potential critical slip surface is 1.5. For a deeper embankment slip surface, the factor of safety is 1.6. The location of potential slip surfaces during operations and post-closure are given on Figures 6.8 and 6.9, respectively.

A sensitivity analysis was conducted to evaluate the downstream static stability of the Stage 1b and Final Main Embankments for various hydrostatic pore pressures in the foundations soils. The results, shown on Figure 6.10, indicate that a minimum Factor of Safety of 1.1 is approached as the foundation pore pressures reach a height about 6.0 and 8.5 metres above ground for the Stage 1b and Final Main Embankments, respectively. The pore pressures will be monitored and appropriate actions will be taken to assure embankment stability. These actions may include implementation of depressurization measures and/or buttressing with suitably graded filter materials as discussed in the Operating Maintenance and Surveillance Manual for Stage Ib Embankment El. 934 metres (Knight Piésold Ref. No. 1627/3).

The post-closure factor of safety is dependent on the degree of consolidation and strength of the tailings material adjacent to the embankment. If on-going monitoring records and stability evaluations indicate that the minimum required factors of safety are not achieved, a small stability berm will be constructed at the downstream toe to obtain factors of safety greater than 1.5.

For the extreme case of an elevated phreatic surface within the embankment core zone a factor of safety of 1.4 was calculated for the embankment at closure. If on-going monitoring and piezometric records indicate that an elevated phreatic surface can develop in the embankment, appropriate



stabilization measures will be incorporated to ensure a minimum factor of safety of 1.5 after closure. The use of rockfill materials in the downstream shell zone will also enhance the embankment stability.

For earthquake (pseudostatic) loading during operations a minimum factor of safety of 1.3 was computed for a seismic coefficient of 0.04, corresponding to the Design Basis Earthquake. For post closure conditions and a seismic coefficient of 0.065, representing the Maximum Design Earthquake, a factor of safety of 1.2 is obtained for the potential critical slip surface. For a deeper slip surface, the factor of safety is 1.3. The location of the potential slip surface for each case is shown on Figures 6.11 and 6.12. It should be noted that even for a seismic coefficient of 0.13, representing the Maximum Credible Earthquake, the minimum factor of safety is greater than 1.0, which implies that the embankment will be stable with no deformation.

The tailings residual strength case represents the steady state strength of the material after degradation by in-situ straining. Such a condition can occur if liquefaction is initiated in the material by rapid static or seismic loading which causes a corresponding increase in pore pressures. A factor of safety of 1.4 was calculated for this case. This indicates that the embankment is not dependent on tailings strength to maintain overall stability. The potential slip surface for this case is shown on Figure 6.13.

Upstream Stability - The minimum upstream static factor of safety for the Stage Ib embankment during water storage is 1.5 and will increase once tailings deposition commences. Under seismic loading conditions for the Design Basis Earthquake, a minimum factor of safety of 1.3 was computed. The probability of occurrence of such an event during Stage Ib construction and water storage is extremely low. However, even for these worst case conditions a factor of safety well above the minimum of 1.0 is maintained.

For the final impoundment configuration, the minimum upstream static factor of safety is in excess of the minimum 1.5. The minimum factor of safety under seismic loading is well above the required minimum of 1.0.



The location of potential slip surfaces and assumed phreatic surfaces for each case are shown on Figure 6.14. The stability analyses show that the Main Embankment has an acceptable factor of safety under the most extreme and seismic conditions.

Construction Pore Pressures - The influence of the construction pore pressures on the stability of the Stage Ib embankment has also been considered. The starter embankment was constructed to a maximum height of 20 metres over a 7 to 8 month period and represents the largest construction lift for the facility. Close control of the fill moisture contents during construction prevented excess pore pressure development in the fill zones.

Pore pressures will be routinely measured during construction of on-going raises using piezometers installed into the embankment fill and foundations. Stability analyses will be required and evaluated for the design of on-going embankment raises.

6.9 SEEPAGE ANALYSIS

6.9.1 General

Seepage analyses were performed using the finite element computer program SEEP/W. The purposes of the analyses were:

- To establish the pore water pressures within the embankments for stability analyses.
- To estimate the amount of seepage discharge from the tailings storage facility.

The seepage analyses have been conducted for the Main Embankment only and were based on the cross-section shown on Figure 6.15. The parameters used such as the saturated hydraulic conductivity, are also included on Figure

6.15. For a conservative assumption, the final Main Embankment length of 1,200 metres was used in the seepage analyses.

During the initial year of operations, tailings will be discharged into stored make up water, resulting in limited beach development. As a conservative approximation, fine tailings (zone 3), have been assumed to extend to the upstream face of the embankment up to the maximum stored make up water elevation of 925 m.

6.9.2 Summary of Parameters

Saturated and unsaturated hydraulic conductivities were determined for each material in the embankment and foundation zones. In assigning hydraulic conductivity values for the seepage analysis, typical conductivity functions for similar soil types were used. These functions were adjusted to correspond with the actual saturated conductivities of the material. Hydraulic conductivity values for the tailings mass, embankment and foundation were determined as follows:

- The tailings mass was sub-divided into three zones with decreasing hydraulic conductivity to account for the less permeable consolidated tailings at depth.
- Hydraulic conductivity values for the various zones of the embankment and foundation soils were estimated based upon typical values for similar materials.

6.9.3 Boundary Conditions and Flux Sections

Boundary conditions were imposed on the modelled sections to more accurately represent hydrogeologic conditions in the field. These conditions are summarized as follows:



- A no-flow boundary condition was assigned along the left side of the model (upstream of the embankment).
- A total head boundary was imposed at the tailings surface to model a supernatant pond.
- The upstream embankment toe drain was modelled by applying a no-head condition at that location.
- Foundation drains were modelled by applying no-head nodes at drain locations.
- A hydrostatic pore pressure profile with the water table 2 metres below the ground surface was assigned to the right boundary of the model (downstream of the embankment).

Flux sections were included in the model to estimate seepage flow across the various geological units, as well as the engineered components. The following locations, in particular, were examined closely:

- Seepage inflow to the upstream toe drain.
- Seepage flow collected by foundation drains.
- Seepage flow which bypasses the seepage collection systems.

The flows collected by the seepage collection systems (i.e. the upstream toe drain and foundation drains) will drain to the Main and Perimeter Embankment Seepage Collection Ponds. These seepage flows will be recycled to the tailings impoundment. The seepage flows which bypass the seepage collection systems are the only component which will be lost to groundwater.

6.9.4 Results

All seepage flow estimates are projected increases over baseline flow rates. In particular, the embankment foundation drains include a baseline

groundwater flow component which is not factored into the following flow projections. Case one modelled the embankment drain as designed and represents the expected final Main Embankment configuration. The total solution flow rate of 1.52 l/s (24 gpm) was calculated from the seepage analysis. Approximately 97 percent of the flow was collected in the upstream toe drain and the embankment foundation drains while the remaining 3 percent of the solution flowed through the foundation. In case one, the solution flow contribution made by each of the components is as follows:

- The upstream toe drain collected 95 percent (1.45 l/s or 23 gpm).
- The embankment foundation drain system collected 2 percent (0.03 l/s or 0.4 gpm).
- Seepage loss through the foundation was 3 percent (0.04 l/s or 0.6 gpm).

Case two modelled the failure of the upstream embankment toe drain. The results provide the maximum seepage pore pressure for use in the stability analysis of the final Main Embankment. The total solution flow of 0.16 l/s (2.5 gpm) was calculated from the seepage analysis. Approximately 88 percent of the flow was collected in the embankment foundation drains, while the remaining 12 percent of the solution flowed through the foundation.

In case two, the solution flow contribution made by each of the components is as follows:

- The embankment foundation drain system collected 88 percent (0.14 l/s or 2.2 gpm).
- Seepage loss through the foundation was 12 percent (0.02 l/s or 0.3 gpm).



The seepage rates presented above are expected maximum incremental values which occur late in the project. However, during the early years of operation, seepage rates are expected to be lower, particularly at the Perimeter and South Embankments where the natural groundwater table provides complete hydraulic confinement during the first year. As the tailings surface rises, the seepage rate is expected to gradually increase to the maximum values presented above.

For both cases, the baseline groundwater flow rates recorded during construction and in the period since are much greater than the flow rates predicted for the foundation drains as a result of tailings impoundment. The total maximum baseline flow rate to date has been measured at approximately 0.9 l/s.



tributary catchment above the sediment pond. The storage capacity can be increased by selectively routing flows into the tailings system. Erosion control and energy dissipation riprap will be provided as necessary in spillways and discharge channels.



- The need for sediment removal at sediment control ponds should be checked annually and after major storm events and carried out when necessary.

7.3.3 Polley Lake Pumping System

The Polley Lake Pumping System is a contingency option that can provide additional make-up water to the milling process. The system was designed for a maximum water extraction rate of 8,000 US gpm and will operate during the spring freshet only. It includes a submerged intake structure, suction pipeline, pumping station and a discharge pipeline into the Tailings Storage Facility. The general arrangement of the pumping system is shown on Dwg. No. 1628.001. The design was presented in the report "Polley Lake Pumping System" (Knight Piésold Ref. No. 1628/5).

Based on annual water balances for average precipitation conditions, the extraction of up to 1 million cubic metres may be required for the first 3 years of operations, after which the annual make-up water requirements decrease.

The amount of water that can be extracted from Polley Lake is limited by the minimum fish flow requirements for Hazeltine Creek. To minimize the negative potential impacts on Hazeltine Creek, water will only be extracted from Polley Lake during the freshet, from approximately mid March to mid May. Based on annual outflow hydrographs for Polley Lake, approximately 1.4 to 2.0 million cubic metres of water should be available annually for pumping. However, the actual water available for pumping will be determined by monitoring flows in Hazeltine Creek during the pumping period.

7.3.4 Sediment Control Ponds and Discharge Requirements

Sediment control ponds are sized to provide storage (Southeast Sediment Pond) of the 1 in 10 year - 24 hour storm runoff flood flows from the



- Catchment above the tailings access road, between the Millsite and Bootjack Creek - Runoff will be directed to Bootjack Creek with no transfer to the Tailings Storage Facility.
- Catchment areas downstream from the tailings embankments - Runoff for some areas will be directed to the Seepage Collection Ponds and transferred to the Tailings Storage Facility.
- Millsite area - Diversion ditches along the lower perimeter of the Millsite area will collect and direct runoff to the Millsite Sump. The water will be pumped to the mill or will flow by gravity to an inlet point (T1) on the tailings pipeline so that it can be returned to the process circuit via the tailings and reclaim systems.
- Waste Rock Storage Area - A diversion ditch along the base of the waste rock storage area will collect and direct runoff to the Southeast Sediment Pond. From here, water can be directed into the process circuit via the Reclaim Booster Pump Station or the T2 Dropbox. The design criteria for the diversion ditches are as follows:
 - The ditches are sized to convey the peak flow runoff from the 1 in 10 year precipitation event. This flow was determined on the basis of site IDF values and the rational formula, as outlined in the MOE Manual of Operational Hydrology.
 - Erosion protection and energy dissipation will be provided to minimize erosion under normal operating conditions. Erosion damage requiring repairs to surface water control facilities would be expected during extreme flood events.
 - For design purposes, "extreme" floods are defined as those with an annual probability of occurrence of less than 2%.



- Minimize the volume of fresh water extracted from Polley Lake.
- Monitor the quality of surface runoff from disturbed areas and groundwater flows within the project site.
- Release only the highest quality water from within the project boundaries in accordance with permitted requirements. The volumes to be released will be as necessary to maintain an overall project water balance under actual hydrometeorological conditions.
- Manage the tailings supernatant pond to optimize the volume of water stored on the tailings surface during operations and provide the final volume of ponded water in the tailings basin at closure. The objective at closure is to provide a walk-away solution.
- Develop and maintain a detailed data base to allow water balances for the site to be as accurate as possible, thereby becoming useful tools for predicting annual make-up water requirements and for scheduling releases of clean surface runoff water as appropriate.

7.3.2 Surface Runoff Diversion Ditches

Some of the surface runoff diversion ditches will be used to direct runoff to the Tailings Storage Facility from various catchments as follows:

- Catchment above the Tailings Storage Facility - Runoff from the area directly above the Tailings Storage Facility will be captured during the early years of operation.
- Catchment above tailings area access road, below Bootjack Creek - Runoff in the ditch for the access road will be directed to the Tailings Storage Facility. The pipelines are in a separate pipe containment channel.



The annual withdrawal of the maximum of 1.0 million cubic metres of water from Polley Lake will likely only be required prior to start-up and for the first three to four years of operations. Withdrawal requirements for subsequent years will decrease progressively with time due to the increased consolidation of tailings in the pond (greater release of pore water) and the progressive development of the open pit and waste dump.

7.2.3 Water Supply at Start-Up

As stated above, the updated water management plan indicates that approximately 1.9 to 2.5 million cubic metres of water should be stored in the Tailings Storage Facility prior to mill start-up. This water volume will be obtained by capturing the 1997 freshet and by pumping up to 1 million cubic metres from Polley Lake.

7.3 WATER MANAGEMENT PLAN

7.3.1 General

The objective of the project Water Management Plan in the early years is to route all project water flows from disturbed areas into the milling process or into associated mine site activities such as dust suppression. In the later years of operation the objective will be to monitor and release selected surface water inflows 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:

- Maximize the capture of surface and groundwater flows from within the project area.
- Maximize the use of the uncharacteristic water recovered from within the project area in the milling process.



the analyses are consistent with those used in previous water balances for the tailings impoundment and mine site. For this report, average annual water balances for years 1 and 13 are presented.

7.2.2 Water Balance Results

When conducting the water balance, a fundamental consideration was that an adequate volume of water must be available to the milling circuit during the cold winter months (when precipitation accumulates as snow and surface runoff is at a minimum) or if drier than average conditions occur. This requirement can be met by:

- Providing up to 2.5 million cubic metres of water in the tailings impoundment prior to start-up.
- Ensuring that 1.9 to 2.5 million cubic metres of water is available in the tailings impoundment following the freshet during on-going operations.
- Allowing for contingency water extraction of up to 1.0 million cubic metres annually from Polley Lake during peak flow months.

The water balance components for years 1 and 13 are shown on Figures 7.2 and 7.3, respectively. The results of the water balance for years 1 and 13 are shown on Tables 7.1 and 7.2, respectively, and indicate that water stored in the Tailings Storage Facility will be at a minimum in March of every year, just prior to freshet. The subsequent snowmelt will significantly increase the water storage in the tailings impoundment. However, it is unlikely that the freshet alone will provide the volume required to carry operations through the following winter. Consequently, additional make-up water from Polley Lake (up to about 1 million cubic metres) will be required to make up the difference so that sufficient process water is available for reclaim. A schematic illustration of the water balances for these years is presented on Figure 7.4.



SECTION 7.0 - WATER BALANCE AND MANAGEMENT

7.1 GENERAL

The water management strategy for the Mount Polley Project was originally presented in the "Report on Project Water Management" (Knight Piésold Ref. No. 1624/1). The current revised water management strategy differs from the concept originally presented as catchment areas A, B and C will no longer be utilized as a source of surface runoff for transfer to the tailings impoundment. Instead, up to one million cubic metres of water will be extracted annually from Polley Lake during the spring freshet high flow period.

The overall project components include disturbed and undisturbed areas at the open pits, waste rock storage area, Millsite, Tailings Storage Facility, the undisturbed catchment area immediately upstream of the Tailings Storage Facility and the diverted areas downstream of the tailings embankments. A schematic of the site water management plan is shown on Figure 7.1.

7.2 WATER BALANCE

7.2.1 General

The overall project water balance was completed in the "Report on Project Water Management" by integrating the water balances for the mine site with those for the Tailings Storage Facility. The analyses included a comprehensive series of water balances to evaluate the volumes of surface runoff water available throughout the life of the mine. A probabilistic water balance analysis using the @RISK Analysis and Modelling program was developed to describe the effects of a statistical range of precipitation conditions over the entire life of the project. Over 1000 different combinations of wet and dry precipitation conditions were considered.

The staged development plans for the various components of the project are included in the water balance analyses. Specific assumptions incorporated in



SECTION 8.0 - PIPEWORK

8.1 GENERAL

This section describes the pipework and pump systems required for the tailings and reclaim pipelines and for the Tailings Storage Facility seepage recovery system. Design criteria for the various components of the Tailings Storage Facility pipework are provided. The pipeline plan and profiles are shown on Dwg. Nos. 1625.218, 222 and 228, with sections and details shown on Dwg. No. 1625.219, 223, 224, 225 and 226.

8.2 TAILINGS PIPEWORK

8.2.1 General

The tailings pipeline extends approximately 7,000 metres from the Millsite to the southwest corner of the Tailings Storage Facility (the right abutment of the Main Embankment). The tailings system is designed to flow by gravity and to be self-draining.

8.2.2 Design Criteria

The tailings pipeline has been designed to the following criteria:

- Millsite tailings discharge at El. 1,110 metres (approx.).
- Tailings embankment crest elevation at start-up at El. 934 metres.
- Tailings embankment crest elevation at end of mine life at El. 965 metres.
- Continuous downhill grade to ensure pipeline is free draining and to prevent potential sanding and freezing problems.





- Pipe diameter selected for gravity flow (open channel or non-pressure flow) over a range of operating conditions.
- All pipework is butt fusion welded HDPE, with the exception of a short (300 metres) stretch of steel pipe at the reclaim barge.
- A dropbox (T2) provided along the tailings line allows for the addition of waste dump runoff from the Southeast Sediment Pond to the tailings stream and serves as an overflow for the reclaim booster sump.
- Spill containment is provided for the full length of all pipelines.
- The pipelines are buried through the Millsite area and are laid in a pipe containment channel cut in or lined with glacial till from the Millsite to the Tailings Storage Facility.
- The pipelines are sleeved at the Bootjack Creek crossing to provide additional spill containment.

8.2.3 Tailings Delivery Pipework

The tailings delivery pipework consists of High Density Polyethylene (HDPE) pipe of varying diameter. Pipe wall thickness (pressure rating) was selected to accommodate the anticipated operating pressures and vacuum conditions and includes an allowance for internal abrasive wear.

The tailings pipeline has two sections, with different pressure ratings and diameters. The first section extends from the Millsite to the T2 Dropbox and is comprised of 22 inch (556 mm) DR 17 HDPE pipe. The second section extends from the T2 Dropbox to the Tailings Storage Facility and comprises 24 inch (610 mm) DR 15.5 HDPE pipe. Two sections of 30 inch (762 mm) DR 15.5 HDPE pipe are also included at the start of the two pipeline sections (at the Millsite and at the T2 Dropbox) to ensure that flows are not restricted at the inlets.



8.2.4 Tailings Discharge Pipework

At the Tailings Storage Facility, the pipeline will run along the inside crest of the embankment. The pipeline will be provided with a movable discharge section comprising twelve lengths of pipe (199.2 m) with 150 mm offtakes near the end of every second pipe (6 offtakes total). The movable discharge section will allow controlled deposition of tailings over the tailings beach. The tailings pipeline has been installed with a number of flanged connections where the movable discharge section can be installed. For the first year of operations, discharge will be concentrated from the Main Embankment at the deepest part of the impoundment to establish the tailings beach and from the right abutment of the Main Embankment to cover the Upper Basin Liner. Additional discharge will be provided at the M1 dump valves, as required.

The offtakes will be made from one of a number of commercially available options for this purpose. A typical offtake or "spigot" comprises:

- a strap-on tee sleeve (Robar type) with a flanged 150 mm outlet;
- a valve, which is required for regulation of high flows or pressures;
- a length of heavy duty (material handling type) hose or HDPE pipe;
- a pipe anchored to the embankment to direct tailings flow and minimize erosion of the embankment fill.

The tailings pipeline will be secured on the embankment crest by straps and concrete blocks or guide posts to restrict thermally induced movements.

8.3 RECLAIM WATER SYSTEM

8.3.1 General

The reclaim water system returns water from the Tailings Storage Facility to the Millsite for re-use in the process circuit. The reclaim water system



comprises a pump barge, the reclaim pipeline and a reclaim booster pump station.

8.3.2 Design Criteria

The reclaim water system is designed to meet the following criteria:

- To provide adequate pipeline and pumping capacity to meet operational process requirements.
- To provide a Stage Ib drawdown range of the pond using the pump barge channel from El. 932 to El. 917.
- To provide a booster pump station at the midpoint of elevation to reduce pressure rating requirement. Pumps identical to those at the barge will be used in the booster station to reduce spare part requirements and to simplify maintenance.

8.3.3 Reclaim Barge

The reclaim barge will be a prefabricated floating pump station complete with perimeter trash screens, internal wet well(s), pump(s), valving, piping, electrical power, instrumentation and control circuitry. The reclaim barge will be designed by Others.

A hinged walkway/pipe bridge will be provided for access to the barge from the side of the reclaim barge channel. The reclaim barge channel is shown on Dwg. No. 1625.206.

8.3.4 Reclaim Pipeline

The reclaim pipeline will be constructed in two sections, with varying pressure ratings to accommodate anticipated operating pressures and vacuum conditions. The first section will extend from the pump barge to the booster



pump station and will include a stretch (approximately 300 metres) of steel pipe at the reclaim barge. The remainder will consist of HDPE pipe which decreases in thickness (pressure rating) as the booster pump station is approached and the pressure head is decreased. The second pipe section is similar to the first, but does not have any steel pipe sections. Nominal 24 inch (610 mm) HDPE pipe with varying pressure ratings has been selected to provide the required water transfer capacity.

8.3.5 Reclaim Booster Pump Station

The reclaim booster pump station will be constructed using parts identical to those at the pump barge to the greatest degree possible. This will ensure ease of maintenance and will allow parts to be interchanged as needed.

An inter-linked control system, to be designed by Others, will co-ordinate pump operations with process water demand at the millsite. The control system and pipework design will include the necessary provisions for spill prevention.

8.4 SEEPAGE RECOVERY SYSTEM

8.4.1 Monitoring Wells

The monitoring wells around the perimeter of the Tailings Storage Facility will be used to monitor seepage from the tailings area. These wells will be sampled prior to start-up to establish baseline ground water quality and during operations to check for process constituents in the groundwater.

The monitoring wells can not be operated as seepage recovery wells. However, on-going monitoring will indicate if additional seepage recovery wells are required. Any new seepage recovery wells will be suitably sized to permit installation of submersible pumps.



8.4.2 Embankment Foundation Drains

Embankment foundation drains and pressure relief wells and trenches located immediately below the compacted glacial till at the Main Embankment will relieve any groundwater or seepage pressures which may develop in the embankment foundations. The drains will convey the resulting flows to the Drain Monitoring Sump, where the outlets will be monitored for flow quantity and water quality.

In the event that an additional pressure relief trench is required on the right abutment of the Main Embankment, it will be directed to the Drain Monitoring Sump, where a new outlet can be installed and monitored for flow quantity and water quality.

All foundation drain flows will be recycled to the tailings impoundment via the Drain Monitoring Sump.

8.4.3 Toe Drains

The upstream toe drains shown on Dwg. Nos. 1625.111 and 1625.236 are included to dewater the tailings beach. They are an important component for the modified centreline raising of future stages of the embankment. The detailed design of the upstream toe drain system will be completed prior to Stage III construction, after the tailings characteristics, available borrow materials and the performance of the facility during operations can be reviewed.

The toe drain outlets will discharge to the drain monitoring sumps. The flows will be monitored for flow quantity and water quality and the results correlated to other instrumentation and monitoring data.



8.4.4 Drain Monitoring Sump

Drain monitoring sumps are provided upstream of the Main and Perimeter Embankment Seepage Collection Ponds to allow flow measurements and water quality samples to be taken from the individual drains. The sumps are constructed using 1.8 m diameter manholes with low level outlets to the seepage collection ponds as shown on Dwg. No. 1625.202.

8.4.5 Seepage Collection Pond Recycle Pumps

The seepage collection ponds are provided with recycle pump systems to pump the water back to the Tailings Storage Facility. The seepage collection and recycle system is shown schematically on Dwg. No. 1625.213. The pipelines consist of six inch diameter HDPE pipe with suitable pressure ratings and will extend from the pumps to the crest of the tailings embankment to discharge directly onto the tailings beach.



SECTION 9.0 - INSTRUMENTATION AND MONITORING

9.1 GENERAL

Geotechnical and environmental instrumentation and monitoring systems are essential to evaluate the performance of the embankment and associated structures and to detect abnormal conditions relevant to dam safety. Close monitoring of the Tailings Storage Facility is especially important in the first year of operations, before the tailings beaches are established (Stage Ia/Ib will initially function as a water storage dam to store runoff and make-up water for mill start-up.)

9.2 MONITORING PROGRAM

The monitoring program for the Tailings Storage Facility includes the following:

a) **Measurement of the rate of filling with water and/or tailings.**

The pond elevation, depth, area and volume must be closely monitored:

- To ensure that the required amount of make-up water (maximum 2.5 million cubic metres) is not exceeded so that there is adequate storage capacity for tailings until construction of the next raise.
- 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 piezometers and drain flow quantities.

The filling rate can be monitored by measuring the pond level and using a staff gauge together with the depth / area / capacity curve for the facility. The

d) Monitoring of the vibrating wire piezometers.

For Stage Ia/Ib, vibrating wire piezometers have been installed along three instrumentation planes at the Main Embankment. One piezometer was also installed at the Perimeter Embankment. The piezometers measure pore pressures in the foundation soils, the embankment foundation drains and the embankment fill zones, including the Chimney Drain.

Summary plots for data collected to date at the three Main Embankment piezometer planes are shown on Figures 9.2, 9.3, and 9.4. The results show that:

- Pore pressures in the foundation soils have remained at or near pre-construction levels (Piezometers A2-PE2-01/02, B2-PE2-01/02, C2-PE2-01/02). Temporary pore pressure increases in the range of one metre of head resulted from fill placement. Foundation pore pressures also increased by approximately 1 m due to impounding water to an elevation of about 926 m.
- Pore pressures in the foundation and chimney drains have remained at zero, indicating that all drains are unimpeded and are functioning well (Piezometers A1-PE1-01/02/03, B1-PE1-01/02/03, C1-PE1-01/02).
- The fill piezometers responded quickly to the placement of additional material and were monitored accordingly. Some high pressures were observed (greater than the load from the new fill). This is attributed to the piezometer installation method, where the saturated tips were immersed in a loose slurry in a small hole and were then quickly loaded. Therefore, these pore pressures are not considered to be indicative of general pore pressure conditions in the embankment fill, but only provide an indication of the confined slurry pressure at the piezometer tip. The high pressures are slowly dissipating and illustrate the low permeability nature of the surrounding fill.



pond level is shown on the summary plots for the foundation drain flows and the vibrating wire piezometer pressure plots, as discussed below.

b) Measurement of the Foundation Drain flow quantities and sampling for water quality analyses.

The flows in the foundation drains at the Main Embankment must be closely monitored to allow for correlations with other data (especially pond level) to be established. This is of particular importance during the initial filling of the Tailings Storage Facility when there are no tailings to help seal the basin.

A plot of the up to date foundation drain flows and pond level is shown on Figure 9.1. The plot shows that the foundation drain flows have continued to remain low, with a total flow below 20 litres/minute, even though the water level in the pond is rising. This indicates that the impounded water has not influenced the underlying soils and that the glacial till liner (natural and constructed basin liner) is working.

In addition to monitoring the foundation drain flows, samples should also be collected for water quality testing. Sampling and testing have already been initiated and should be continued quite frequently prior to mill start-up so that consistent baseline data are established. It is recommended that sampling and testing be continued until at least three consistent sets of results have been collected.

c) Monitoring of the Chimney Drain outlets.

The three outlet drains for the Main Embankment Chimney Drain end at the downstream face of the embankment. They will be extended to the Drain Monitoring Sump as part of Stage II construction in 1998. These drains must also be closely monitored to allow for correlations with other data (especially pond level) to be established. Any outlets installed in the Perimeter Embankment Chimney Drain will be similarly monitored.

- h) Sampling of surface water streams down gradient of the facility for water quality analyses.

The surface water streams down gradient of the facility will be sampled for water quality analyses on an on-going basis. As discussed above, sampling and testing should be continued frequently until mill start-up so that consistent baseline data are established.

- i) Sampling of process water in the tailings pond and seepage recycle ponds for water quality analyses.

After tailings discharge has commenced, process water in the tailings pond and seepage recycle ponds should be sampled for water quality analyses. The results can be compared to those from groundwater quality monitoring wells.

- j) Flow monitoring in diversion ditches, runoff collection ditches, and Polley Lake Pumping System.

This is required for the detailed on-going evaluation of the project water balance and can be used to help predict the amount of make-up water needed from Polley Lake.

- k) Meteorological (rain, snow, evaporation) and air quality data collection.

Meteorological data is important for the water balances and can be used to help predict the amount of make-up water needed from Polley Lake. This data is being collected on an on-going basis.

Instrumentation details are shown on Dwg. Nos. 1625.220 and 221 and the frequency of monitoring for the instrumentation is shown on Table 9.1. The instrumentation systems will be upgraded as required during each staged expansion of the tailings embankment. The locations and details of additional piezometers and surface movement monuments will be established during the detailed design of each staged expansion.



Monitoring is being continued on a weekly basis. The piezometer leads will be extended to the instrumentation monitoring huts after the foundation preparation work required for future embankment raises has been completed. All new piezometer installations for future embankment raises will be similarly monitored.

e) Monitoring of Surface Movement Monuments and Survey Control Points.

Surface movement monuments are required on the crests of the embankment each year to monitor vertical and lateral movement of the earthfill dams. End of construction and beginning of construction embankment crest surveys will also be carried out for each staged expansion raise.

Survey control points established for Stage Ia/Ib construction will act as survey control for all features at the Tailings Storage Facility, including the staff gauge for monitoring the pond level and the surface movement monuments on the embankment. New survey control points will be established as required.

f) Monitoring of water levels in groundwater monitoring wells.

A total of 11 monitoring wells were installed at six locations around the perimeter of the Tailings Storage Facility in late 1996, as shown on Figure 9.8. Monitoring of the water levels has been initiated and will be continued on a monthly basis. In addition, well MP89-234 will be monitored.

g) Sampling of groundwater monitoring wells for water quality analyses.

A total of 11 monitoring wells were installed at six locations around the perimeter of the Tailings Storage Facility in late 1996, as shown on Figure 9.5. Sampling for water quality analyses has been initiated and will be continued frequently prior to impounding tailings so that consistent baseline data are established.



Routine Inspections

Routine inspections provide, to the maximum extent possible, continuous surveillance of the facility and should be done on a weekly basis.

Routine inspections are very important during the initial filling of the Tailings Storage Facility. The downstream slope and toe of the Main Embankment should be inspected in detail and any signs of seepage noted, such as wet areas, seepage boils, flows from the Chimney Drain outlets, etc.

Intermediate Inspections

Intermediate inspections of the civil/structural works and mechanical equipment should be carried out on an annual basis, or as required if abnormal conditions or a particular hazard arises.

Equipment Tests

Intermediate inspections of pumps should be conducted on a regular basis with valve inspections occurring twice a year, or as required, to ensure effective operation.

Special Inspections

Special inspections are required during initial reservoir filling and may be required following a major flood, earthquake or other event which may have affected the operation of the equipment or damaged the facilities.

Special inspections should be conducted by the Design Engineer. Special inspections will include all earthfills and cut slopes, the drain monitoring sumps, an on-site review of all monitoring data and an overall site inspection of all components associated with the Tailings Storage Facility.



An "Operation, Maintenance and Surveillance Manual for Stage Ia Embankment El. 927 metres" was previously issued (Knight Piésold Ref. No. 1627/1), and was a requirement prior to commencing water impoundment in the Tailings Storage Facility. A revised manual "Operation, Maintenance and Surveillance Manual for Stage Ib Embankment El. 934 metres" will be issued (Knight Piésold Ref. No. 1627/3) prior to start-up.

The main objectives of the Operation, Maintenance and Surveillance Manuals are to provide operational procedures and to detail monitoring systems which will be implemented both prior to start-up and during operations. In particular, the various components of the project water management plan will be identified and specific operational and monitoring requirements will be itemized so that the objective of storing sufficient runoff water in the tailings facility for mill operations is maintained, while simultaneously preventing the accumulation of excess water in the tailings impoundment during on-going operations.

The frequency and testing requirements for the water quality monitoring (groundwater monitoring wells, surface waters, tailings water) are being evaluated and will be finalized as required to meet the all guidelines required by government agencies.

9.3 INSPECTIONS

All components of the embankment and associated structures should be regularly inspected to ensure the serviceability and integrity of the Tailings Storage Facility. The type and scope of inspections were originally presented in the "Operation, Maintenance and Surveillance Manual for Stage Ia Embankment El. 927 metres" (Knight Piésold Ref. No. 1627/1) and are summarized below. All inspections are to be carried out by suitably qualified individuals as described in the manual. The inspection requirements will be reviewed and presented in the revised "Operation, Maintenance and Surveillance Manual for Stage Ib Embankment El. 934 metres".



In addition to the special inspection required prior to start-up and after a flood or earthquake, increased site surveillance should also be initiated if the following conditions or circumstances are observed:

- Abnormally high piezometric levels.
- Settlement, cracks and/or slumping of the embankment.
- Sinkholes along slope(s) of the embankment.
- Failure or substantial movement of reservoir slopes.
- Slope failure or seepage flows from the embankment slopes.
- Increased or contaminated flow from foundation drain outlet pipes.
- Damage to any component of the facility.

The minimum frequency of inspections and tests is specified on Table 9.2.

9.4 CONTINGENCY PLANS

In the event that minor repairs are required at the Tailings Storage Facility, construction equipment should be available at the Mine. The minimum equipment requirements include an excavator, a grader and a bulldozer. The equipment will be used to repair any slumped or scoured areas along embankment slopes, or to construct other key cuts or fills etc. Construction materials should be available at the Tailings Storage Facility and at the Mine for use in repairing or remediating any damaged areas. Local stockpiles of filter sand, drain gravel, riprap, and glacial till should be made available for periodic maintenance or for emergency use. Sources of cement, plastic sheeting, filter fabric, miscellaneous pipework and spare parts etc. should also be available at the Mine.

The surficial glacial till on the right abutment (approx. Chainage. 16+40 to 18+70) is underlain by sandy sediments with some elevated pore pressures. There is a possibility that the pore pressures in this unit will increase as the Tailings Storage Facility is filled, especially during the initial filling with water prior to start-up. In the event that on-going monitoring and inspections indicate that uplift pressures are increasing (indicated by elevated pore pressures in the piezometers or evidence of



seepage or piping downstream of the embankment), it may be necessary to install a pressure relief trench in this unit downstream of the embankment.

The pressure relief trench will be designed as required. Materials needed to construct this pressure relief trench would likely include 6 inch corrugated polyethylene tubing (CPT), 8 oz. non-woven filter fabric, drain gravel and Type B filter sand. These materials should be available at the Mine or in the vicinity of the Tailings Storage Facility.

A second option to minimize any effects that increased uplift pressures could have is to construct a buttress on the downstream side of the Stage Ia/Ib Main Embankment. This work is already planned as part of the Stage II expansion in 1998 but could be undertaken earlier, if necessary. The design of the buttress, including material and placement Specifications, would be completed as required.

The Longitudinal Drains have been installed in dense natural ground at the left abutment of the Main Embankment. At the right abutment, the Longitudinal Drain was installed in fill just above the prepared ground surface. As a result, the Longitudinal Drains can function as foundation drains and some seepage should be expected.

In the event that seepage is observed from the Chimney Drain outlets on the downstream face of the Main Embankment, the outlets should be extended to the Seepage Collection Pond or the Drain Monitoring Sump. Extensions to the Drain Monitoring Sump are planned for Stage II construction and will require 6 inch corrugated polyethylene tubing (CPT), 8 oz non-woven filter fabric, drain gravel and Type B filter sand. These materials should be available at the Mine or in the vicinity of the Tailings Storage Facility. A riprap lined trench can be constructed should the flows require temporary redirection to the Seepage Collection Pond. Suitable materials should also be available at the Mine or in the vicinity of the Tailings Storage Facility.



SECTION 10.0 - RECLAMATION

10.1 GENERAL

In accordance with requirements under the *B.C. Mines Act* and *Health, Safety and Reclamation Code for British Columbia*, the primary objective of the proposed Reclamation Plan will be to return the tailings impoundment to an equivalent pre-mining use and capability. This comprises forested wildlife habitat that supports grazing, hunting, guiding, trapping and recreational uses. The following goals are implicit in achieving this primary objective:

- Long-term preservation of water quality within and downstream of decommissioned operations
- Long-term stability of the tailings impoundment
- Re-grading of all access roads, ponds, ditches and borrow areas not required beyond mine closure
- Removal and proper disposal of all pipelines, structures and equipment not required beyond mine closure
- Long-term stabilization of all exposed materials susceptible to erosion
- Natural integration of disturbed lands into surrounding landscape, and restoration of the natural appearance of the area after mining ceases, to the greatest possible extent
- Establishment of a self-sustaining vegetative cover consistent with existing forestry, grazing and wildlife needs

As an overall approach to achieving these objectives, the Reclamation Plan is sufficiently flexible to allow for future changes in the mine plan and to incorporate



information obtained from ongoing reclamation research programs such as trial tailings re-vegetation plots.

10.2 TOPSOIL STOCKPILING

Soil surveys were completed prior to construction to determine soil characteristics, soil volumes and to select topsoil stockpile areas. Requirements for salvage and stockpiling of surficial materials from the tailings impoundment were subsequently developed. The preferred locations for topsoil stockpiling are shown on the Drawings. All topsoil stockpiles will be provided with runoff collection ditches and sediment control features.

10.3 DECOMMISSIONING AND CLOSURE

Testwork has confirmed that the tailings are non-acid generating. Therefore, the tailings surface will be decommissioned as a mixed forested/wetlands complex with a gradual transition towards a ponded area with an overflow spillway. The downstream face of the tailings embankments will be revegetated progressively during operations to the greatest extent possible, once the final toe position and slope have been established.

At mine closure, surface facilities will be removed in stages, salvaged and sold. The tailings delivery system will be dismantled and removed immediately following cessation of operations. The reclaim barge, pumps and pipeline will be utilized for supplementary flooding of the open pit and will then be dismantled and removed. The seepage collection ponds and recycle pumps will be retained for a period after closure until monitoring results indicate that tailings area seepage is of suitable quality for direct release to the environment. At that time, the seepage collection pond and pumps will be removed. The groundwater monitoring wells and monitoring piezometers in the tailings embankment will be retained for use as long term monitoring devices.

A dual level spillway will be constructed, with the lower level designed to accommodate the 1-in-200 year flood flows and the second capable of accommodating



the Probable Maximum Flood (PMF) within the tailings basin. The lower spillway, which will include the outflow channel, will be constructed in competent ground adjacent to the South Embankment and will discharge to the Edney Creek north tributary drainage. The elevation of this spillway and outflow channel will be designed to establish a set water elevation over the tailings surface (approximately 15% coverage). A secondary, or emergency overflow spillway section will be designed to accommodate the PMF while maintaining sufficient freeboard within the impoundment. This secondary spillway is also required in the event that beavers, ice or debris block the lower spillway and outflow channel.

Before the final tailings impoundment flooding to the required pond elevation, the area along the final water level will be sculptured using conventional earthmoving equipment to create a series of small bays and channels which will become a margin environment conducive to the creation of waterfowl breeding and staging habitat. The tailings embankments and the upland portions of the exposed tailings beach will be covered with a layer of soil and revegetated with indigenous species of conifer and deciduous trees, and willow and marsh land grasses. The moist transition zone between the topsoiled beach and final pond will be revegetated as an early seral stage meadow, leading to aquatic tolerant, emergent and submerged species of plant. Native vegetation species that are accustomed to swampy areas will be utilized for these transition zones. Where necessary, the final tailings surface will be treated with amendments suitable for sustaining permanent growth. The shoreline will then be planted with native emergent plant species for cover. The expected species will be transplanted from nearby wetlands of a similar aspect and elevation or propagated from root cuttings, turf squares or offsets.

The advice of organizations such as the B.C. Fish and Wildlife Branch, Ducks Unlimited and local trappers/guided outfitters will be sought during final design.

Final seeding of the embankment slopes with grasses and legumes will provide a stable vegetation mat that resists erosion. Once open pit flooding is complete, the surface water diversion system will be dismantled to allow for natural runoff to be routed through the tailings area.



SECTION 11.0 - REFERENCES

The following Knight Piésold documents provide background information to support this report:

1. Imperial Metals Corp. Mt. Polley Project, "Report on Geotechnical Investigations and Design of Open Pit, Waste Dumps and Tailings Storage Facility", February 19, 1990.
2. 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.
3. Imperial Metals Corp. Mt. Polley Project, Report on Project Water Management, Ref. No. 1624/1, February 6, 1995.
4. Imperial Metals Corp. Mt. Polley Project, Groundwater Monitoring Program, Ref. No. 1624/2, June 3, 1996.
5. Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility, Design Report, Ref. No. 1625/1, May 26, 1995.
6. Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility, Site Inspection Manual, Ref. No. 1625/2, May 26, 1995.
7. Imperial Metals Corp. Mt. Polley Project, Tailings Storage Facility and Ancillary Works, Part 10 - Technical Specifications, Ref. No. 1625/3, March 25, 1995.
8. Imperial Metals Corp. Mt. Polley Project, Tailings Access Road and Tailings/ Reclaim Pipelines, Part 6 - Technical Specifications, Ref. No. 1625/4, May 17, 1995.

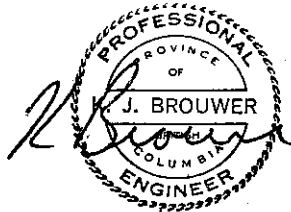


9. Imperial Metals Corp. Mt. Polley Project, Manual on Sampling and Handling Guidelines for Determination of Groundwater Quality, Ref. No. 1625/5, May 19, 1995.
10. Imperial Metals Corp. Mt. Polley Project, Response to Review Comments on Tailings Embankment Design, Ref. No. 1625/6, January 25, 1996.
11. Imperial Metals Corp. Mt. Polley Project, Response to Review Comments on Groundwater Monitoring Program, Ref. No. 1625/7, September 12, 1996.
12. Imperial Metals Corp. Mt. Polley Project, Requirements and Specifications for the 1996 Groundwater Monitoring Program, Ref. No. 1625/8, September 12, 1996.
13. Mount Polley Mining Corporation, Mount Polley Project, Tailings Storage Facility, Operation, Maintenance and Surveillance Manual for Stage Ia Embankment (El. 927 m), Ref. No. 1627/1, March 11, 1997.
14. Imperial Metals Corp. Mt. Polley Project, Report on Geotechnical Investigations and Design of Open Pits and Waste Dumps, Ref. No. 1628/1, July 5, 1996.
15. Imperial Metals Corp. Mt. Polley Project, Specification for Drilling, Monitoring Well Installations and Related Services, Ref. No. 1628/3, September 18, 1996.
16. Mount Polley Mining Corporation, Mount Polley Project, 1996 Groundwater Monitoring Well Installation Program, Ref. No. 1628/4, February 17, 1997.
17. Mount Polley Mining Corporation, Mount Polley Project, Polley Lake Pumping System, Ref. No. 1628/5, February 19, 1997.



Other references include the following:

1. Basham, P.W., Weichert, D.H., Anglin, F.M., and Berry, M.J., 1982. "New Probabilistic Strong Seismic Ground Motion Maps of Canada: A Compilation of Earthquake Source Zones, Methods and Results", Earth Physics Branch Open-File Report 22-33.
2. Cornell, C.A., 1968. "Engineering Seismic Risk Analysis", Bulletin of the Seismological Society of America, Vol. 58, No. 5, pp. 1583-1606.
3. Idriss, I.M., 1993. "Procedure for Selecting Earthquake Ground Motions at Rock Sites", Report to U.S. Dept. of Commerce, NIST GCR 93-625.
4. Seed, R.B. and Harder, L.F., 1990. "SPT-Based Analysis of Cyclic Pore Pressure Generation and Undrained Residual Strength", H. Bolton Seed Memorial Symposium, Vol. 2.
5. Zarling, J.P., Nelson, W.G. and Ryan, W.L., November 1990. "Cold Regions Engineering Short Course", University of Alaska.



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TABLE 2.1

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

MEAN MONTHLY AND ANNUAL PRECIPITATION

Location:	Likely, B.C.		Mine Site		Barkerville	
Elevation:	724 m		1000 m		1265	
Location:	52° 36'N 121° 32'W		52° 30'N 121° 35'W		53° 4'N 121° 31'W	
	<u>Mean</u>	<u>Std. Dev.</u>	<u>Mean</u>	<u>Std. Dev.</u>	<u>Mean</u>	<u>Std. Dev.</u>
	(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
Jan	74.2	27.0	75.5	27.0	103.0	44.4
Feb	60.2	27.7	58.1	27.7	85.6	42.5
Mar	37.8	13.5	44.5	13.5	85.3	29.1
Apr	42.2	20.9	43.1	20.9	61.8	24.5
May	36.6	15.4	50.6	15.4	65.9	28.9
June	66.3	29.7	81.5	29.7	89.2	28.8
July	47.0	27.4	65.7	27.4	81.7	31.0
Aug	82.0	35.7	83.1	35.7	102.3	53.0
Sept	50.4	27.1	60.4	27.1	85.4	39.9
Oct	61.6	42.3	60.4	42.3	88.4	37.4
Nov	58.4	18.8	57.3	18.8	86.6	28.2
Dec	83.0	36.9	74.8	36.9	108.7	42.5
Annual	699.7	116.4	755	116.4	1043.9	112.7

Source :

Canadian Climate Normals, 1951-1980, Temperature and Precipitation Atmospheric Environment Service, Environment Canada.



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MOUNT POLLEY MINING CORPORATION**MOUNT 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 2.3

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

PROBABLE MAXIMUM PRECIPITATION

1 hour PMP	= 78 mm	= 78 mm/hour
6 hour PMP	= 88 mm	= 14.6 mm/hour
24 hour PMP	= 203 mm	= 8.5 mm/hour
10 day PMP	= 406 mm	= 1.7 mm/hr

Source :

Rainfall Frequency Atlas for Canada, W.D. Hogg, D.A. Carr, Supply and Services
Canada 1985.

Note:

1. 24 hr. PMP value conservatively assumes an orographic factor of 1.5.
2. 10 day PMP value assumes a 10 day to 24 hour PMP ratio of 2.0.



TABLE 9.1

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

FREQUENCY OF INSTRUMENTATION MONITORING

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INSTRUMENTATION	No. Installed	No. Working	Frequency of Monitoring	Monitored By ⁽³⁾	Comments
STAFF GAUGE - Basin Filling	1	1	Weekly	MPMC	
PIEZOMETERS: Stage Ia/Ib Embankments					
- Foundation	6	6	Weekly	MPMC	One piezometer at Perimeter Embankment (D2-PE1-01)
- Drains	8	8	Weekly	MPMC	
- Embankment Fill	9	8	Weekly	MPMC	
DRAIN OUTLETS: Stage Ia/Ib Main Embankment					
- Foundation Drains	4	4	Weekly	MPMC	Chimney Drain outlets to be extended to Drain Monitoring in Stage II.
- Chimney Drain Outlets	3	3	Weekly	MPMC	
SURFACE MOVEMENT MONUMENTS: ⁽¹⁾ Stage Ia/Ib Main Embankment	3		4 times per year		Not yet installed.
SURVEY CONTROL POINTS: ⁽²⁾ Stage Ia/Ib Main Embankment	2		2 times per year		Survey Hubs established for Stage Ia/Ib construction.

Notes:

1. Surface movement monuments used to monitor lateral and vertical displacements along slopes and crests of embankment.
2. Survey control points to be established for Stage Ia/Ib construction will act as survey control for surface monuments.
3. Instrumentation to be monitored during initial construction (by Design Engineer) and during operations (by Dam Co-ordinator).

TABLE 9.2

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY

MINIMUM FREQUENCY OF INSPECTIONS AND TESTS

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ITEM	INSPECTION FREQUENCY	
	Weekly	Annually
1. INSPECTIONS:		
a. Routine	x	
b. Intermediate		
- earthfills	x	
- pipelines	x	
- civil	x	
- mechanical equipment		x
- electrical equipment		x
2. TESTS:		
a. Portable Generators / Pumps		
- no load		x
- under full load		x
b. Valves / Flowmeters		x
3. EPP TESTS *:		
a. Communications Tests		x
b. Operational Tests		x

* EPP = Emergency Preparedness Plan



Knight Piesold Ltd.

CONSULTING ENGINEERS

Assumptions:

Daily Ore and Tailings Throughput (tpd) = 17,808
Solids Content = 35%
Tailings S.G. = 2.78
Water Content of Ore = 4%
Tailings Initial Dry Density (t/m^3) = 0.9
Tailings Final Dry Density (t/m^3) = 1.1
Minimum Fresh Water Makeup = 2.4%
Open Pit Groundwater Discharge (m^3/mo) = 39,818
(200 l/gpm)

TABIR CORPORATION MOUNT POLLEY MILL PROJECT TAILINGS STORAGE FACILITY MONTHLY WATER BALANCE - AVERAGE PRECIPITATION CONDITIONS YEAR 1

Catchment Areas:

Total Tailings Facility Area (ha) = 233
Pond Area (ha) = 48.6
Beach Area (ha) = 50.3
Unprepared Area (ha) = 134.1
Upstream Undiverted Area (ha) = 61
Total Pit Area (ha) = 17.6
Downstream Area (ha) = 63.1
Millsite Area-disturbed (ha) = 20
Millsite Area-undisturbed (ha) = 38.9
Waste Dump-disturbed (ha) = 27.2
Waste Dump-undisturbed (ha) = 106.8
Area North of Millsite (ha) = 22.6

Runoff Coefficients:

Tailings Pond = 1.0
Unprepared Basin = 0.24
Tailings Beach = 0.9
Open Pit Area = 0.5
Undisturbed Catchment Areas = 0.24
Millsite Area-disturbed = 0.70
East Waste Dump-disturbed = 0.60
Beach Evaporation Factor = 0.80
Downstream Area Factor = 0.70

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DESCRIPTION	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	ANNUAL
A Rainfall (mm/month)	81.5	65.7	83.1	58.9	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	450.7
B Snowfall (mm/month)	0.0	0.0	0.0	1.5	12.1	40.0	67.2	68.7	52.1	38.5	18.9	5.3	304.3
C Evaporation (mm/month)	112.0	107.0	92.0	50.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	423.0
< WATER INTO TAILINGS IMPOUNDMENT > (m^3)													
1 With Slurry	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	12,071,280
2 Tailings Pond Precipitation	39,647	31,961	40,425	29,382	23,496	8,416	3,697	3,308	2,919	2,919	88,731	92,379	367,278
3 Tailings Beach Runoff	36,861	29,715	37,585	27,318	21,845	7,825	3,437	3,076	2,714	2,714	82,497	85,889	341,475
4 Undiverted Runoff From Within Tailings Facility	26,230	21,145	26,745	19,439	15,545	5,568	2,446	2,189	1,931	1,931	58,704	61,117	242,989
5 Runoff from Upstream Undiverted Area	11,932	9,618	12,166	8,843	7,071	2,533	1,113	996	878	878	26,703	27,801	110,532
5a Runoff from Downstream Area	35,999	29,020	36,705	26,679	21,334	7,641	3,357	3,004	2,650	2,650	80,566	129,740	379,344
6 Waste Dump Runoff (Disturbed and Undisturbed)	36,682	29,570	37,402	26,510	21,739	7,786	3,421	3,061	2,700	2,700	82,095	85,471	339,137
7 Water Available From Polley Lake	0	0	0	0	0	0	0	0	0	0	500,000	500,000	1,000,000
8 >>> Total	1,193,290	1,156,969	1,196,968	1,144,110	1,116,971	1,045,709	1,023,411	1,021,572	1,019,733	1,019,733	1,925,235	1,988,337	14,852,036
< WATER OUT OF TAILINGS IMPOUNDMENT > (m^3)													
Supernatant Recovery													
9 (+) Recovery from Tailings	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	7,187,247
10 (+) Total Net Precipitation and Runoff = (2)+(3)+(4)+(5)+(5a)+(6)-(18)-(19)	87,838	55,960	109,286	93,746	97,703	39,769	17,471	15,632	13,793	13,793	419,295	440,638	1,404,923
11 (+) Consolidation to Final Density	109,426	109,426	109,426	109,426	109,426	109,426	109,426	109,426	109,426	109,426	109,426	109,426	1,313,115
12 (+) Water Available From Polley Lake	0	0	0	0	0	0	0	0	0	0	500,000	500,000	1,000,000
13 (-) Seepage	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(767,280)
14 Sub-Total (recovered water in supernatant pond)	732,262	700,384	753,710	738,169	742,127	684,192	661,894	660,055	658,216	658,216	1,563,719	1,585,061	10,138,006
Underdrainage Recovery													
15 (+) 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
16 Sub-Total (total recovered water) = (14)+(15)	790,362	758,484	811,810	796,269	800,227	742,292	719,994	718,155	716,316	716,316	1,621,819	1,643,161	10,835,206
Unrecoverable Water													
17 (-) Water Retained in Tailings	297,576	297,576	297,576	297,576	297,576	297,576	297,576	297,576	297,576	297,576	297,576	297,576	3,570,917
18 (-) Evaporation from Supernatant Pond	54,484	52,051	44,754	24,323	7,297	0	0	0	0	0	0	22,864	205,773
19 (-) Evaporation from Beach	45,027	43,017	36,987	20,102	6,030	0	0	0	0	0	0	18,895	170,059
20 (-) 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
21 Sub-total (unrecoverable water)	402,928	398,485	385,158	347,841	316,744	303,416	303,416	303,416	303,416	303,416	303,416	345,176	4,016,830
22 >>> Total	1,193,290	1,156,969	1,196,968	1,144,110	1,116,971	1,045,709	1,023,411	1,021,572	1,019,733	1,019,733	1,925,235	1,988,337	14,852,036
Water Required at Millsite													
23 Water for slurry	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	12,071,280
24 Water for Dust Control on Roads	25,000	25,000	25,000	25,000	25,000	0	0	0	0	0	0	25,000	150,000
25 Mill Water Required	1,030,940	1,030,940	1,030,940	1,030,940	1,030,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,030,940	12,221,280
26 (-) Minimum Fresh Water Input to Mill (from open pit groundwater) = $2.4\% \times (1)$	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	289,711
27 (-) Water In Ore	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	263,784
28 Water Required from Additional Sources = (25)-(26)-(27)	984,815	984,815	984,815	984,815	984,815	959,815	959,815	959,815	959,815	959,815	959,815	984,815	11,667,785
< WATER DISTRIBUTION IN SYSTEM > (m^3)													
29 Open Pit Surface Runoff	7,694	6,203	7,846	5,702	4,560	1,633	718	642	566	566	17,221	17,929	71,280
30 Open Pit Groundwater (39,818 - fresh water input to mill)	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	188,105
31 Mill Site Runoff (Disturbed and Undisturbed)	20,404	16,449	20,805	14,746	12,092	4,331	1,903	1,702	1,502	1,502	45,666	47,543	188,646
32 Catchment Area North of Millsite	4,743	3,823	4,836	3,427	2,811	1,007	442	396	349	349	10,614	11,051	43,847
33 Recovered Water from Tailings Facility (excluding storage)	790,362	758,484	811,810	796,269	800,227	742,292	719,994	718,155	716,316	716,316	1,621,819	1,643,161	10,835,206
34 Total Water Available In the System	838,879	800,634	860,972	835,821	835,365	764,939	738,732	736,571	734,409	734,409	1,710,995	1,735,359	11,327,083
35 Water Surplus/(Deficit) = (34)-(28)	(145,937)	(184,181)	(123,844)	(148,994)	(149,450)	(194,876)	(221,083)	(223,245)	(225,406)	(225,406)	751,179	750,544	-340,700
36 Cumulative Water Surplus/(Deficit)	(145,937)	(330,118)	(453,962)	(602,956)	(752,406)	(947,283)	(1,168,366)	(1,391,611)	(1,617,017)	(1,842,423)	(1,091,244)	(340,700)	-340,700

Notes:

1. Snowfall is provided in equivalent depth of rainfall and is assumed to accumulate on catchment areas until April and May when it melts equally over the two months.
2. Fresh water input to mill to be supplied from Open Pit dewatering wells.

Knight Piésold Ltd.

CONSULTING ENGINEERS

Assumptions:
Daily Ore and Tailings Throughput (tpd) = 17,808
Solids Content = 35%
Tailings S.G. = 2.78
Water Content of Ore = 4%
Tailings Initial Dry Density (t/m^3) = 0.9
Tailings Final Dry Density (t/m^3) = 1.3
Minimum Fresh Water Makeup = 2.4%
Open Pit Groundwater Discharge (m^3/mo) = 39,818
(200 l/gpm)

Catchment Areas:
Total Tailings Facility Area (ha) = 233
Pond Area (ha) = 101
Beach Area (ha) = 122
Unprepared Area (ha) = 10
Upstream Undiverted Area (ha) = 61
Total Pit Area (ha) = 64.7
Downstream Area (ha) = 63.1

Millsite Area-disturbed (ha) = 20
Millsite Area-undisturbed (ha) = 39
Waste Dump-disturbed (ha) = 134
Waste Dump-undisturbed (ha) =
Area North of Millsite (ha) = 24.3

Runoff Coefficients:
Tailings Pond = 1.0
Unprepared Basin = 0.24
Tailings Beach = 0.9
Open Pit Area = 0.5
Undisturbed Catchment Areas = 0.24
Millsite Area-disturbed = 0.70
East Waste Dump = 0.60
Beach Evaporation Factor = 0.80
Downstream Area Factor = 0.70

MONTHLY WATER BALANCE - AVERAGE PRECIPITATION CONDITIONS YEAR 13

DESCRIPTION	JUN	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	ANNUAL
A Rainfall (mm/month)	81.5	65.7	83.1	58.9	48.3	17.3	7.6	6.8	6.0	6.0	24.2	45.3	450.7
B Snowfall (mm/month)	0.0	0.0	0.0	1.5	12.1	40.0	67.2	68.7	52.1	38.5	18.9	5.3	304.3
C Evaporation (mm/month)	112.0	107.0	92.0	50.0	15.0	0.0	0.0	0.0	0.0	0.0	0.0	47.0	423.0
<WATER INTO TAILINGS IMPOUNDMENT> (m^3)													
1 With Slurry	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	12,071,280
2 Tailings Pond Precipitation	82,152	66,226	83,765	60,883	48,686	17,438	7,661	6,854	6,048	6,048	183,859	191,419	761,040
3 Tailings Beach Runoff	89,707	72,316	91,468	66,482	53,164	19,042	8,365	7,485	6,604	6,604	200,768	209,023	831,029
4 Undiverted Runoff From Within Tailings Facility	1,936	1,561	1,974	1,435	1,148	411	181	162	143	143	4,334	4,512	17,939
5 Runoff from Upstream Undiverted Area	11,932	9,618	12,166	8,843	7,071	2,533	1,113	996	878	878	26,703	27,801	110,532
5a Runoff from Downstream Area	35,999	29,020	36,705	26,679	21,334	7,641	3,357	3,004	2,650	2,650	80,566	129,740	379,344
6 Waste Dump Runoff (Disturbed and Undisturbed)	70,300	56,671	71,680	50,805	41,662	14,922	6,556	5,865	5,175	5,175	157,333	163,802	649,948
7 Water Available From Polley Lake	0	0	0	0	0	0	0	0	0	0	0	0	0
8 >>> Total	1,297,965	1,241,352	1,303,698	1,221,067	1,179,005	1,067,928	1,033,172	1,030,305	1,027,439	1,027,439	1,659,503	1,732,238	14,821,111
<WATER OUT OF TAILINGS IMPOUNDMENT> (m^3)													
Supernatant Recovery													
9 (+) Recovery from Tailings	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	598,937	7,187,247
10 (+) Total Net Precipitation and Runoff = (2)+(3)+(4)+(5)+(5a)+(6)-(18)	69,548	22,867	115,009	115,807	143,269	61,988	27,232	24,365	21,499	21,499	653,563	632,937	1,909,584
11 (+) Consolidation to Final Density	185,183	185,183	185,183	185,183	185,183	185,183	185,183	185,183	185,183	185,183	185,183	185,183	2,222,195
12 (+) Water Available From Polley Lake	0	0	0	0	0	0	0	0	0	0	0	0	0
13 (-) Seepage	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(63,940)	(767,280)
14 Sub-Total (recovered water in supernatant pond)	789,729	743,047	835,190	835,987	863,449	782,168	747,412	744,545	741,679	741,679	1,373,743	1,353,117	10,551,746
Underdrainage Recovery													
15 (+) 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
16 Sub-Total (total recovered water) = (14)+(15)	847,829	801,147	893,290	894,087	921,549	840,268	805,512	802,645	799,779	799,779	1,431,843	1,411,217	11,248,946
Unrecoverable Water													
17 (-) Water Retained in Tailings	221,820	221,820	221,820	221,820	221,820	221,820	221,820	221,820	221,820	221,820	221,820	221,820	2,661,838
18 (-) Evaporation from Supernatant Pond	112,896	107,856	92,736	50,400	15,120	0	0	0	0	0	0	47,376	426,384
19 (-) Evaporation from Beach	109,581	104,689	90,013	48,920	14,676	0	0	0	0	0	0	45,985	413,863
20 (-) 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
21 Sub-total (unrecoverable water)	450,137	440,205	410,409	326,980	257,456	227,660	227,660	227,660	227,660	227,660	227,660	321,021	3,572,165
22 >>> Total	1,297,965	1,241,352	1,303,698	1,221,067	1,179,005	1,067,928	1,033,172	1,030,305	1,027,439	1,027,439	1,659,503	1,732,238	14,821,111
Water Required at Millsite													
23 Water for slurry	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	12,071,280
24 Water for Dust Control on Roads	25,000	25,000	25,000	25,000	25,000	0	0	0	0	0	0	25,000	150,000
25 Mill Water Required	1,030,940	1,030,940	1,030,940	1,030,940	1,030,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,005,940	1,030,940	12,221,280
26 (-) Minimum Fresh Water Input to Mill (from open pit groundwater) = $2.4\% \times (1)$	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	24,143	289,711
27 (-) Water In Ore	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	21,982	263,784
28 Water Required from Additional Sources = (25)-(26)-(27)	984,815	984,815	984,815	984,815	984,815	959,815	959,815	959,815	959,815	959,815	959,815	984,815	11,667,785
<WATER DISTRIBUTION IN SYSTEM> (m^3)													
29 Open Pit Surface Runoff	28,286	22,802	28,841	20,963	16,763	6,004	2,638	2,360	2,082	2,082	63,305	65,908	262,036
30 Open Pit Groundwater (39,818 - fresh water input to mill)	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	15,675	188,105
31 Mill Site Runoff (Disturbed and Undisturbed)	20,404	16,449	20,805	14,746	12,092	4,331	1,903	1,702	1,502	1,502	45,666	47,543	188,646
32 Catchment Area North of Millsite	5,099	4,111	5,199	3,685	3,022	1,082	476	425	375	375	11,413	11,882	47,145
33 Recovered Water from Tailings Facility (excluding storage)	847,829	801,147	893,290	894,087	921,549	840,268	805,512	802,645	799,779	799,779	1,431,843	1,411,217	11,248,946
34 Total Water Available in the System	917,294	860,184	963,811	949,157	969,103	867,362	826,203	822,809	819,414	819,414	1,567,902	1,552,226	11,934,879
35 Water Surplus/(Deficit) = (34)-(28)	(67,522)	(124,631)	(21,005)	(35,658)	(15,713)	(92,454)	(133,612)	(137,007)	(140,401)	(140,401)	608,087	567,410	267,094
36 Cumulative Water Surplus/(Deficit)	(67,522)	(192,153)	(213,158)	(248,816)	(264,528)	(356,982)	(490,594)	(627,601)	(768,002)	(908,403)	(300,316)	267,094	

Notes: 1. Snowfall is provided in equivalent depth of rainfall and is assumed to accumulate on catchment areas until April and May when it melts equally over the two months.
2. Fresh water input to mill to be supplied from Open Pit dewatering wells.

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

RECORD TEST SUMMARY SHEET FOR ZONE B

18/04/97

J:\VOB\REPORT\1627\2-0610.xls\Data Sheet

Knight Piésold Ltd. CONSULTING ENGINEERS					RECORD TEST - SUMMARY SHEET MAIN EMBANKMENT ZONE B RECORD SAMPLES																				SHEET: 1 of 1																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
PROJECT : MOUNT POLLEY - TAILINGS STORAGE FACILITY - STAGE 1b CONSTRUCTION					PERIOD : Aug. 28/96 to Mar. 13/97																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
MATERIAL : Glacial Till Zone B Record Tests					PROJECT NO. : 1627																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
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DATE SAMPLED	SAMPLE No.	LOCATION			R1			R2		R7			R3										R4		R6	R8a																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
		Chainage (m)	Offset (m)	Elev. (m)	Atterberg Limits					Field m.c. %	LI %	R7a Dry Density kg/m ³	R7b Nat. m.c. %	%	76.2	38.1	25.4	19.05	9.525	4.7498	2.37998	1.19126	0.5944	0.4191			0.1499	0.0737	0.002	Standard Proctor																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											
					PL %	LL %	PI %								3	1.5	1	0.75	0.375	0.187	0.0937	0.0469	0.0234	0.0165			0.0059	0.0029	Max Dry Density kg/m ³	Opt. m/c %																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

COMMENTS : These are 100% limits.

- R1 Atterberg Limits (ASTM D4318)
- R2 Moisture Content (ASTM D2216)
- R3 Particle Size Distribution (ASTM D422)
- R4 Laboratory Compaction (ASTM D1557)
- R6 Specific Gravity (ASTM D854)
- R7a Field Density by Nuclear Methods (ASTM D2922)
- R7b Moisture Content by Nuclear Methods (ASTM D3017)
- R8a Lab Air Entry Permeameter (LAEP)

TABLE 6.11

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

SUMMARY OF CONSOLIDATED-UNDRAINED TRIAXIAL TESTS
FOR STABILITY ANALYSES

J:\JOB\DATA\1627\SLOPEW\APRIL97\TABLE.XLS

5-Jun-97

Triaxial Testing Stages	Units	Sample No.			
		TP95-27 (Test 1)	TP95-37 (Test 2)	TP95-27 (Test 3)	TP95-37 (Test 4)
Consolidation Stage					
Final effective consolidation pressure, $p' = \sigma_{3c}'$	kPa	287	498	745	962
Shearing Stage					
Maximum deviator stress, $(\sigma_d')_{max}$	kPa	1416	1268	812	1624
Undrained Shear Strength parameter, $C_u = (\sigma_d')_{max}/2$	kPa	708	634	406	812
Undrained Shear Strength Ratio, C_u/p'		2.47	1.27	0.54	0.84

Note

1. For the conservative assumption, Undrained Shear Strength of 0.5 was adopted in the stability analyses.
2. The consolidated-undrained triaxial tests information abstracted from Report on 1995 Geotechnical Investigations for Mill Site and Tailings Storage Facility, (Report 1623/1)

TABLE 6.8

**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT**

CONTROL TEST SUMMARY SHEET FOR FUTURE BORROW AREA

J:\JOB\REPORT\1627\2-1616-8.xls>Data Sheet

18/04/97

Knight Piesold Ltd. CONSULTING ENGINEERS				CONTROL TEST - SUMMARY SHEET FUTURE BORROW AREA																	SHEET : 1 of 1 PERIOD : 13-Sep-96 to 24-Oct-96 PROJECT NO. : 1627 AREA : Future Borrow Area (east of PE)				
PROJECT : MOUNT POLLEY - TAILINGS STORAGE FACILITY - STAGE 1b CONSTRUCTION																									
MATERIAL : GLACIAL TILL FROM FUTURE BORROW AREA (FILTER SAND INVESTIGATION AREA EAST OF PE)																									
DATE SAMPLED	CONTROL SAMPLE No.	ET SAMPLE No.	Depth (m)	C1			C2 Field m/c %	LI %	C3										C4		C6 S.G.	C8a LAEP cm/s			
				Atterberg Limits					76.2 3 3	38.1 1.5 1 1/2	25.4 1 1	19.05 0.75 3/4	9.525 0.375 3/8	4.750 0.187 #4	2.380 0.0937 #8	1.191 0.0469 #16	0.594 0.0234 #30	0.419 0.0165 #40	0.150 0.0059 #100	0.074 0.0029 #200			0.002 CLAY	Standard Proctor ⁽¹⁾	
				PL %	LL %	PI %																		Max Dry Density kg/m ³	Opt. m/c %
24-Oct-96	C/ME(FB)/(ZS,ZB)-1A	ET-96/10/24-1	(0.3-0.5)				14.7																		
"	C/ME(FB)/(ZS,ZB)-1B	"	(0.8-1.0)				15.4																		
"	C/ME(FB)/(ZS,ZB)-1C	"	(2.0-4.0)				10.2		100.0	87.3	84.6	81.9	75.7	70.1	67.1	63.8	59.7	56.7	45.8	37.5					
"	C/ME(FB)/(ZS,ZB)-1D	"	(5.0-5.4)				10.0		100.0	94.8	91.3	88.0	81.3	76.7	71.9	67.7	63.7	61.2	50.5	42.2	5.0				
"	C/ME(FB)/(ZS,ZB)-2A	ET-96/10/24-2	(0.7-1.0)				12.6																		
"	C/ME(FB)/(ZS,ZB)-2B	"	(3.0-3.5)				10.6		100.0	100.0	100.0	98.6	96.2	93.4	90.4	87.2	83.3	80.3	67.5	55.0					
"	C/ME(FB)/(ZS,ZB)-3A	ET-96/10/24-3	(1.0-1.5)				13.0																		
"	C/ME(FB)/(ZS,ZB)-3B	"	(2.5-3.0)				9.7		100.0	88.7	86.7	83.6	79.5	75.0	68.8	64.2	59.8	56.9	46.3	38.1	3.0				
"	C/ME(FB)/(ZS,ZB)-4A	ET-96/10/24-4	(0.7-1.2)				14.9																		
"	C/ME(FB)/(ZS,ZB)-4B	"	(2.5-3.0)				9.2																		
MEAN							12.0		100.0	92.7	90.7	88.0	83.2	78.8	74.6	70.7	66.6	63.8	52.5	43.2	4.0				
MEDIAN							11.6		100.0	91.8	89.0	85.8	80.4	75.9	70.4	66.0	61.8	59.1	48.4	40.2	4.0				
MAXIMUM (*)							15.4		100.0	100.0	100.0	98.6	96.2	93.4	90.4	87.2	83.3	80.3	67.5	55.0	5.0				
MINIMUM (*)							9.2		100.0	87.3	84.6	81.9	75.7	70.1	67.1	63.8	59.7	56.7	45.8	37.5	3.0				

- (*) These are 100% limits.
 C1 Atterberg Limits (ASTM D4318)
 C2 Moisture Content (ASTM D2216)
 C3 Particle Size Distribution (ASTM D422)
 C4 Laboratory Compaction (ASTM D1557)
 C6 Specific Gravity (ASTM D854)
 C7a Field Density by Nuclear Methods (ASTM D2922)
 C7b Moisture Content by Nuclear Methods (ASTM D3017)
 C8a Lab Air Entry Permeameter (LAEP)

TABLE 6.9

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

RECORD TEST SUMMARY SHEET FOR ZONE S

J:\JOB\REPORT\1627\12-TBL6-9.XLS>Data Sheet

18/04/97

Knight Piesold Ltd. CONSULTING ENGINEERS				RECORD TEST - SUMMARY SHEET MAIN EMBANKMENT ZONE S RECORD SAMPLES																												SHEET: 1 of 1		
PROJECT : MOUNT POLLEY - TAILINGS STORAGE FACILITY - STAGE 1b CONSTRUCTION				PERIOD : 22-Aug-96 22-Aug-96 to 19-Oct-96																														
MATERIAL : Glacial Till Zone S Record Tests				PROJECT NO. : 1627																														
				AREA : Main Embankment - Zone S																														
DATE SAMPLED	SAMPLE No.	LOCATION			R1			R2		R7			R3												R4		R6	R8a						
		Chainage (m)	Offset (m)	Elevation (m)	Atterberg Limits			Field m/c %	LI %	R7a Dry Density kg/m³	R7b Nat. m.c. %	% Max Density	76.2	38.1	25.4	19.05	9.525	4.7498	2.37998	1.19126	0.5944	0.4191	0.1499	0.0737	0.002	Standard Proctor		S.G.	LAEP cm/s					
					PL	LL	PI						3	1.5	1	0.75	0.375	0.187	0.0937	0.0469	0.0234	0.0165	0.0059	0.0029	Max Dry Density kg/m³	Opt. m/c %								
					%	%	%						%	%	%	%	%	%	%	%	%	%	%	%	%									
22-Aug-96	R/ME/ZS-1	21+84	15m N of C/L	916.0	15.4	28.1	12.7	14.4	-0.08	1959	14.0	95.8	100.0	100.0	98.0	93.1	89.3	85.3	81.4	78.2	75.0	72.8	63.7	55.3	17.0	2045.0	10.5	2.74	2.4E-09					
22-Aug-96	R/ME/ZS-2	19+30	10m N of C/L	915.0	15.8	27.8	12.0	16.0	0.02	1928	13.1	96.4	100.0	100.0	98.4	95.7	92.5	89.9	86.6	83.6	80.6	78.6	70.0	62.2	18.0	2000.0	11.2	2.74						
24-Aug-96	R/ME/ZS-3	20+50	20m S U/S Shoulder	914.9	15.0	27.0	12.0	12.4	-0.22	1954	12.5	97.7	100.0	100.0	96.2	94.9	92.8	89.4	86.9	84.0	80.8	78.7	69.2	60.8	16.0	2000.0	11.0	2.74	7.9E-10					
25-Aug-96	R/ME/ZS-4	20+50	20m S U/S Shoulder	913.5	13.9	26.1	12.2	15.1	0.10	2034	12.6	100.4	100.0	100.0	97.4	93.5	88.4	84.2	79.0	75.5	72.1	70.1	61.3	53.0	16.0	2025.0	11.2	2.75	9.8E-10					
27-Aug-96	R/ME/ZS-5	21+90	20m S U/S Shoulder	915.3	15.1	27.3	12.2	13.5	-0.13	2047	11.7	101.8	100.0	100.0	96.6	96.4	93.3	89.6	84.5	80.7	77.2	74.9	65.1	56.2	16.0	2010.0	11.6	2.72	1.4E-10					
27-Aug-96	R/ME/ZS-6	20+00	20m S U/S Shoulder	915.0	14.2	24.7	10.5	12.4	-0.18	1980	12.2	96.9	100.0	100.0	96.8	93.6	89.8	85.5	81.7	78.0	74.5	72.1	62.7	54.1	12.0	2050.0	11.1	2.73	4.7E-08					
13-Sep-96	R/ME/ZS-7	21+00	10m N of C/L	916.5	13.9	24.6	10.7	11.7	-0.21	2097	11.1	99.9	100.0	96.4	93.0	90.2	84.1	78.8	75.6	72.5	69.0	66.7	57.3	49.4	11.3	2093.0	9.9	2.72	4.8E-10					
26-Sep-96	R/ME/ZS-8	21+00	5m S U/S Shoulder	917.0	14.7	26.8	12.1	11.8	-0.24	1973	12.3	97.4	100.0	93.3	92.2	90.1	85.5	82.3	79.4	76.7	73.6	71.3	62.1	54.1	12.0	2025.0	11.1	2.75						
30-Sep-96	R/ME/ZS-9	20+50	S of U/S Shoulder	917.8	15.2	23.4	8.2	10.8	-0.54	2041	12.2	97.7	100.0	94.1	90.5	89.3	85.9	80.8	77.5	73.9	70.1	67.3	56.4	48.4	9.7	2090.0	10.1		5.3E-09					
03-Oct-96	R/ME/ZS-10	20+90	10m N L/D	919.0	14.3	22.6	8.3	11.2	-0.37	2000	13.3	96.9	100.0	89.5	88.3	85.7	80.8	76.7	72.1	68.6	65.6	63.4	54.4	46.4	15.0	2065.0	9.8							
12-Oct-96	R/ME/ZS-11	20+80	13m S U/S Shoulder	919.6	15.1	25.2	10.1	12.0	-0.31	2079	12.0	101.4	100.0	97.5	96.6	95.1	90.2	84.5	81.4	78.4	75.3	72.9	63.4	55.0	10.5	2050.0	10.0		6.3E-10					
13-Oct-96	R/ME/ZS-12	19+00	Ditch crossing	917.6	14.6	24.1	9.5	12.3	-0.24	2115	11.8	102.4	100.0	94.9	93.6	91.6	86.9	82.4	78.1	74.5	70.8	68.4	58.0	47.3	11.7	2065.0	10.1							
16-Oct-96	R/ME/ZS-13	21+50	6m S U/S Shoulder	920.9	14.5	24.8	10.3	11.4	-0.30	2101	11.0	101.6	100.0	98.7	93.3	90.7	86.1	80.9	77.9	74.4	70.3	68.5	59.0	51.5	12.1	2068.0	10.0		2.9E-09					
18-Oct-96	R/ME/ZS-14	18+75	18m S U/S Shoulder	917.6	14.9	24.9	10.0	12.4	-0.25	2053	12.3	99.7	100.0	95.6	93.6	92.3	88.2	83.4	79.5	76.2	72.8	70.5	61.2	53.2	13.2	2060.0	9.6		1.2E-09					
19-Oct-96	R/ME/ZS-15	18+50	5m N of C/L	918.5	14.7	24.9	10.2	12.2	-0.25	2015	12.5	97.0	100.0	98.7	96.8	93.9	89.9	84.5	80.1	76.6	73.1	70.6	60.6	52.4	12.1	2077.0	9.7							
03-Dec-96	R/ME/ZS-16	19+00	5m S U/S Shoulder	921.0	15.3	24.3	9.0	10.3	-0.56	2060	10.4	98.5	100.0	95.4	94.5	92.9	89.4	84.3	80.7	77.6	74.3	72.0	62.6	55.3	9.0	2092.0	10.1							
04-Dec-96	R/ME/ZS-17	18+25	6m S U/S Shoulder	922.0	15.7	23.5	7.8	10.1	-0.72	2090	10.4	98.8	100.0	97.1	92.1	90.0	86.2	82.7	79.4	76.3	73.0	70.7	60.8	52.9	7.5	2115.0	9.2							
05-Dec-96	R/ME/ZS-18	17+10	6m S U/S Shoulder	923.5	15.9	21.0	5.1	8.2	-1.51	2144	10.0	99.7	100.0	93.3	92.0	89.5	83.8	78.7	74.9	71.5	68.0	65.6	55.7	50.2	5.5	2150.0	8.7		9.3E-10					
03-Dec-96	R/ME/ZS-19	21+20	20m S U/S Shoulder	923.0	15.4	24.4	9.0	11.9	-0.39	2082	11.3	97.1	100.0	87.9	82.3	80.4	77.2	72.8	70.4	67.4	64.0	62.4	54.1	48.0	9.0	2145.0	9.1							
10-Dec-96	R/ME/ZS-20	23+50	10m S U/S Shoulder	925.5	14.3	21.0	6.7	10.0	-0.64	2070	10.0	97.6	100.0	100.0	94.5	91.7	86.0	80.9	75.3	71.9	68.8	66.7	57.8	51.3	8.5	2120.0	9.6							
11-Dec-96	R/ME/ZS-21	23+00	5m N D/S Shoulder	927.0	14.9	22.0	7.1	10.1	-0.68	2141	8.1	102.9	100.0	100.0	99.3	97.7	93.3	87.8	81.8	78.1	74.4	71.7	64.5	54.5	9.0	2080.0	10.1							
21-Feb-97	R/ME/ZS-22	18+25	C/L	926.0	13.5	23.0	9.5	10.7	-0.29	2150	7.8	103.4	100.0	100.0	98.6	96.4	90.9	86.0	81.8	77.4	72.2	68.7	66.1	45.9	8.0	2080.0	9.9							
21-Feb-97	R/ME/ZS-23	19+75	8m N of C/D	925.0	14.6	22.5	7.9	11.8	-0.35	2090	8.4	100.5	100.0	97.9	93.0	89.3	82.5	77.2	71.5	67.1	63.0	60.4	49.4	39.9	12.0	2080.0	10.1							
22-Feb-97	R/ME/ZS-24	19+00	5m N of C/D	927.5	11.5	22.8	11.3	8.8	-0.24	2070	12.3	97.4	100.0	96.6	92.3	89.9	83.6	77.3	71.9	67.7	63.8	61.3	51.2	42.4	7.9	2125.0	9.7							
25-Feb-97	R/ME/ZS-25	19+50	7m N of C/D	929.0	14.2	24.5	10.3	10.4	-0.37	2140	10.2	99.5	100.0	100.0	93.7	90.1	83.8	76.1	70.0	65.2	60.7	57.8	46.5	37.6	8.8	2150.0	9.8		2.8E-10					
26-Feb-97	R/ME/ZS-26	20+05	4m S U/S Shoulder	927.5			17.0			2080	10.7		100.0	100.0	98.6	97.1	92.6	86.7	79.7	74.3	69.4	66.2	54.6	45.4	4.0									
05-Mar-97	R/ME/ZS-27	25+85	3m N D/S Shoulder	933.0	19.6	27.0	7.4	15.6	-0.54	1870	14.3	97.9	100.0	100.0	96.6	96.0	93.0	90.8	89.2	87.5	84.8	82.5	73.2	65.2	7.0	1910.0	14.3		3.4E-08					
09-Mar-97	R/ME/ZS-28	22+00	6m N of C/D	926.5	16.3	26.2	9.9	12.8	-0.35	2050	10.8	96.7	100.0	97.5	94.7	90.0	82.4	76.1	73.2	69.9	66.2	63.8	52.8	47.5	10.0	2120.0	9.1							
09-Mar-97	R/ME/ZS-29	21+18	D/S Shoulder	932.0	15.2	21.7	6.5	10.6	-0.71	2060	11.1	96.0	100.0	92.6	88.6	84.5	80.3	75.5	71.8	67.9	63.9	60.9	48.1	40.7	6.7	2145.0	9.0							
13-Mar-97	R/ME/ZS-30	22+50	5m S U/S Shoulder	931.0	13.7	24.6	10.9	11.3	-0.22	2040	12.1	95.3	100.0	94.9	94.9	89.7	82.4	76.6	72.1	67.9	63.8	60.9	48.1	37.4	8.2	2140.0	9.4							
14-Mar-97	R/ME/ZS-31	24+00	8m S U/S Shoulder	928.0	NP	18.3	NP	11.0	NP	2090	9.8	103.5	100.0	96.3	95.3	94.2	91.0	90.0	88.5	87.3	85.7	84.4	75.9	58.3	7.0	2020.0	9.4							
14-Mar-97	R/ME/ZS-32	24+50	4 m U/S of CL	932.0	16.9	20.5	3.6	9.8	-1.97	2140	9.3	100.5	100.0	94.0	91.4	89.8	82.6	77.6	75.2	72.5	69.5	67.2	55.5	45.0	8.0	2130.0	9.4							
17-Mar-97	R/ME/ZS-33	25+75	U/S sh.	934.0	15.5	21.7	6.2	9.9	-0.90	2100	9.7	100.0	100.0	97.0	95.7	94.7	87.9	82.7	79.5	76.2	72.8	70.2	58.8	48.6	10.0	2100.0	8.8							
MEAN				14.5	23.9	9.0		11.7	-0.43	2055.8	11.3	99.0	100.0	96.9	94.2	91.8	86.9	82.4	78.4	75.0	71.5	69.1	59.1	50.5	10.6	2075.8	10.1	2.74	7.5E-09					
MEDIAN				14.9	24.4	9.7		11.6	-0.30	2070.0	11.3	98.6	100.0	97.5	94.5	91.7	86.2	82.7	79.4	75.5	72.1	68.7	58.8	51.3	10.0	2080.0	9.9	2.74	9.8E-10					
MAXIMUM (*)				19.6	28.1	12.7		16.0	0.10	2150.0	14.3	103.5	100.0	100.0	99.3	97.7	93.3	90.8	89.2	87.5	85.7	84.4	75.9	65.2	18.0	2150.0	14.3	2.75	4.7E-08					
MINIMUM (*)				0.0	17.0	0.0		8.2	-1.97	1870.0	7.8	95.3	100.0	87.9	82.3	80.4	77.2	72.8	70.0	65.2	60.7	57.8	46.5	37.4	4.0	1910.0	8.7	2.72	1.4E-10					

COMMENTS : These are 100% limits.

- | | |
|----|--|
| R1 | Atterberg Limits (ASTM D4318) |
| R2 | Moisture Content (ASTM D2216) |
| R3 | Particle Size Distribution (ASTM D422) |
| R4 | Laboratory Compaction (ASTM D1557) |

- | | |
|-----|--|
| R6 | Specific Gravity (ASTM D854) |
| R7a | Field Density by Nuclear Methods (ASTM D2922) |
| R7b | Moisture Content by Nuclear Methods (ASTM D3017) |
| R8a | Lab Air Entry Permeameter (LAEP) |

TABLE 6.7

**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT**

CONTROL TEST SUMMARY SHEET FOR ALTERNATE BORROW AREA

J:\JOB\REPORT\1627\2-1b16-7.xls>Data Sheet

18/M/97

Knight Piésold Ltd. CONSULTING ENGINEERS				CONTROL TEST - SUMMARY SHEET ALTERNATE BORROW AREA																		SHEET : 1 of 1				
PROJECT : MOUNT POLLEY - TAILINGS STORAGE FACILITY - STAGE 1b CONSTRUCTION																						PERIOD : 13-Sep-96 to 18-Oct-96				
MATERIAL : GLACIAL TILL FROM ALTERNATE BORROW AREA (NEAR TOPSOIL STOCKPILE)																						PROJECT NO. : 1627				
																						AREA : Alternate Borrow Area				
DATE SAMPLED	CONTROL SAMPLE No.	ET SAMPLE No.	Depth (m)	C1			C2 Field m/c %		LJ %	C3												C4		C6 S.G.	C8a LAEP cm/s	
				Atterberg Limits						63.5 2.5 3	38.1 1.5 1 1/2	25.4 1 1	19.05 0.75 3/4	9.525 0.375 3/8	4.750 0.187 #4	2.380 0.0937 #8	1.191 0.0469 #16	0.594 0.0234 #30	0.419 0.0165 #40	0.150 0.0059 #100	0.074 0.0029 #200	0.002 same Clay	Standard Proctor ⁽¹⁾			
				PL %	LL %	PI %																	Max Dry Density kg/m ³			Opt. m/c %
13-Sep-96	C/ME(AB)/(ZS,ZB)-1A	ET96/09/13-3	(2.4-2.7)	14.7	20.9	6.2	8.9	-0.94		91.2	82.8	72.5	67.5	59.1	53.9	50.5	47.6	44.5	42.5	34.1	27.3	2.5			2.74	
	C/ME(AB)/(ZS,ZB)-1B	"	(3.6-3.9)				12.1		100.0	86.3	81.6	78.7	71.9	67.3	64.8	62.1	59.2	57.2	48.9	41.9	8.0			2.73		
13-Sep-96	C/ME(AB)/(ZS,ZB)-2A	ET96/09/13-4	(0.3-0.6)				12.8		100.0	94.5	93.6	92.4	88.1	84.3	79.1	75.1	70.8	67.9	56.7	48.1	9.0	2025.0	10.2	2.72		
	C/ME(AB)/(ZS,ZB)-2B	"	(2.0-3.0)	14.8	25.4	10.6	11.2	-0.34	100.0	94.3	90.7	89.2	84.1	78.5	73.1	69.3	66.1	64.1	56.4	49.5	13.0	2083.0	10.5	2.73		
	C/ME(AB)/(ZS,ZB)-2C	"	(2.5-3.1)				13.0																			
	C/ME(AB)/(ZS,ZB)-2D	"	(3.6-4.1)				12.1																			
	C/ME(AB)/(ZS,ZB)-2E	"	(5.0-5.3)				10.9																			
13-Sep-96	C/ME(AB)/(ZS,ZB)-3A	ET96/09/13-5	(1.0-2.0)				11.9		100.0	96.8	94.5	91.3	84.0	78.3	72.9	68.8	64.7	62.0	51.6	43.3	7.5			2.74		
16-Sep-96	C/ME(AB)/(ZS,ZB)-4A	ET96/09/16-1	(0.0-0.7)				17.0																			
	C/ME(AB)/(ZS,ZB)-4B	"	(1.0-2.0)				10.3																			
	C/ME(AB)/(ZS,ZB)-4C	"	(2.0-3.0)				10.5		100.0	98.7	95.5	93.9	89.6	85.2	80.9	77.0	73.1	70.5	59.8	50.1	6.0	2070.0	10.5	2.73		
	C/ME(AB)/(ZS,ZB)-4D	"	(4.0-5.0)				10.1																			
16-Sep-96	C/ME(AB)/(ZS,ZB)-5A	ET96/09/16-2	(2.0-3.0)	14.8	24.3	9.5	11.0	-0.40	100.0	97.2	92.2	89.6	83.8	77.3	72.0	67.8	64.1	61.7	53.3	46.4	7.5	2083.0	9.5	2.73		
	C/ME(AB)/(ZS,ZB)-5B	"	(3.3-3.6)				10.4																			
16-Sep-96	C/ME(AB)/(ZS,ZB)-6A	ET96/09/16-3	(0.5-1.5)				11.8		100.0	99.0	98.0	96.1	92.1	88.5	83.9	80.0	76.4	74.1	64.6	56.4	8.0	2000.0	11.4	2.74		
	C/ME(AB)/(ZS,ZB)-6B	"	(2.2-2.7)				11.4																			
	C/ME(AB)/(ZS,ZB)-6C	"	(4.4-4.7)				10.2																			
16-Sep-96	C/ME(AB)/(ZS,ZB)-7A	ET96/09/16-4	(3.5-4.5)				9.3		100.0	95.4	94.1	91.6	85.9	81.1	77.3	73.1	68.5	65.5	52.7	42.3	7.5	2168.0	8.3	2.72		
	C/ME(AB)/(ZS,ZB)-7B	"	(4.5-5.0)				12.6																			
19-Sep-96	C/ME(AB)/(ZS,ZB)-8A	ET96/09/19-1	(0.3-1.0)				11.9																			
	C/ME(AB)/(ZS,ZB)-8B	"	(1.0-2.0)				9.9																			
	C/ME(AB)/(ZS,ZB)-8C	"	(2.5-3.0)				10.7																			
19-Sep-96	C/ME(AB)/(ZS,ZB)-9A	ET96/09/19-2	(1.0-2.0)				11.6																			
	C/ME(AB)/(ZS,ZB)-9B	"	(3.0-4.0)				12.5																			
	C/ME(AB)/(ZS,ZB)-9C	"	(4.5-4.9)				12.1																			
	C/ME(AB)/(ZS,ZB)-9D	"	(6.0-6.3)				10.5																			
19-Sep-96	C/ME(AB)/(ZS,ZB)-10A	ET96/09/19-3	(0.2-0.5)				14.8																			
	C/ME(AB)/(ZS,ZB)-10B	"	(0.5-1.1)				13.4																			

TABLE 6.7

**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT**

CONTROL TEST SUMMARY SHEET FOR ALTERNATE BORROW AREA

J:\JOB\REPORT\1627\12-ib16-7.xls>Data Sheet

18/04/97

Knight Piésold Ltd. CONSULTING ENGINEERS				CONTROL TEST - SUMMARY SHEET ALTERNATE BORROW AREA																		SHEET : 1 of 1			
PROJECT : MOUNT POLLEY - TAILINGS STORAGE FACILITY - STAGE 1b CONSTRUCTION																						PERIOD : 13-Sep-96 to 18-Oct-96			
MATERIAL : GLACIAL TILL FROM ALTERNATE BORROW AREA (NEAR TOPSOIL STOCKPILE)																						PROJECT NO. : 1627			
																						AREA : Alternate Borrow Area			
DATE	CONTROL	ET	Depth	C1			C2		C3												C4		C6	C8a	
				Atterberg Limits					Field		63.5	38.1	25.4	19.05	9.525	4.750	2.380	1.191	0.594	0.419	0.150	0.074			0.002
	C/ME(AB)/(ZS,ZB)-10C		(2.0-2.4)	15.4	23.6	8.2	13.2	-0.27	100.0	95.9	94.6	93.2	88.8	84.1	78.7	74.1	69.7	66.9	57.5	49.7	6.3	2025.0	11.3	2.75	
	C/ME(AB)/(ZS,ZB)-10D	"	(3.4-3.6)				9.9																		
19-Sep-96	C/ME(AB)/(ZS,ZB)-11A	ET96/09/19-4	(0.1-0.4)				12.2																		
	C/ME(AB)/(ZS,ZB)-11B	"	(0.4-0.85)				14.5																		
	C/ME(AB)/(ZS,ZB)-11C	"	(0.85-2.0)				10.8																		
	C/ME(AB)/(ZS,ZB)-11D	"	(2.0-3.0)				10.0																		
	C/ME(AB)/(ZS,ZB)-11E	"	(3.5-3.7)				9.3																		
	C/ME(AB)/(ZS,ZB)-11F	"	(4.0-4.2)				11.2																		
	C/ME(AB)/(ZS,ZB)-11G	"	(5.0-5.4)				9.5																		
13-Oct-96	C/ME(AB)/(ZS,ZB)-12	Hand Dug	(0.0-0.4)	17.2	25.8	8.6	16.9	-0.03	100.0	97.9	89.4	86.6	79.5	75.1	70.6	66.2	61.9	59.2	50.4	43.8	10.0	1970.0	12.4		
13-Oct-96	C/ME(AB)/(ZS,ZB)-13	Hand Dug	(0.0-0.3)	16.4	21.6	5.2	13.9	-0.48	100.0	96.5	93.6	90.9	84.7	79.4	75.8	71.4	67.1	64.6	56.0	48.0	7.0	1975.0	12.0		
MEAN				15.6	23.6	8.1	11.7	-0.41	99.3	94.6	90.9	88.4	82.6	77.8	73.3	69.4	65.5	63.0	53.5	45.6	7.7	2044.3	10.7	2.73	
MEDIAN				15.1	24.0	8.4	11.4	-0.37	100.0	96.2	93.6	91.1	84.4	79.0	74.5	70.4	66.6	64.4	54.7	47.2	7.5	2025.0	10.5	2.73	
MAXIMUM (*)				17.2	25.8	10.6	17.0	-0.03	100.0	99.0	98.0	96.1	92.1	88.5	83.9	80.0	76.4	74.1	64.6	56.4	13.0	2168.0	12.4	2.75	
MINIMUM (*)				14.7	20.9	5.2	8.9	-0.94	91.2	82.8	72.5	67.5	59.1	53.9	50.5	47.6	44.5	42.5	34.1	27.3	2.5	1970.0	8.3	2.72	

- (*) These are 100% limits.
C1 Atterberg Limits (ASTM D4318)
C2 Moisture Content (ASTM D2216)
C3 Particle Size Distribution (ASTM D422)
C4 Laboratory Compaction (ASTM D1557)
C6 Specific Gravity (ASTM D854)
C7a Field Density by Nuclear Methods (ASTM D2922)
C7b Moisture Content by Nuclear Methods (ASTM D3017)
C8a Lab Air Entry Permeameter (LAEP)

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

CONTROL TEST SUMMARY SHEET FOR ORIGINAL BORROW AREA

J:\NOB\REPORT\1627\2-TBL6-6.XLS

5/19/97

Knight Piésold Ltd. CONSULTING ENGINEERS				CONTROL TEST - SUMMARY SHEET ORIGINAL BORROW AREA																				SHEET : 1 of 2			
PROJECT : MOUNT POLLEY - TAILINGS STORAGE FACILITY - STAGE 1b CONSTRUCTION				PERIOD : 23/6/ to 5/10/96																				PROJECT NO. : 1627			
MATERIAL : GLACIAL TILL - FROM ORIGINAL BORROW AREA (OB)				AREA : Original Borrow Area																							
DATE SAMPLED	SAMPLE No.	Location	Depth (m)	C1 Atterberg Limits			C2 Field m/c	LI %	C3														Standard Proctor ⁽¹⁾		C6 S.G.	C8 LAEP cm/s	
				PL	LL	PI			76.2	38.1	25.4	19.05	9.525	4.7498	2.37998	1.19126	0.59436	0.4191	0.14986	0.07366	0.002	Max Dry Density kg/m ³	Opt. m/c %				
				%	%	%			3	1.5	1	0.75	0.375	0.187	0.0937	0.0469	0.0234	0.0165	0.0059	0.0029	Clay						
	C/ME/ZS-29	OB : ET-96/08/15-10	0.5-1.2	-	-	-	14.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-30A	OB : ET-96/08/15-11	1.0-3.0	16.2	22.2	6.0	10.2	-1.00	100.0	97.5	96.3	93.4	87.9	82.7	78.6	70.4	65.9	62.7	49.6	40.0	8.0	2090.0	9.5	2.73	-	-	
	C/ME/ZS-30B		4.0-6.0	-	-	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-31A	OB : ET-96/08/15-12	0.5-2.0	13.6	20.1	6.5	12.7	-0.14	100.0	100.0	99.1	97.5	95.4	91.6	86.4	81.1	74.6	69.6	51.5	40.6	8.0	2015.0	11.0	2.75	-	-	
	C/ME/ZS-31B		4.0-6.0	-	-	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
16-Aug-96	C/ME/ZS-32A	OB : ET-96/08/16-1	0.1-0.6	-	-	-	14.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-32B		1.5-2.5	13.3	24.4	11.1	13.1	-0.02	100.0	100.0	100.0	100.0	91.4	86.9	81.8	77.6	73.6	71.0	60.9	52.9	11.0	2005.0	10.9	2.71	-	-	
	C/ME/ZS-32C		4.0-5.8	-	-	-	9.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-33A	OB : ET-96/08/16-2	0.6-1.5	-	-	-	14.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-33B		1.5-2.0	-	-	-	9.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-33D		4.5-6.0	-	-	-	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
23-Sep-96	C/ME/ZS-34A	ET96/09/23-1	(0-0.25)	-	-	-	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-34B		(0.25-0.55)	-	-	-	15.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-34C		(0.55-2.0)	-	-	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-34E		(4.8-5.1)	-	-	-	12.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-34F		(5.5-5.7)	-	-	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-35A	ET96/09/23-2	(0-0.6)	-	-	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-35B		(0.6-2.0)	-	-	-	9.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-35C		(3.0)	-	-	-	8.6	-	100.0	93.3	92.3	91.3	85.9	79.8	74.7	70.7	67.0	64.4	54.8	46.4	7.5	-	2.72	-	-	-	
	C/ME/ZS-35D		(4.5)	-	-	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
24-Sep-96	C/ME/ZS-36A	ET96/09/24-1	(0-0.25)	-	-	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-36B		(0.25-0.6)	-	-	-	14.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-36C		(0.6-2.0)	-	-	-	10.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-36D		(3.1)	-	-	-	13.0	-	100.0	100.0	95.6	90.3	92.0	76.0	71.1	67.6	64.6	62.6	54.0	46.5	9.0	-	2.75	-	-	-	
	C/ME/ZS-36E		(4.5)	-	-	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-36F		(6.0)	-	-	-	10.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-36G		(6.3)	-	-	-	9.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-37A	ET96/09/24-2	(0-0.4)	-	-	-	12.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-37B		(0.4-1.0)	-	-	-	11.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-37C		(1.0-2.5)	-	-	-	11.7	-	100.0	95.4	93.9	91.8	84.7	78.4	73.9	69.6	65.7	63.0	52.4	43.7	11.0	-	2.72	-	-	-	
	C/ME/ZS-38A	ET96/09/24-3	(0.3-1.1)	-	-	-	14.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-38B		(1.1-2.0)	-	-	-	10.2	-	100.0	97.6	94.4	91.1	85.2	78.5	72.0	67.6	63.6	61.0	50.8	40.0	7.0	-	2.75	-	-	-	
	C/ME/ZS-38C		(3.7)	-	-	-	8.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-38D		(5.0-5.8)	-	-	-	11.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-38E		(6.5)	-	-	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-39A	ET96/09/24-4	(0.2-5-1.1)	-	-	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-39B		(1.1-2.5)	-	-	-	10.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-40A	ET96/09/24-5	(0.5-1.2)	-	-	-	13.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-40B		(1.2-2.5)	-	-	-	10.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-41A	ET96/09/24-6	(0-0.6)	-	-	-	12.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
	C/ME/ZS-41B		(0.6-2.0)	-	-	-	11.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
CONTROL TEST SUMMARY SHEET FOR ORIGINAL BORROW AREA

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5/19/97

Knight Piésold Ltd. CONSULTING ENGINEERS				CONTROL TEST - SUMMARY SHEET																		SHEET : 1 of 2				
				ORIGINAL BORROW AREA																		PERIOD : 23/6/ to 5/10/96				
PROJECT : MOUNT POLLEY - TAILINGS STORAGE FACILITY - STAGE 1b CONSTRUCTION								PROJECT NO. : 1627																		
MATERIAL : GLACIAL TILL - FROM ORIGINAL BORROW AREA (OB)								AREA : Original Borrow Area																		
DATE SAMPLED	SAMPLE No.	Location	Depth (m)	C1			C2 Field m/c %	LI %	C3																C6 S.G.	C8 LAEP cm/s
				Atterberg Limits					76.2	38.1	25.4	19.05	9.525	4.7498	2.37998	1.19126	0.59436	0.4191	0.14986	0.07366	0.002	Standard Proctor ⁽¹⁾				
				PL	LL	PI			3	1.5	1	0.75	0.375	0.187	0.0937	0.0469	0.0234	0.0165	0.0059	0.0029	Max Dry	Opt.				
				%	%	%			3	1 1/2	1	3/4	3/8	#4	#8	#16	#30	#40	#100	#200	Clay	Density kg/m ³	m/c %			
-	C/ME/ZS-41C	-	(2.5)	-	-	-	9.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	C/ME/ZS-42A	ET96/09/24-7	(0.5-1.2)	-	-	-	12.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	C/ME/ZS-42B	-	(1.2-2.5)	-	-	-	11.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
-	C/ME/ZS-42C	-	(2.5)	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
5-Oct-96	C/ME/ZS-43	OB		13.9	22.5	8.6	14.4	0.06	100.0	98.4	95.2	92.6	88.1	83.6	80.8	77.6	73.6	70.8	58.8	48.5	8.1	2062.0	10.7	-	-	
5-Oct-96	C/ME/ZS-44	OB		13.9	20.2	6.3	12.4	-0.24	100.0	97.0	94.0	91.6	86.7	81.4	77.9	73.5	69.2	66.4	55.1	42.7	5.9	2095.0	9.7	-	1.0E-09	
15-Aug-96	C/ME/ZS-26A	OB : ET-96/08/15-7	2.0-3.5	-	-	-	15.5	-	100.0	100.0	100.0	98.8	97.3	96.2	94.9	93.7	92.4	91.3	85.7	81.0	-	-	-	-	-	-
16-Aug-96	C/ME/ZS-33C	-	3.4-4.5	-	-	-	14.5	-	100.0	100.0	100.0	100.0	98.1	97.5	96.7	95.5	93.7	92.3	87.6	83.4	13.0	-	-	-	-	-
MEAN				16.0	24.6	8.6	12.7	-0.36	100.0	99.2	97.8	95.4	91.5	87.0	83.4	78.5	74.7	71.5	59.8	50.4	10.5	2005.2	11.6	2.73	3.5E-09	
MEDIAN				16.5	24.4	8.9	12.5	-0.11	100.0	100.0	98.6	96.7	92.5	88.6	85.0	81.5	77.1	74.3	62.1	52.9	9.5	2002.5	11.1	2.73	1.8E-09	
MAXIMUM (*)				18.2	30.1	14.8	19.4	0.31	100.0	100.0	100.0	100.0	97.9	95.6	93.3	90.7	88.0	86.0	77.2	69.2	18.0	2095.0	13.9	2.75	1.4E-08	
MINIMUM (*)				13.3	18.5	1.3	6.1	-2.79	100.0	93.3	88.8	84.0	73.1	66.1	60.2	54.6	51.2	47.9	28.3	13.8	3.0	1920.0	9.5	2.70	5.0E-10	

Bold and italicized no suitable for fill material. Not Used for Mean, Median, Maximum, Minimum calculations.

(*) These are 100% limits.

C1 Atterberg Limits (ASTM D4318)

C2 Moisture Content (ASTM D2216)

C3 Particle Size Distribution (ASTM D422)

C4 Laboratory Compaction (ASTM D1557)

C6 Specific Gravity (ASTM D854)

C7a Field Density by Nuclear Methods (ASTM D2922)

C7b Moisture Content by Nuclear Methods (ASTM D3017)

C8a Lab Air Entry Permeameter (LAEP)

TABLE 6.5

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

SUMMARY OF LABORATORY TESTS
EFFECTIVE STRENGTH PARAMETERS, COMPACTION AND PERMEABILITY TEST RESULTS

J:\JOB\REPORT\1627\2-TBL6-5.XLS\Table6.5

Apr 18 '97 8:00 am

Test Pit Sample No.	Location	EFFECTIVE STRENGTH PARAMETERS		COMPACTION			PERMEABILITY	Soil Description
		Friction Angle, ϕ' (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	4×10^{-8}	SAND and SILT, some gravel and clay
TP95-31	East Ridge Borrow Area	-	-	11.0	7.6	2200	6×10^{-8}	Silty, sandy GRAVEL, trace clay
TP95-35	South Basin	-	-	-	-	-	7×10^{-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	-	-	-	-	-	3×10^{-7}	SILT, some clay, trace sand and gravel
TP95-39	Main Embankment Foundation	33	0	-	-	-	2×10^{-6}	SILT and fine SAND, some clay
TPB-13,14,16	Embankment & Pond Foundations	-	-	25.1	13.3	1935	2×10^{-8}	Clayey SILT, some sand, trace gravel

Notes:

1. Triaxial tests results from samples TP95-27 and 37 were combined to determine average strength parameters 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.

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
CONTROL TEST SUMMARY SHEET FOR ORIGINAL BORROW AREA

J:\JOB\REPORT\1627\2-TBL6-6.XLS

3/19/97

Knight Piésold Ltd. CONSULTING ENGINEERS				CONTROL TEST - SUMMARY SHEET																		SHEET: 1 of 2				
				ORIGINAL BORROW AREA																		PERIOD: 23/6/ to 5/10/96				
PROJECT: MOUNT POLLEY - TAILINGS STORAGE FACILITY - STAGE 1b CONSTRUCTION																						PROJECT NO.: 1627				
MATERIAL: GLACIAL TILL - FROM ORIGINAL BORROW AREA (OB)																						AREA: Original Borrow Area				
DATE SAMPLED	SAMPLE No.	Location	Depth (m)	C1			C2 Field m/c %	L1 %	C3														Standard Proctor ⁽¹⁾		C6 S.G.	C8 LAEP cm/s
				Atterberg Limits					76.2	38.1	25.4	19.05	9.525	4.7498	2.37998	1.19126	0.59436	0.4191	0.14986	0.07366	0.002	Max Dry Density kg/m ³	Opt. m/c %			
				PL %	LL %	PI %			3	1.5	1	0.75	0.375	0.187	0.0937	0.0469	0.0234	0.0165	0.0059	0.0029						
23-Jun-96	C/ME/ZS-1	OB : Test Pit	-	14.4	28.3	13.9	16.6	0.16	100.0	100.0	100.0	100.0	97.9	94.4	91.4	87.7	69.0	54.4	28.3	13.8	3.7	-	-	-	3.9E-09	
23-Jun-96	C/ME/ZS-2	OB : Test Pit	-	16.4	23.0	6.6	15.6	-0.12	100.0	100.0	100.0	98.8	95.7	91.0	88.4	85.3	82.0	79.6	68.7	58.9	9.0	-	-	2.75	6.7E-09	
23-Jun-96	C/ME/ZS-3	OB : Test Pit	-	16.7	22.9	6.2	13.9	-0.45	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
23-Jun-96	C/ME/ZS-4	OB : Test Pit	-	16.5	23.6	7.1	13.1	-0.48	100.0	100.0	100.0	100.0	93.9	89.3	86.3	82.7	78.4	75.5	62.4	51.7	8.0	-	-	2.73	-	
23-Jun-96	C/ME/ZS-5	OB : Test Pit	-	18.2	21.6	3.4	16.4	-0.53	100.0	100.0	98.1	95.3	91.7	88.0	84.9	82.0	78.4	75.9	65.5	56.5	15.0	-	-	2.74	1.5E-09	
23-Jun-96	C/ME/ZS-6	OB : Test Pit	-	17.5	18.8	1.3	14.9	-2.00	100.0	100.0	100.0	98.9	94.5	91.0	86.7	84.0	81.3	79.5	69.7	59.8	6.0	-	-	2.75	-	
23-Jun-96	C/ME/ZS-7	OB : Test Pit	-	16.9	30.1	13.2	17.8	0.07	100.0	100.0	100.0	100.0	97.8	94.1	90.4	87.0	83.6	81.4	71.4	62.2	17.0	-	-	I/P	2.5E-09	
17-Jul-96	C/ME/ZS-8	OB : Test Pit	-	17.1	28.0	10.9	17.6	0.05	100.0	100.0	98.1	96.9	91.9	88.6	85.7	81.8	76.7	73.4	61.9	53.1	13.0	1920.0	13.9	2.74	5.0E-10	
17-Jul-96	C/ME/ZS-9	OB : Test Pit	-	16.6	25.7	9.1	19.4	0.31	100.0	100.0	98.0	96.7	93.8	90.6	85.0	81.1	77.1	74.3	63.6	55.2	12.0	1935.0	13.1	2.72	5.7E-10	
17-Jul-96	C/ME/ZS-10	OB : Test Pit	-	15.8	26.4	10.6	17.0	0.11	100.0	100.0	96.9	95.6	92.5	89.6	87.8	85.0	81.2	78.3	66.2	57.1	17.0	1940.0	13.4	2.72	1.8E-09	
2-Aug-96	C/ME/ZS-11	OB : Test Pit	-	15.8	26.4	10.6	15.7	-0.01	100.0	100.0	100.0	98.8	97.6	94.8	92.8	88.9	83.6	80.3	68.3	58.1	10.0	-	-	2.70	1.6E-09	
9-Aug-96	C/ME/ZS-12	OB : Test Pit	-	-	-	-	18.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9-Aug-96	C/ME/ZS-13	OB : Test Pit	-	-	-	-	13.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9-Aug-96	C/ME/ZS-14	OB : Test Pit	-	17.5	29.4	11.9	15.8	-0.14	100.0	100.0	98.6	97.4	95.8	92.7	89.6	86.9	83.6	81.4	72.2	64.2	18.0	-	-	2.72	-	
9-Aug-96	C/ME/ZS-15	OB : Test Pit	-	17.8	27.3	9.5	19.4	0.17	100.0	100.0	100.0	98.6	97.6	95.6	93.3	90.7	88.0	86.0	77.2	69.2	18.0	-	-	2.73	-	
9-Aug-96	C/ME/ZS-16	OB : Test Pit	-	-	-	-	12.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
9-Aug-96	C/ME/ZS-17	OB : Test Pit	-	-	-	-	18.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
12-Aug-96	C/ME/ZS-18	OB : Test Pit	-	17.1	18.5	1.4	13.2	-2.79	100.0	97.6	96.1	94.0	89.7	85.2	79.9	75.5	71.2	68.7	58.6	50.3	7.0	-	-	2.71	4.1E-09	
12-Aug-96	C/ME/ZS-19	OB : Test Pit	-	14.4	29.2	14.8	14.0	-0.03	100.0	100.0	98.9	91.7	88.5	86.3	83.1	80.1	77.1	75.1	66.1	58.2	13.0	1980.0	12.5	2.73	1.4E-08	
10-Aug-96	C/ME/ZS-20	OB : ET-96/08/10-1	-	-	-	-	14.0	-	100.0	100.0	100.0	97.9	94.8	91.8	88.7	85.7	82.8	80.8	71.6	63.2	15.0	-	-	-	-	
10-Aug-96	C/ME/ZS-21	OB : ET-96/08/10-2	-	-	-	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
15-Aug-96	C/ME/ZS-22A	OB : ET-96/08/15-1	0.5-1.5	-	-	-	13.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	C/ME/ZS-22B	-	2.5-3.0	-	-	-	16.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	C/ME/ZS-23A	OB : ET-96/08/15-2	0.5-1.5	14.9	28.1	13.2	13.6	-0.10	100.0	100.0	100.0	97.8	93.3	88.6	84.7	81.5	78.6	76.7	67.4	59.5	15.0	1990.0	12.3	2.75	-	
-	C/ME/ZS-23B	-	2.5-3.5	-	-	-	12.9	-	100.0	100.0	100.0	95.6	91.6	87.2	84.3	81.5	78.1	75.5	63.2	53.7	-	-	-	-	-	
-	C/ME/ZS-24	OB : ET-96/08/15-4	0.5-1.5	-	-	-	13.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	C/ME/ZS-25	OB : ET-96/08/15-5	4.0-6.0	-	-	-	10.8	-	100.0	100.0	98.5	87.8	86.0	82.4	89.1	54.6	77.9	73.2	59.7	53.5	-	-	-	-	-	
-	C/ME/ZS-26B	-	5.7-7.3	-	-	-	6.1	-	100.0	97.4	88.8	84.0	73.1	66.1	60.2	55.7	51.2	47.9	36.7	28.3	-	-	-	-	-	
-	C/ME/ZS-27A	OB : ET-96/08/15-8	0.5-2.0	-	-	-	11.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	C/ME/ZS-27B	-	2.0-3.0	np	-	-	12.1	-	100.0	100.0	97.5	94.8	92.9	90.2	87.8	83.8	78.3	74.8	62.1	52.4	3.0	2000.0	11.2	2.73	-	
-	C/ME/ZS-27C	-	3.0-4.0	-	-	-	8.7	-	100.0	100.0	100.0	97.1	92.7	88.0	82.8	75.9	67.2	61.7	47.5	39.3	-	-	-	-	-	
-	C/ME/ZS-27D	-	4.0-6.0	-	-	-	8.5	-	100.0	100.0	97.9	96.1	91.0	86.1	79.5	71.2	62.6	58.2	46.0	38.6	-	-	-	-	-	
-	C/ME/ZS-27E	-	6.0-7.0	-	-	-	10.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
-	C/ME/ZS-28A	OB : ET-96/08/15-9	1.0-3.0	17.0	24.4	7.4	11.8	-0.70	100.0	100.0	98.9	97.6	94.8	90.9	87.0	83.6	80.6	78.5	68.6	51.5	12.0	2030.0	11.0	2.70	-	
-	C/ME/ZS-28B	-	3.0-5.0	-	-	-	9.7	-	100.0	100.0	100.0	97.0	93.3	89.4	85.4	81.8	78.1	75.3	63.7	55.2	8.0	-	-	-	-	

TABLE 6.3

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

STAGED EMBANKMENT FILL QUANTITIES

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ZONE AND MATERIAL	Stage El. (m)	FILL QUANTITY BY STAGE (m ³)								TOTAL (m ³)
		1b	2	3	4	5	6	7	8	
	Year	1934	1937	1940	1946	1951	1956	1961	1965	
		1996/97	1998	1999	2000	2002	2004	2006	2008	
CBL: free-draining random fill		-	59,800	7,800	-	-	13,000	14,700	15,400	110,700
Chimney Drain: clean sand and gravel		22,000	14,900	-	-	-	-	-	-	36,900
Toe Drain: clean sand and gravel		2,300	21,000	18,200	-	9,000	-	9,500	-	60,000
S: Glacial Till, core zone		386,300	60,200	75,800	202,800	180,700	168,800	173,400	152,500	1,400,500
B: Glacial Till, downstream shell		242,000	42,700	40,700	-	-	25,300	28,900	23,800	403,400
C: Random Fill, downstream shell		-	412,200	98,000	844,700	216,300	160,900	1,403,700	213,600	3,349,400
CS: Cyclone Sand, upstream shell		-	-	-	208,600	155,900	169,800	164,700	129,900	828,900
TOTALS		652,600	610,800	240,500	1,256,100	561,900	537,800	1,794,900	535,200	6,189,800

Notes:

- 1) All quantities listed above are neat line + 10% contingency.
- 2) No allowance has been added for cut to fill shrinkage
- 3) Coarse Bearing Layer material type dependent on tailings beach development; to be determined prior to construction.

TABLE 6.4

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

SUMMARY OF LABORATORY TESTS
INDEX TEST RESULTS

J:\JOB\REPORT\1627\2-TBL6-4.XLS\Table 3.1

Apr 18 '97 8:00 am

Test Pit Sample No.	Location	Specific Gravity	Natural Moisture Content (%)	Atterberg Limits (%)				Grain Size Distribution				Soil Description
								+ #4	#4 - #200	#200 - 0.002mm	-0.002mm	
				LL	PL	PI	LI	% Gravel	% Sand	% Silt	% 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.

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

DESIGN BASIS AND OPERATING CRITERIA

6.4 Water Quality Monitoring	<ul style="list-style-type: none">• To ensure environmental compliance.• Water quality samples taken at regular intervals from sediment ponds, drains (at drain monitor sump), groundwater monitoring wells, seepage ponds and tailings pond.• Upstream and downstream samples for impact analysis.
6.5 Hydrometeorology	<ul style="list-style-type: none">• Operator weather station for input to water balance calculations.• Precipitation (rain and snow).• Evaporation.• Air quality monitoring (dust, etc.).
6.6 Operational Monitoring	<ul style="list-style-type: none">• Quantify operation of tailings storage facility.• Rate of tailings accumulation in terms of mass and volume.• Tailings characteristics and water recovery.• Supernatant pond (depth, area and volume).
7.0 CLOSURE REQUIREMENTS	
7.1 General	Return impoundment to equivalent pre-mining use and productivity by establishing a wetland area adjacent to a final spillway and re-vegetating remainder of tailings surface with indigenous species of trees, shrubs and grasses adjacent to embankment grading to aquatic species along and adjacent to final pond.
7.2 Spillway	Two stage spillway with lower channel outlet designed to pass 1 in 200 yr. 24 hour flood event and upper wider outlet section designed to pass Probable Maximum Flood without overtopping embankments.

Notes:

1. The closure plan will remain flexible during operations to allow for future changes in the mine plan and to incorporate information from on-going reclamation programs.



TABLE 6.2

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

CONSEQUENCE CLASSIFICATION OF DAMS

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Consequence Category	Potential Incremental Consequences of Failure ^[a]	
	Loss of Life	Economic, Social, Environmental
Very High	Large increase expected ^[b]	Excessive increase in social, economic and/or environmental losses.
High	Some increase expected ^[b]	Substantial increase in social, economic and/or environmental losses.
Low	No increase expected	Low social, economic and/or environmental losses.
Very Low	No increase	Small dams with minimal social, economic and/or environmental losses. Losses generally limited to the owner's property; damages to other property are acceptable to society.

[a] Incremental to the impacts which would occur under the same natural conditions (flood, earthquake event) but without failure of the dam. The type of consequences (e.g. loss of life, or economic losses) with the highest rating determines which category is assigned to the structure.

[b] The loss-of-life criteria which separates the High and Very High categories may be based on risks which are acceptable to society, taken to be 0.001 lives per year for each dam. Consistent with this tolerable societal risk the minimum criteria for a Very High Consequence dam (PMF and MCE) should result in an annual probability of failure of less than 1/100,000.



TABLE 6.1**MOUNT POLLEY MINING CORPORATION****MOUNT POLLEY PROJECT****DESIGN BASIS AND OPERATING CRITERIA**

	<ul style="list-style-type: none"> Butt fusion welded HDPE with 30" DR15.5, 22" DR17 and 24" DR15.5.
Spigots	<ul style="list-style-type: none"> Movable discharge section placed on tailings embankment crest.
Flow Rate	<ul style="list-style-type: none"> Design throughput 900 tonnes/hr dry solids. Slurry solids content 35%. Design flow 19.6 cfs (0.55m³/s). Increases to 23.8cfs (0.67m³/s) at 30% solids content with addition of 4.2cfs storm water runoff.. Waste dump and Millsite runoff will be added to tailings stream, increasing flow and decreasing solids content.
Spill Containment: <ul style="list-style-type: none"> - Mill site to Bootjack Creek - Bootjack Creek Crossing - Bootjack Creek to TSF 	<ul style="list-style-type: none"> Pipeline laid in pipe containment channel. There is an overflow pond for the T2 dropbox. Pipeline sleeved in pipe containment channel. Pipeline laid in pipe containment channel.
4.2 Reclaim Water System	
Function	Primary source of water for milling process. (Pump and Barge System Designed by Others.)
Reclaim Barge	<ul style="list-style-type: none"> Prefabricated pump station on barge in excavated channel in TSF. Local and remote control from Millsite.
Reclaim Pipeline	<ul style="list-style-type: none"> 24" pipeline with a steel section at the reclaim barge and HDPE with varying pressure ratings along length.
Reclaim Booster Pump Station	<ul style="list-style-type: none"> Prefabricated pump station located between TSF and Millsite. Identical pumps, sensors and controls as reclaim barge for ease of maintenance.
Spill Containment	<ul style="list-style-type: none"> See Item 4.1 above, all same for pipelines. Booster pump station has closed sump.
4.3 Seepage Recycle System	
Function	Return seepage and foundation drain flows to TSF.
Drain Monitoring Sumps	Flow quantity and water quality measurements on individual drains.
Seepage Collection Ponds	<ul style="list-style-type: none"> Sized to hold 10 times max. weekly seepage flow quantity. Excavated in low permeability natural soil liner, operated as groundwater sink.
Seepage Recycle Pumps	<ul style="list-style-type: none"> Set in vertical pump sumps. Submersible pumps, system by Others. Pumps discharge back to TSF via 150 mm HDPE pipes.
5.0 MAKE-UP WATER SUPPLY	
5.1 General	
Function	To direct runoff from the Millsite and Southeast Sediment pond to the TSF, providing additional water for recycle to the mill. Also, to implement the Polley Lake Pump Station when and as required to meet the project Water Management Plan objectives.
5.2 Millsite Sump	
Catchment Area	Approx. 20 ha direct catchment, plus pit dewatering.
Design Storm	1.5 x I in 10 yr. 24 hour event runoff (6,000 m ³)
Sump Cross-Section	3:1 inside slope, 2:1 outside slope, 4m crest width.



TABLE 6.1**MOUNT POLLEY MINING CORPORATION****MOUNT POLLEY PROJECT****DESIGN BASIS AND OPERATING CRITERIA**

Normal Operating Level	1102.7 m
Maximum Operating Level	1106.2 m
Flow Control Structures	See Dwg. No. 1625.232 for layout details.
Discharge Pipe	300 mm HDPE DR 21 to plant or tailings line.
Flow Monitoring	None.
5.3 Southeast Sediment Pond	
Catchment Area	Approx. 150 ha direct catchment.
Design Storm	1 in 10 yr. 24 hour event runoff (25,000 m ³)
Sump Cross-Section	3:1 inside slope, 2:1 outside slope, 4m crest width.
Normal Operating Level	1054.5 m
Maximum Operating Level	1057.4 m
Flow Control Structures	See Dwg. No. 1625.232 for layout details.
Discharge Pipe	250mm HDPE DR 21 to Reclaim sump or T2 dropbox
Flow Monitoring	None.
5.4 Polley Lake Pump Station	Report and Drawings soon to be issued.
Max. Volume to be extracted	1,000,000 m ³ annually
Period for water extraction	Freshet
Max. Intake Velocity	0.11 m/s
Intake Screen Opening	0.1 inch (No. 8 Mesh wire cloth)
Spill Containment at Pump	Collection into a Holding Basin
Discharge Pipe	22 ½ inch ID, 350 ft of 19 ½ inch ID and 5200 ft of 17 ½ inch ID pipe.
Max. Flow	5,500 US GPM
Flow Monitoring	Flows in Hazeltine Creek, water level on Polley Lake, pumping hours times measured flow rate.
Security and Access	Signs for buried or submerged components, buoys attached to intake in Polley Lake.
6.0 INSTRUMENTATION AND MONITORING	
6.1 General	
Function	To quantify environmental conditions and performance characteristics of the TSF to ensure compliance with design objectives.
6.2 Geotechnical Instrumentation and Monitoring	
Piezometers	<ul style="list-style-type: none"> • Measure pore pressures in drains, foundations, fill materials and tailings. • Vibrating wire piezometers. • Installed by qualified technical personnel. • Three instrumentation planes for Main Embankment and one for Perimeter Embankment.
Survey Monuments	<ul style="list-style-type: none"> • Deformation and settlement monitoring of embankments.
6.3 Flow Monitoring	<ul style="list-style-type: none"> • To provide data for on-going water balance calculations. • Drain flows regularly monitored. • Reclaim and seepage pump systems flow meters. • Tailings output monitored at millsite. • Streamflow monitoring.



TABLE 6.1***Knight Piésold Ltd.***

CONSULTING ENGINEERS

MOUNT POLLEY MINING CORPORATION**MOUNT POLLEY PROJECT****DESIGN BASIS AND OPERATING CRITERIA**

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ITEM	DESIGN CRITERIA
1.0 GENERAL DESIGN CRITERIA	
Scope	Generally applicable to all components and structures.
Regulations	MEI MELP (Water Management Branch)
Codes and Standards	NBC and related codes CAN/CSA HSRC (Health, Safety and Reclamation Code for Mines in B.C.) ASTM ACI ANSI
Design Life	14 Years
Operational Criteria:	
General	NBC where relevant
Rainfall/Precipitation:	Section 2.1 (Ref. No. 1625/1) and (Ref. No. 1624/1)
Seismic:	
DBE (operations)	M = 6.5, A max. = 0.037 g
MDE (closure)	M = 6.5, A max. = 0.065 g
2.0 TAILINGS BASIN	
Site Selection	Section 4.0, (Ref. No. 1625/1) and (Ref. No. 1621/1) <ul style="list-style-type: none"> Capacity and filling characteristics. Hydrology and downstream water usage. Hydrogeology and groundwater regime. Aesthetics and visual impact. Foundation conditions. Construction requirement. Closure and reclamation requirements. Capital and operating costs.
Geological and Geotechnical Conditions	Section 5.0, (Ref. No. 1625/1) and (Ref. No. 1623/1).
Basin Liner	<ul style="list-style-type: none"> Compacted glacial till with frost protection layer required in areas with <2 m in-situ glacial till. Liner placed in 3 - 150 mm lifts. Liner compacted to 95% Std. Proctor max. dry density (ASTM D698) at optimum moisture content minus 1% to plus 2%.
Embankment Foundation Drains	<ul style="list-style-type: none"> Installed in Main Embankment Foundation. Geotextile wrapped 1000 mm x 800 mm gravel/drain with 100 mm perforated CPT drain pipe. Drain conveyance pipes are solid HDPE. Discharge to Main Embankment Seepage Collection Pond via Drain Monitoring Sump.
Stripping	<ul style="list-style-type: none"> Required at areas directly affected by construction (embankments, basin liners, seepage collection ponds, reclaim barge channel, stockpiles, roads etc.). Remove organic soil to topsoil stockpiles.



MOUNT POLLEY PROJECT**DESIGN BASIS AND OPERATING CRITERIA**

3.0 TAILINGS EMBANKMENT		
Function		<ul style="list-style-type: none"> Storage of tailings and process water for design life. Provide storage for 24 hour PMP storm. Provision for routing PMF at closure.
Embankment Crest Width		8 m starter dam and 8 m final dam.
Embankment Height (Max):	Starter	15 m (Crest El. 927 m)
	Final	53 m (Crest El. 965 m)
Embankment Crest Length:	Starter	1000 m
	Final	4500 m
Design Tonnage		6,500,000 tpy (17,808) tpd
Solids Content of Tailings Stream		35% (before Millsite and waste dump runoff added to tailings stream)
Freeboard:	Operations	24 hour PMP event (679,000 m ³) plus 1.0m wave runup on 2.5 million m ³ operational storage pond.
	Closure	Sufficient to provide routing of PMF plus wave run-up.
Storage Capacity		84.5 million tonnes.
Tailings Density:	Year 1	1.1 t/m ³
	Year 2	1.2 t/m ³
	Year 3-13	1.3 t/m ³
Tailings Specific Gravity		2.78
Borrow Material Properties		Section 6.3.3, 1995 Site Investigation Report (Ref No 1623/1), and (Ref No 1625/1).
Construction Diversion		Not required.
Emergency Spillway Flows:	Operations	Not required.
	Closure	Design flow for routing PMF event.
Filling Rate		Figure 6.1 and 6.2, Figure 6.3 (Ref. No. 1625/1).
Fill Material Properties		Drg. No. 1625.212
Compaction Requirements		Drg. No. 1625.211
Geotechnical Data		Sections 6.3, 6.4 and 6.5, 1995 Site Investigation Report (Ref. No. 1623/1), and Section 5.1 (Ref. No. 1625/1).
Stability Analysis		Section 6.8 and (Ref. No. 1625/1).
Seepage Analysis		Section 6.9 and (Ref. No. 1625/1).
Sediment Control		Primary control from Main Embankment. Main Embankment Seepage Collection Pond provides secondary sediment control.
Seepage Control		Seepage collection ponds and pumpback well systems.
Seismic Parameters		Section 2.3, and (Ref. No. 1625/1).
Spillway Discharge Capacity		Not required during operations.
Settlement		Section 6.6 and (Ref. No. 1625/1).
Surface Erosion Protection		Revegetation with grasses on final embankment slope.
4.0 PIPEWORKS		
4.1 Tailings Delivery and Discharge Pipework		Section 8.0 and (Ref. No. 1625/1).
Function		Transport tailings slurry and mill site and waste dump runoff to Tailings Storage Facility (TSF).
Tailings Pipeline		<ul style="list-style-type: none"> Free draining, gravity flow pipeline.



**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT****SUMMARY OF RECENT GEOLOGICAL INVESTIGATIONS**

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Identification Label	Field Name	Date	Location Description	Type of Investigation
5H	5H	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH5H	BH5H	13-Jan-97	Original Borrow Area	Original Borrow Drillhole
5I	5I	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH5I	BH5I	13-Jan-97	Original Borrow Area	Original Borrow Drillhole
6E	6E	22-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
6F	6F	22-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
6G	6G	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
6G-A	6G-A		Original Borrow Area	Original Borrow Exploration Trench
BH6G	BH6G	5-Jan-97	Original Borrow Area	Original Borrow Drillhole
6H	6H	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
6I	6I	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
6I-A	6I-A		Original Borrow Area	Original Borrow Exploration Trench
BH6I	BH6I	5-Jan-97	Original Borrow Area	Original Borrow Drillhole
7E	7E	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
7F	7F	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
7G	7G	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH7G	BH7G	5-Jan-97	Original Borrow Area	Original Borrow Drillhole
BH7.5G	BH7.5G	4-Jan-97	Original Borrow Area	Original Borrow Drillhole
7H	7H	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
7H-A	7H-A		Original Borrow Area	Original Borrow Exploration Trench
BH7H	BH7H	5-Jan-97	Original Borrow Area	Original Borrow Drillhole
BH7.5H	BH7.5H	4-Jan-97	Original Borrow Area	Original Borrow Drillhole
7I	7I	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH7I	BH7I	4-Jan-97	Original Borrow Area	Original Borrow Drillhole
7J-A	7J-A		Original Borrow Area	Original Borrow Exploration Trench
8E	8E	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
8F	8F	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH8F	BH8F	4-Jan-97	Original Borrow Area	Original Borrow Drillhole
8G	8G	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH8G	BH8G	3-Jan-97	Original Borrow Area	Original Borrow Drillhole
8H	8H	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH8H	BH8H	3-Jan-97	Original Borrow Area	Original Borrow Drillhole
8I	8I	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH8I	BH8I	3-Jan-97	Original Borrow Area	Original Borrow Drillhole
9E	9E	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
9F	9F	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
9G	9G	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
9H	9H	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
9I	9I	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH10F	BH10F	11-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP10G	TP10G	17-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
BH10H	BH10H	10-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP10I	TP10I	17-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP11F	TP11F	15-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP11G	TP11G	17-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP11H	TP11H	18-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP11I	TP11I	17-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP12F	TP12F	15-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP12G	TP12G	16-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
BH12H	BH12H	5-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP12H	TP12H	1/18/1997	Original Borrow Area	Original Borrow Exploration Trench
BH12.5H	BH12.5H	6-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP12I	TP12I	19-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
BH13F	BH13F	13-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP13G	TP13G	16-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
BH13H	BH13H	6-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP13I	TP13I	19-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP14F	TP14F	15-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP14G	TP14G	16-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
BH14H	BH14H	9-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP14I	TP14I	22-Jan-97	Original Borrow Area	Original Borrow Exploration Trench



**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT**

SUMMARY OF RECENT GEOLOGICAL INVESTIGATIONS

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Identification Label	Field Name	Date	Location Description	Type of Investigation
TP15F	TP15F	15-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
TP15G	TP15G	16-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
BH15H	BH15H	8-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP15I	TP15I	22-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
BH16F	BH16F	12-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP16G	TP16G	18-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
BH16H	BH16H	8-Jan-97	Original Borrow Area	Original Borrow Drillhole
TP16I	TP16I	18-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
95- 1	TP95ME-1	15-May-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 2	TP95ME-2	15-May-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 3	TP95ME-3	15-May-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 4	TP95ME-4	3-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 5	TP95ME-5	3-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 6	TP95ME-6	3-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 7	TP95ME-7	3-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 8	TP95ME-8	3-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 9	TP95ME-9	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 10	TP95ME-10	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 11	TP95ME-11	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 12	TP95ME-12	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 13	TP95ME-13	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 14	TP95ME-14	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 15	TP95ME-15	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 16	TP95ME-16	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 17	TP95ME-17	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 18	TP95ME-18	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 19	TP95ME-19	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 20	TP95ME-20	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 21	TP95ME-21	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 22	TP95ME-22	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 23	TP95ME-23	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 24	TP95ME-24	4-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 25	TP95ME-25	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 26	TP95ME-26	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 27	TP95ME-27	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 28	TP95ME-28	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 29	TP95ME-29	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 30	TP95ME-30	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 31	TP95ME-31	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 32	TP95ME-32	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 33	TP95ME-33	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 34	TP95ME-34	5-Oct-95	Main Embankment (Previous Investigations)	Foundation Exploration Trench
95- 35	S19	5-Oct-95	Main Embankment SCP (Previous Investigations)	SCP (Pond) Exploration Trench
95- 36	S20	5-Oct-95	Main Embankment SCP (Previous Investigations)	SCP (Pond) Exploration Trench
95- 37	S20.5	5-Oct-95	Main Embankment SCP (Previous Investigations)	SCP (Pond) Exploration Trench
95- 38	S21	21-Sep-95	Main Embankment SCP (Previous Investigations)	SCP (Pond) Exploration Trench
95- 39	S21.2	5-Oct-95	Main Embankment SCP (Previous Investigations)	SCP (Pond) Exploration Trench
95- 40	S22	21-Sep-95	Main Embankment SCP (Previous Investigations)	SCP (Pond) Exploration Trench

Note : 1995 Previous Investigations are included because they have been used in the confirmation of the geological and geotechnical conditions.



**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT**

SUMMARY OF RECENT GEOLOGICAL INVESTIGATIONS

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Identification Label	Field Name	Date	Location Description	Type of Investigation
96- 26	ET-96/09/03-1	3-Sep-96	Upper Basin Liner	UBL Exploration Trench
96- 27	ET-96/09/03-2	3-Sep-96	Upper Basin Liner	UBL Exploration Trench
96- 28	ET-96/09/03-3	3-Sep-96	Upper Basin Liner	UBL Exploration Trench
96- 29	ET-96/08/14-1	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 30	ET-96/08/14-2	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 31	ET-96/08/14-3	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 32	ET-96/08/14-4	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 33	ET-96/08/14-5	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 34	ET-96/08/14-6	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 35	ET-96/08/14-7	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 36	ET-96/08/14-8	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 37	ET-96/08/14-9	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 38	ET-96/08/14-10	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 39	ET-96/08/14-11	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 40	ET-96/08/14-12	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 41	ET-96/08/14-13	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 42	ET-96/08/14-14	14-Aug-96	Lower Basin Liner	LBL Exploration Trench
96- 43	ET-96/09/13-1	13-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 44	ET-96/09/13-2	13-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 45	ET-96/09/13-3	13-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 46	ET-96/09/13-4	13-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 47	ET-96/09/13-5	13-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 48	ET-96/09/16-1	16-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 49	ET-96/09/16-2	16-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 50	ET-96/09/16-3	16-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 51	ET-96/09/16-4	16-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 52	ET-96/09/19-1	19-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 53	ET-96/09/19-2	19-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 54	ET-96/09/19-3	19-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 55	ET-96/09/19-4	19-Sep-96	Alternate Borrow Area	Alternate Borrow Exploration Trench
96- 56	ET-96/08/31-1			
96- 56	ET-96/08/31-2	31-Aug-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 57	ET-96/08/31-3	31-Aug-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 58	ET-96/08/31-4	31-Aug-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 59	ET-96/09/01-1	1-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 60	ET-96/09/01-2	1-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 61	ET-96/09/01-3	1-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 62	ET-96/09/02-1	2-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 63	ET-96/09/02-2	2-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 64	ET-96/09/02-3	2-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 65	ET-96/09/02-4	2-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 66	ET-96/09/02-5	2-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 67	ET-96/09/02-6	2-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 68	ET-96/09/02-7	2-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 69	ET-96/09/02-8	2-Sep-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 70	ET96-1	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 71	ET96-2	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 72	ET96-3	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 73	ET96-4	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 74	ET96-5	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 75	ET96-6	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 76	ET96-7	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 77	ET96-8	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 78	ET96-9	11-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench



**MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT**

SUMMARY OF RECENT GEOLOGICAL INVESTIGATIONS

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Identification Label	Field Name	Date	Location Description	Type of Investigation
96- 79	ET96-10	12-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 80	ET96-11	12-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 81	ET96-12	12-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 82	ET96-13	12-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 83	ET96-15	12-Jul-96	West end of Reclaim Barge Channel	Foundation Exploration Trench
96- 84	ET-96/09/23-1	23-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 85	ET-96/09/23-2	23-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 86	ET-96/09/24-1	24-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 87	ET-96/09/24-2	24-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 88	ET-96/09/24-3	24-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 89	ET-96/09/24-4	24-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 90	ET-96/09/24-5	24-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 91	ET-96/09/24-6	24-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 92	ET-96/09/24-7	24-Sep-96	Original Borrow Area	Original Borrow Exploration Trench
96- 93	ET-96/08/10-1	8-Oct-96	Original Borrow Area	Original Borrow Exploration Trench
96- 94	ET-96/08/10-2	8-Oct-96	Original Borrow Area	Original Borrow Exploration Trench
96- 95	ET-96/08/15-1	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 96	ET-96/08/15-2	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 97	ET-96/08/15-3	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 98	ET-96/08/15-4	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 99	ET-96/08/15-5	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 100	ET-96/08/15-6	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 101	ET-96/08/15-7	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 102	ET-96/08/15-8	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 103	ET-96/08/15-9	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 104	ET-96/08/15-10	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 105	ET-96/08/15-11	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 106	ET-96/08/15-12	15-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 107	ET-96/08/16-1	16-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 108	ET-96/08/16-2	16-Aug-96	Original Borrow Area	Original Borrow Exploration Trench
96- 109	ET-96/10/29-1	29-Oct-96	Main Embankment (D/S of Final Toe)	Foundation Exploration Trench
96- 110	ET-96/10/29-2	29-Oct-96	Main Embankment (D/S of Final Toe)	Foundation Exploration Trench
96- 111	ET-96/10/24-1	24-Oct-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 112	ET-96/10/24-2	24-Oct-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 113	ET-96/10/24-3	24-Oct-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 114	ET-96/10/24-4	24-Oct-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 115	ET-96/10/24-5	24-Oct-96	Filter Sand Investigations (East of P. E.)	Filter Sand Exploration Trench
96- 116	TP-96/08/16-Barge1	16-Aug-96	Reclaim Barge Channel	Foundation Exploration Trench
96- 117	TP-96/08/16-Barge2	16-Aug-96	Reclaim Barge Channel	Foundation Exploration Trench
96- 118	TP-96/08/16-Barge3	16-Aug-96	Reclaim Barge Channel	Foundation Exploration Trench
96- 119	TP-96/08/16-Barge4	29-Oct-96	Reclaim Barge Channel	Foundation Exploration Trench
TP3H	TP3H	19-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
4E	4E	22-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
4F	4F	22-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
4G	4G	22-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
TP4G	TP4G	18-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
4H	4H	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
4I	4I	24-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
5E	5E	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
5F	5F	23-Nov-96	Original Borrow Area	Original Borrow Exploration Trench
BH5F	BH5F	13-Jan-97	Original Borrow Area	Original Borrow Exploration Trench
5G	5G	23-Nov-96	Original Borrow Area	Original Borrow Drillhole
BHG5	BHG5	13-Jan-97	Original Borrow Area	Original Borrow Drillhole



TABLE 2.4

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

USUAL MINIMUM CRITERIA FOR DESIGN EARTHQUAKES

Consequence Category	Maximum Design Earthquake (MDE)	
	Deterministically Derived	Probabilistically Derived (Annual exceedence probability)
Very High	MCE ^{[a][b][c]}	1/10,000 ^{[b][c]}
High	50% to 100% MCE ^{[d][e]}	1/1000 to 1/10,000 ^[e]
Low	^[f]	1/100 to 1/1000 ^[f]

^a For a recognized fault or geographically defined tectonic province, the Maximum Credible Earthquake (MCE) is the largest reasonably conceivable earthquake that appears possible. For a dam site, MCE ground motions are the most severe ground motions capable of being produced at the site under the presently known or interpreted tectonic framework.

^b In Hydro-Quebec's practice, the MDE for Very High Consequence structures involves a combination of deterministic and probabilistic approaches that reflect current knowledge of seismo-tectonic conditions in Eastern Canada. Hydro-Quebec's deterministically derived MDE magnitude is the maximum historically recorded earthquake, increased by one-half magnitude, while their probabilistically derived earthquake has an estimated probability of exceedence of 1/2000.

^c An appropriate level of conservatism shall be applied to the factor of safety calculated from these loads, to reduce the risks of dam failure to tolerable values. Thus, the probability of dam failure could be much lower than the probability of extreme event loading.

^d MDE firm ground accelerations and velocities can be taken as 50% to 100% of MCE values. For design purposes the magnitude should remain the same as the MCE.

^e In the High Consequence category, the MDE is based on the consequences of failure. For example, if one incremental fatality would result from failure, an AEP of 1/1000 could be acceptable, but for consequences approaching those of a Very High Consequence dam, design earthquakes approaching the MCE would be required.

^f If a Low Consequence structure cannot withstand the minimum criteria, the level of upgrading may be determined by economic risk analysis, with consideration of environmental and social impacts.



SUMMARY OF RECENT GEOLOGICAL INVESTIGATIONS

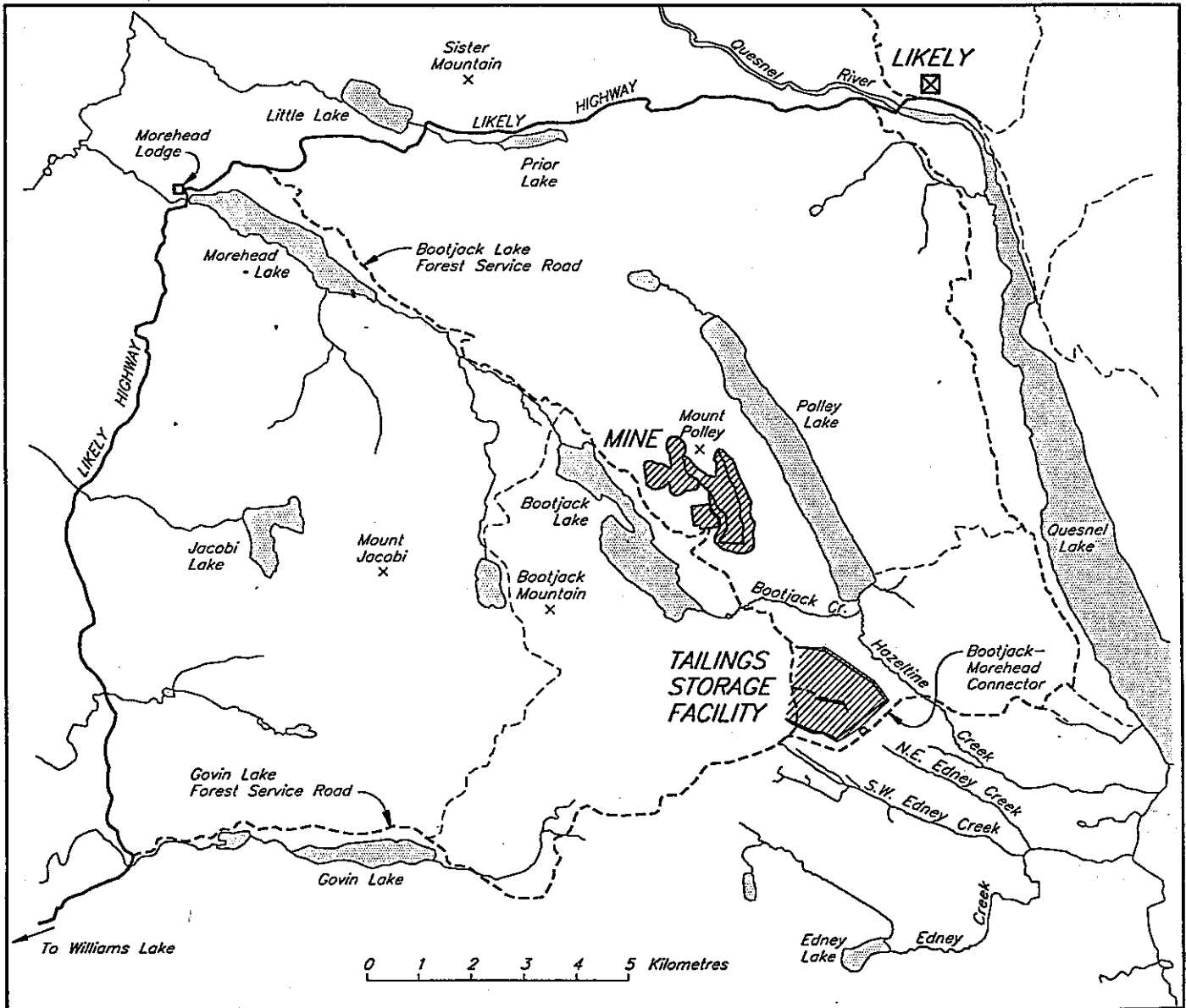
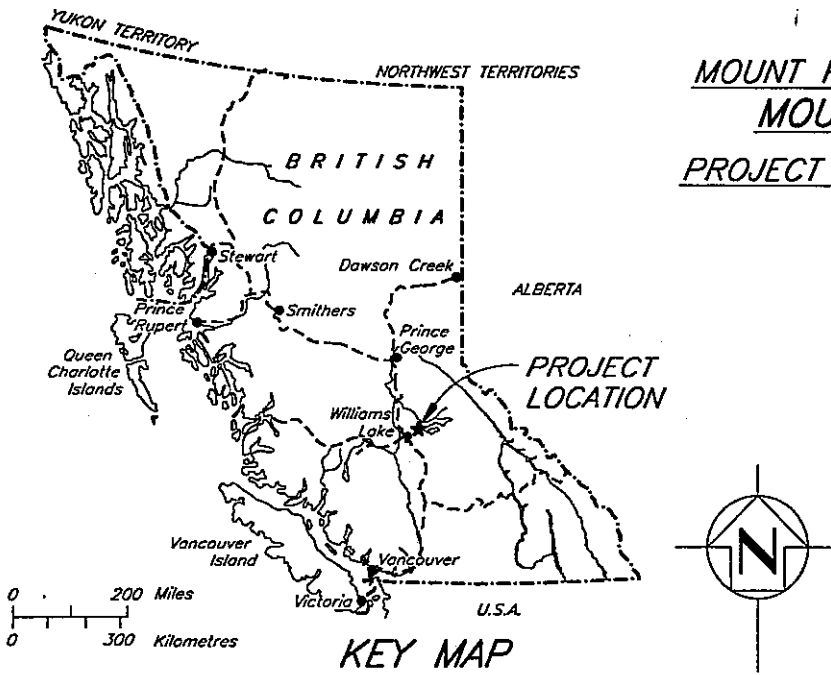
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Identification Label	Field Name	Date	Location Description	Type of Investigation
96- A1	96- A1	21-Jul-96	Main Embankment	Foundation Auger/SPT Drillhole
96- B1	96- B1	21-Jul-96	Main Embankment	Foundation Auger/SPT Drillhole
96- C1	96- C1	21-Jul-96	Main Embankment	Foundation Auger/SPT Drillhole
CPT 96-1	CPT 96-1	27-Jul-96	Main Embankment	Foundation CPT (Cone) Drillhole
CPT 96-2	CPT 96-2	27-Jul-96	Main Embankment	Foundation CPT (Cone) Drillhole
CPT 96-3	CPT 96-3	27-Jul-96	Main Embankment	Foundation CPT (Cone) Drillhole
CPT 96-4	CPT 96-4	28-Jul-96	Main Embankment	Foundation CPT (Cone) Drillhole
CPT 96-5	CPT 96-5	28-Jul-96	Main Embankment	Foundation CPT (Cone) Drillhole
PRW 96-1	PRW 96-1	28-Jul-96	Main Embankment	Foundation Auger Pressure Relief Well
PRW 96-2	PRW 96-2	27-Jul-96	Main Embankment	Foundation Auger Pressure Relief Well
PRW 96-3	PRW 96-3	27-Jul-96	Main Embankment	Foundation Auger Pressure Relief Well
PRW 96-4	PRW 96-4	27-Jul-96	Main Embankment	Foundation Auger Pressure Relief Well
PRT-1	PRT-1	10-Aug-96	Main Embankment	Foundation Pressure Relief Trench
PRT-2	PRT-2	13-Aug-96	Main Embankment	Foundation Pressure Relief Trench
PRT-3	PRT-3	24-Sep-96	Main Embankment	Foundation Pressure Relief Trench
PRT-4	PRT-4	28-Sep-96	Main Embankment	Foundation Pressure Relief Trench
GW96-1A	GW96-1A	29-Nov-96	Perimeter Embankment (D/S of Seepage Collection Pond)	Groundwater Monitoring Well Drillhole
GW96-1B	GW96-1B	29-Nov-96	Perimeter Embankment (D/S of Seepage Collection Pond)	Groundwater Monitoring Well Drillhole
GW96-2A	GW96-2A	10-Nov-96	East of Perimeter Embankment	Groundwater Monitoring Well Drillhole
GW96-2B	GW96-2B	10-Nov-96	East of Perimeter Embankment	Groundwater Monitoring Well Drillhole
GW96-3A	GW96-3A	4-Nov-96	Main Embankment (D/S of Seepage Collection Pond)	Groundwater Monitoring Well Drillhole
GW96-3B	GW96-3B	4-Nov-96	Main Embankment (D/S of Seepage Collection Pond)	Groundwater Monitoring Well Drillhole
GW96-4A	GW96-4A	18-Nov-96	Right Abutment of Final Main Embankment	Groundwater Monitoring Well Drillhole
GW96-4B	GW96-4B	18-Nov-96	Right Abutment of Final Main Embankment	Groundwater Monitoring Well Drillhole
GW96-5A	GW96-5A	21-Nov-96	Northwest side of Tailings Storage Facility	Groundwater Monitoring Well Drillhole
GW96-5B	GW96-5B	21-Nov-96	Northwest side of Tailings Storage Facility	Groundwater Monitoring Well Drillhole
GW96-9	GW96-9	21-Nov-96	Main Embankment (D/S of Final Toe)	Groundwater Monitoring Well Drillhole
96- 1	ET-96/08/19-1	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 2	ET-96/08/19-2	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 3	ET-96/08/19-3	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 4	ET-96/08/19-4	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 5	ET-96/08/19-5	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 6	ET-96/08/19-6	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 7	ET-96/08/19-7	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 8	ET-96/08/19-8	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 9	ET-96/08/19-9	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 10	ET-96/08/19-10	19-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 11	ET-96/08/20-1	20-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 12	ET-96/08/20-2	20-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 13	ET-96/08/20-3	20-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 14	ET-96/08/20-4	20-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 15	ET-96/08/20-5	20-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 16	ET-96/08/27-1	27-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 17	ET-96/08/27-2	27-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 18	ET-96/08/27-3	27-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 19	ET-96/08/28-1	28-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 20	ET-96/08/28-2	28-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 21	ET-96/08/28-3	28-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 22	ET-96/08/28-4	28-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 23	ET-96/08/28-5	28-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 24	ET-96/08/28-6	28-Aug-96	Upper Basin Liner	UBL Exploration Trench
96- 25	ET-96/08/28-7	28-Aug-96	Upper Basin Liner	UBL Exploration Trench



MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
PROJECT LOCATION AND ACCESS PLAN



Apr. 18, 1997
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LOCATION MAP

FIGURE 1.1

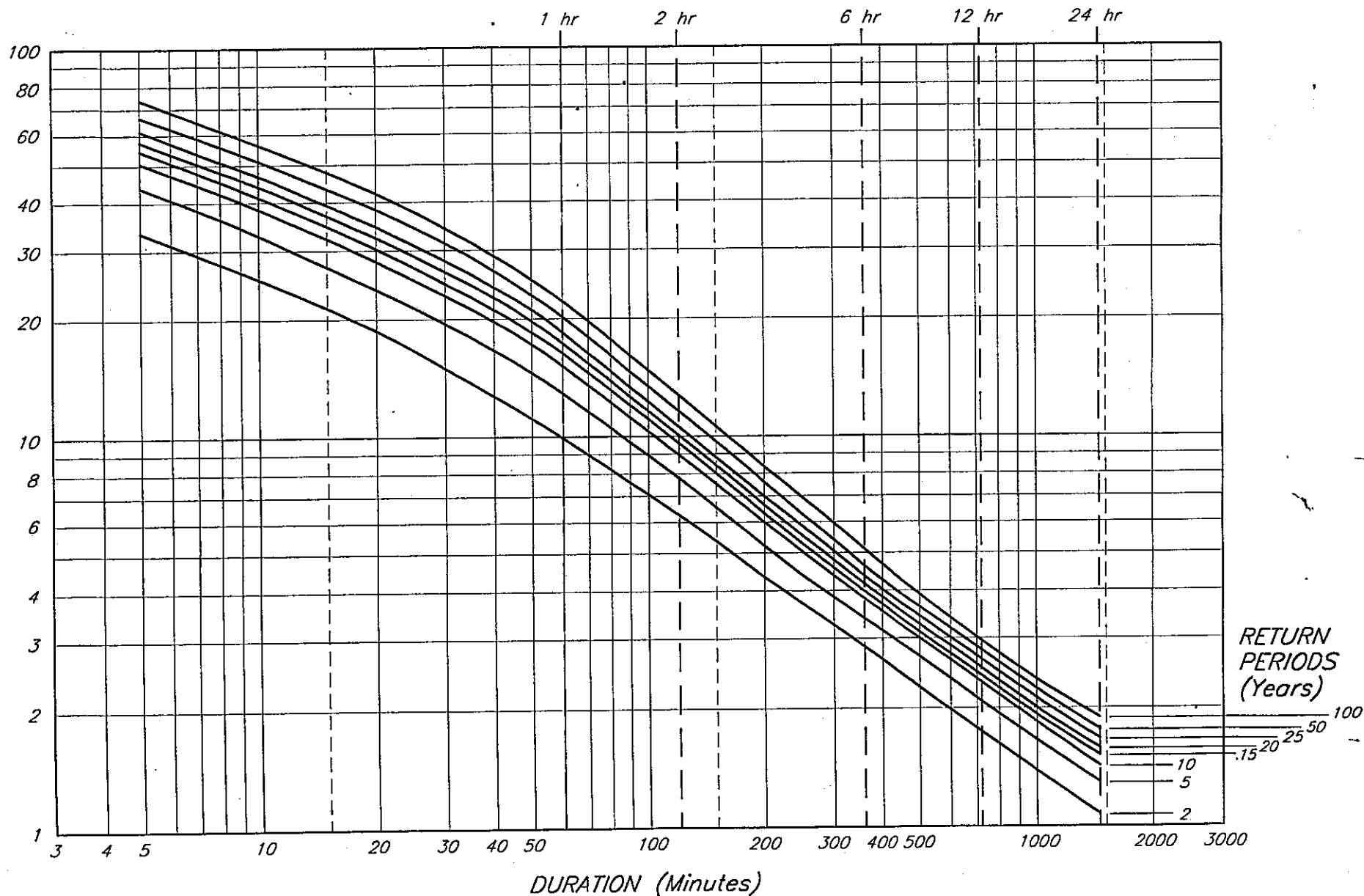
MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

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

Apr. 22, 1997
 KNIGHT PIESOLD LTD.
 CONSULTING ENGINEERS

(mm/hr) YLISNELNI

FIGURE 2.1





MOUNT POLLEY MINING CORPORATION **TAILINGS GRADATION LIMITS**

Project : 1627
Date : April 15, 1997

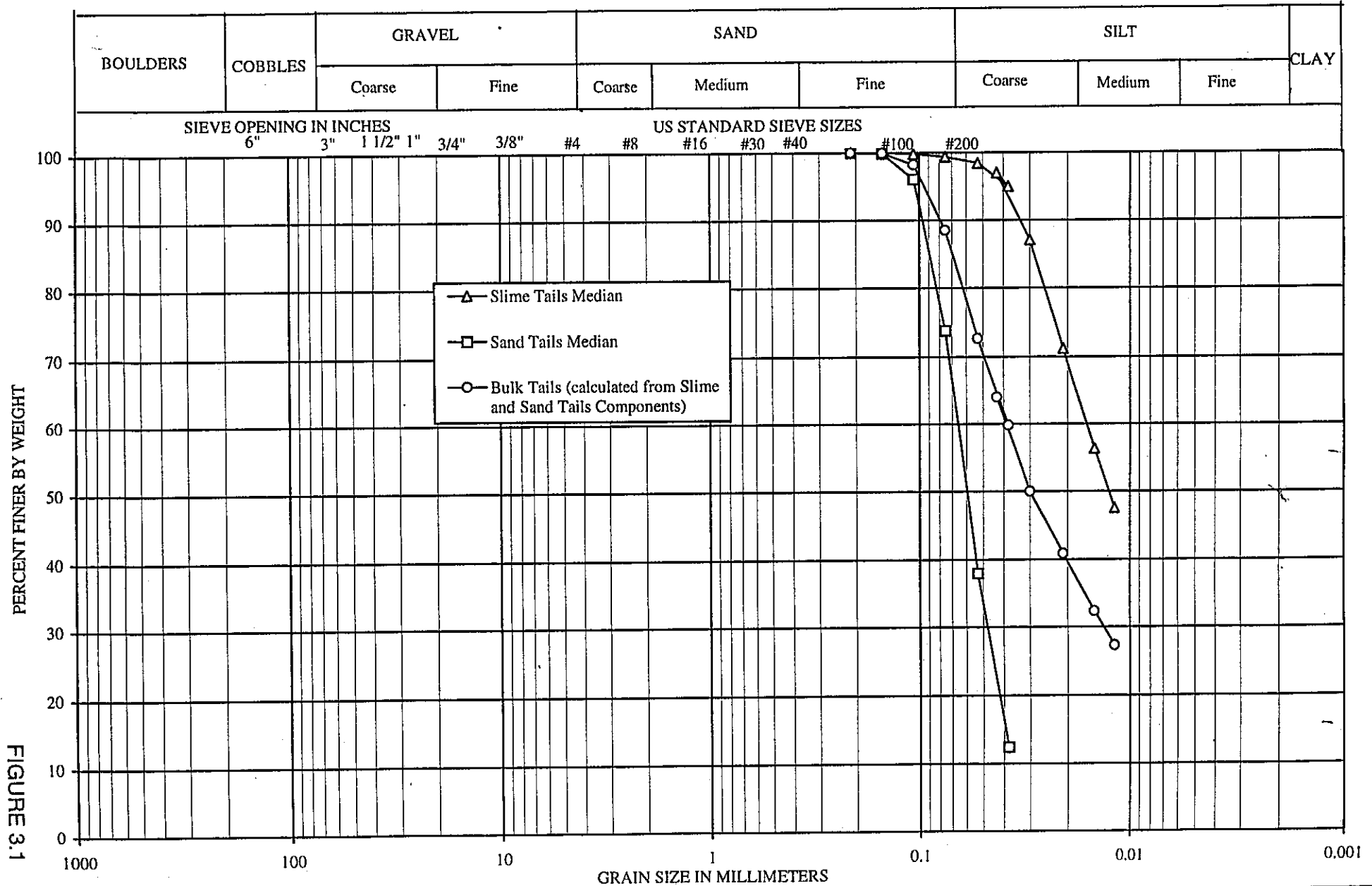
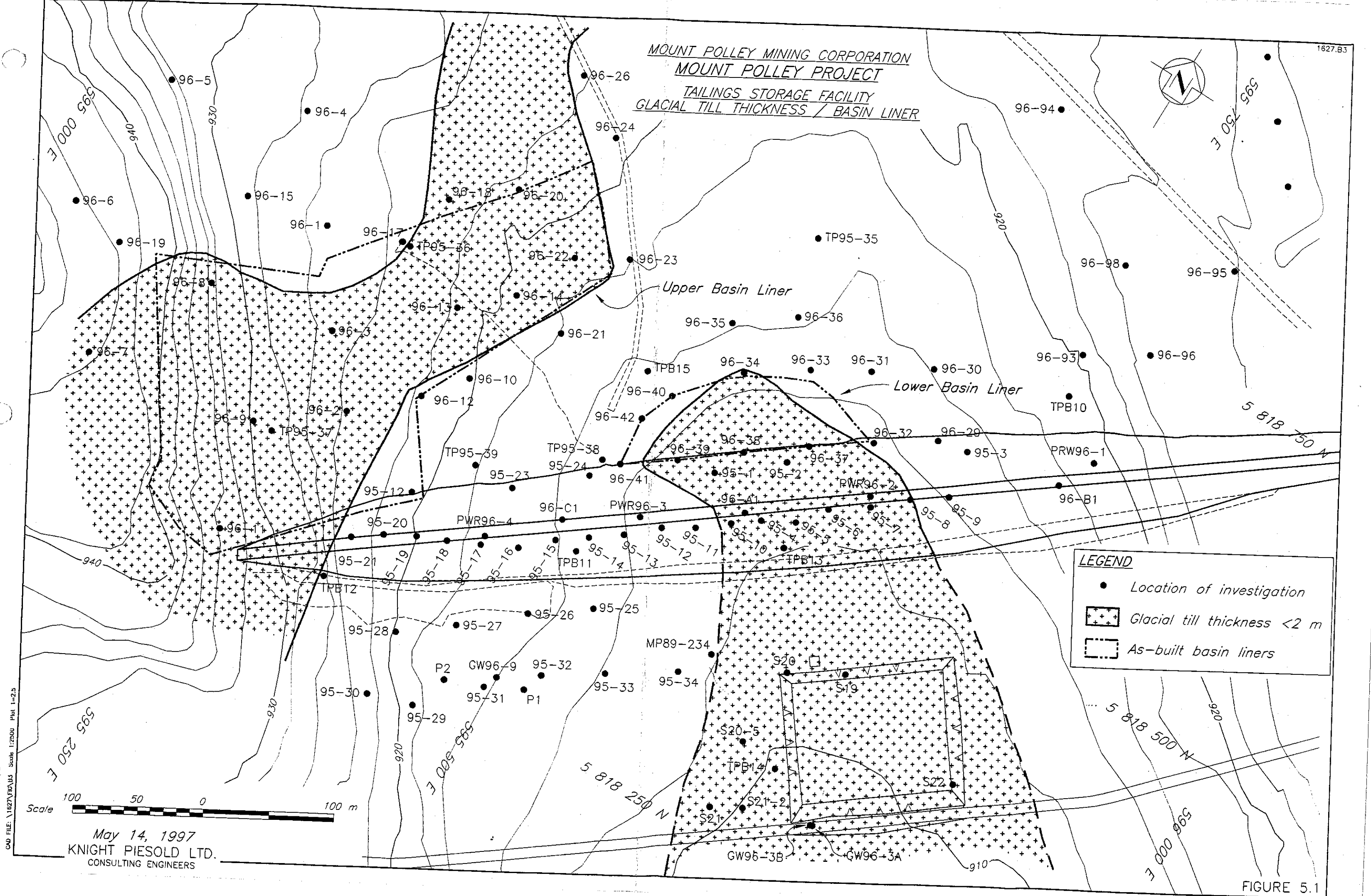


FIGURE 3.1





CAD FILE: \1627\FIG5 Scale 1:2500 Plat 1-2-3

May 14, 1997
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 5.1

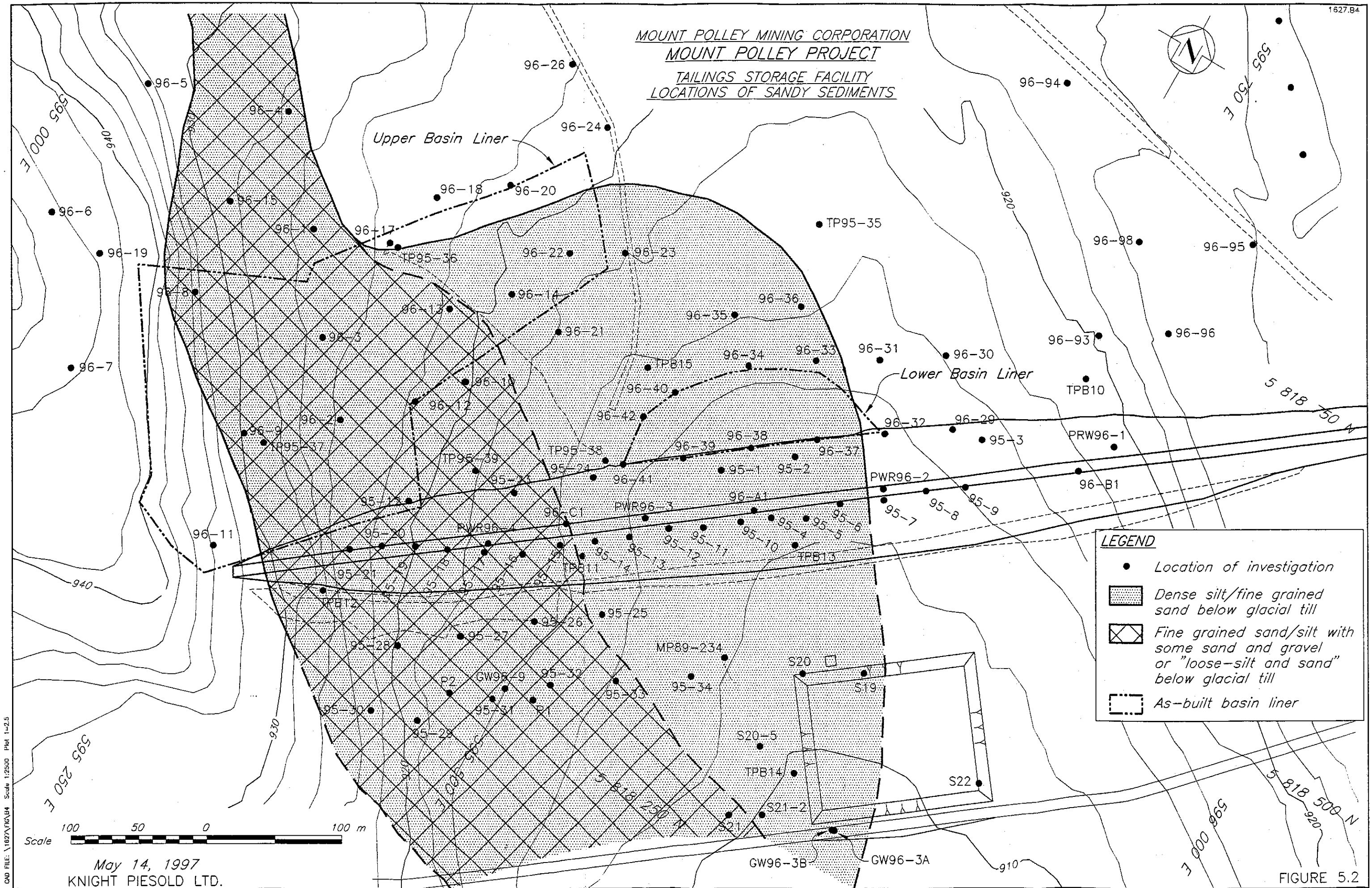
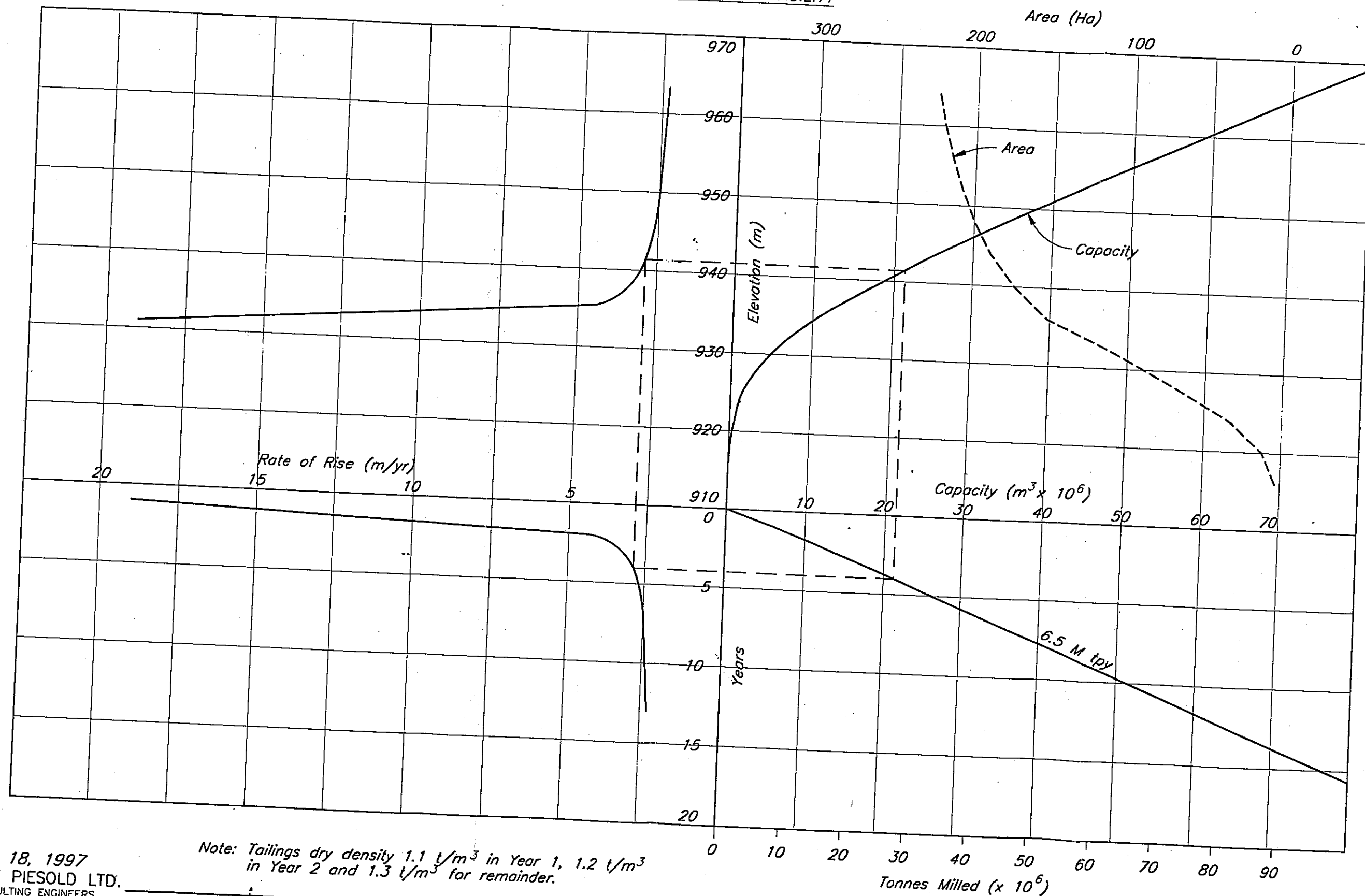


FIGURE 5.2

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
DEPTH/AREA/CAPACITY/FILLING RATE
FOR TAILINGS STORAGE FACILITY

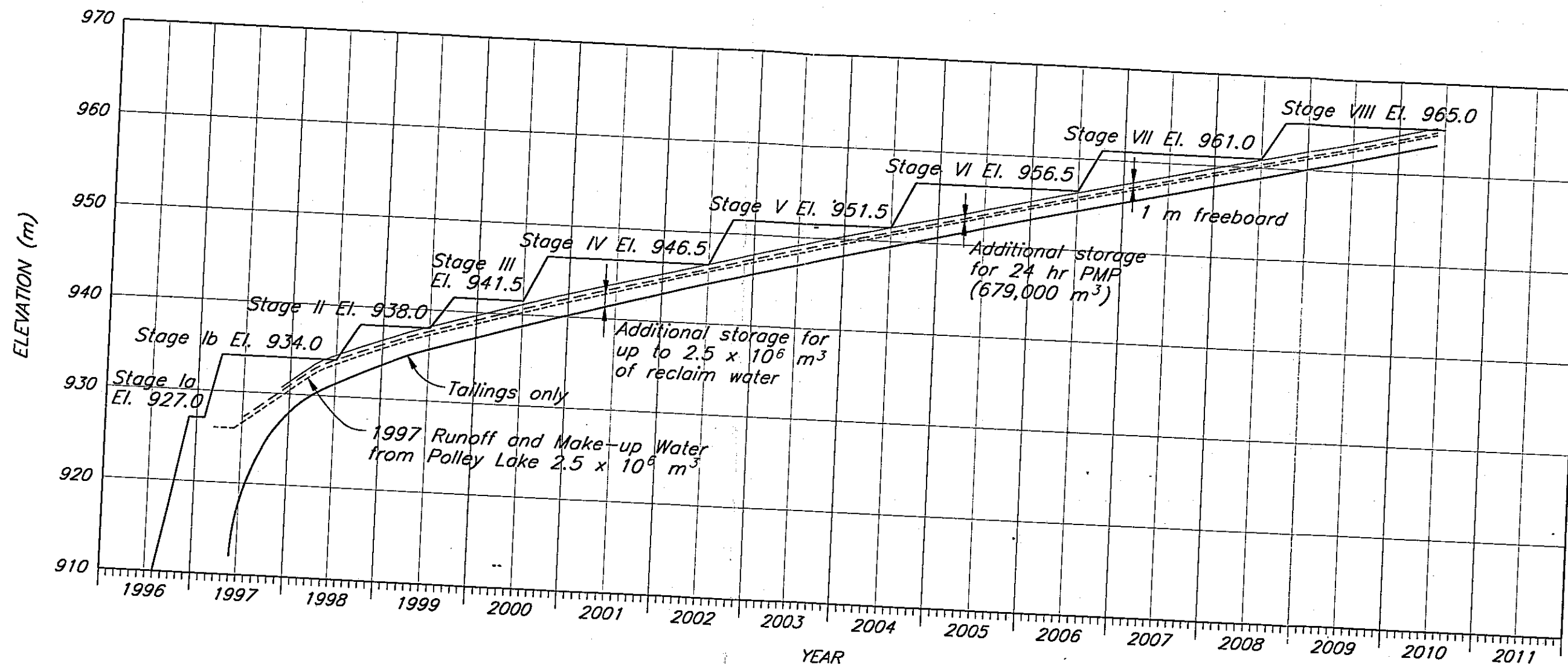
1627.B10



Note: Tailings dry density 1.1 t/m³ in Year 1, 1.2 t/m³ in Year 2 and 1.3 t/m³ for remainder.

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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS AREA FILLING SCHEDULE AND STAGED CONSTRUCTION
FOR 6,500,000 tpy THROUGHPUT



NOTES

1. All construction periods shown are for July through September, except Stage Ib, which is February through March.
2. Filling schedule based on tailings dry density of 1.1 t/m³ in Year 1, 1.2 t/m³ in Year 2 and 1.3 t/m³ for remainder.
3. Embankment crest elevations for each of the staged expansions will be determined annually based on tailings production, in-situ density and water management requirements.

June 3, 1997

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

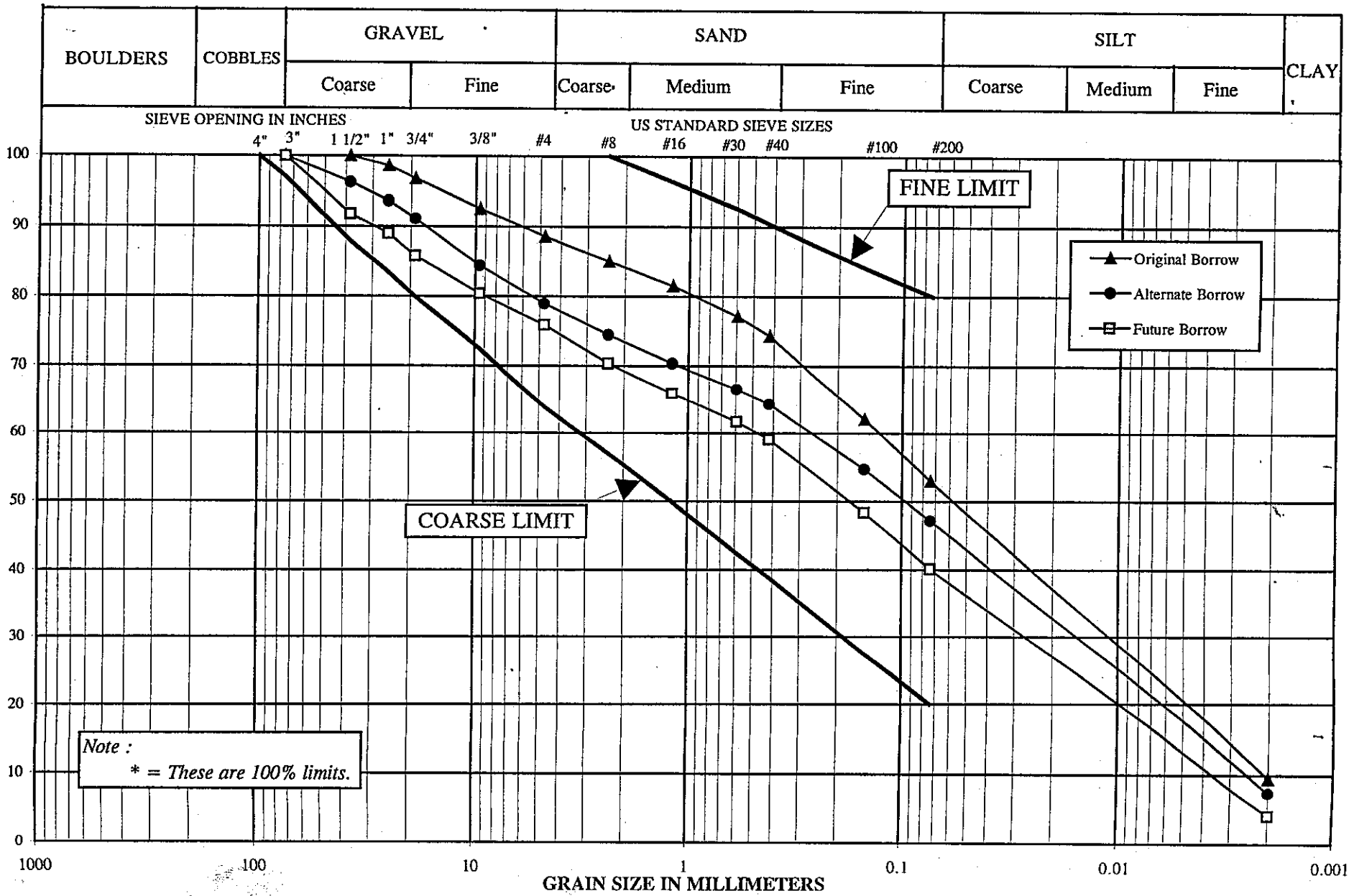
MOUNT POLLEY MINING CORPORATION
TAILINGS STORAGE FACILITY
MEDIAN GRADATION LIMITS - ZONE S CONTROL SAMPLES

Project : 1627
 Date : March 21, 1997

KNIGHT PIESOLD LTD.
 CONSULTING ENGINEERS

PERCENT FINER BY WEIGHT

FIGURE 6.3



Moisture Content vs. Undrained Shear Strength for Glacial Till

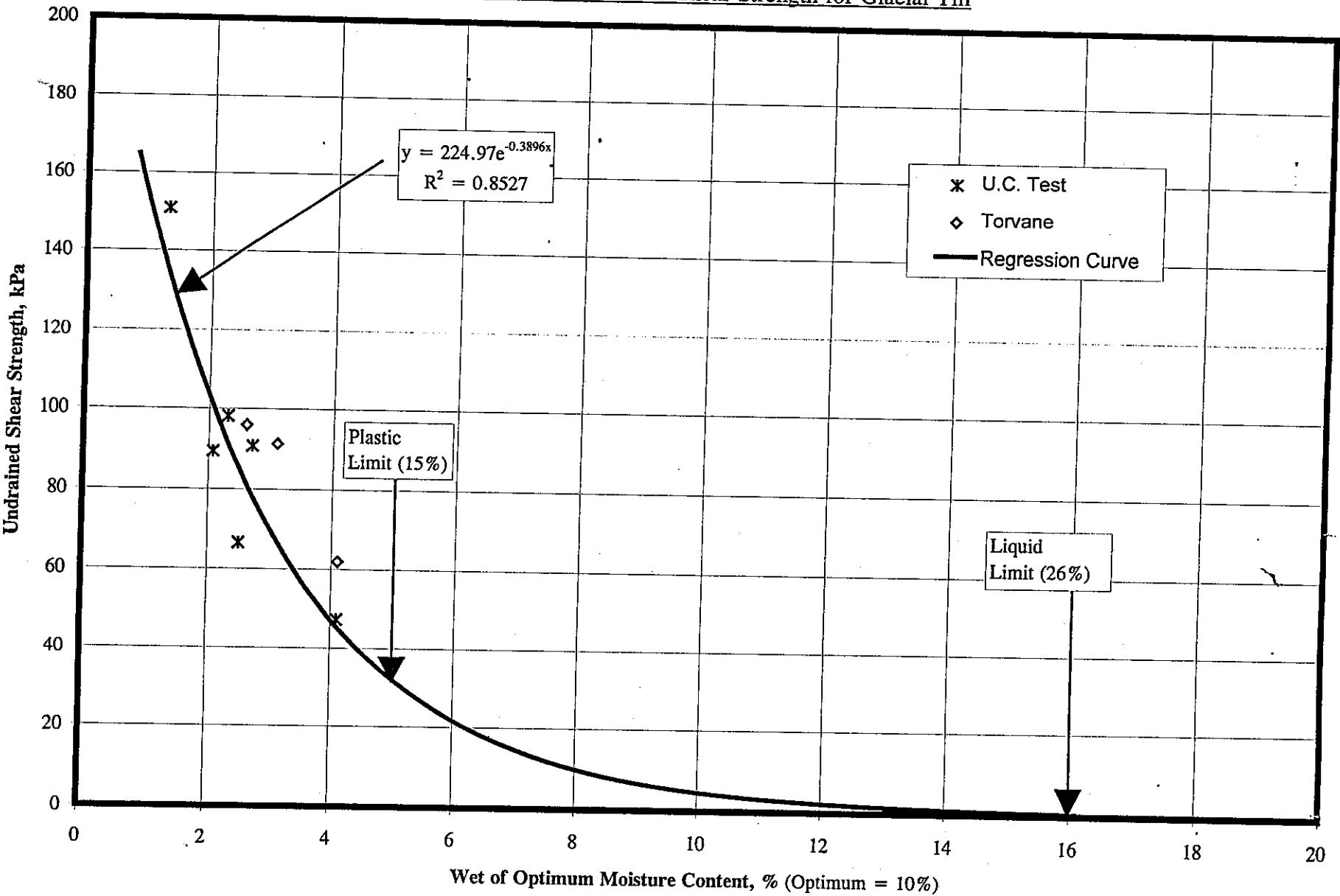
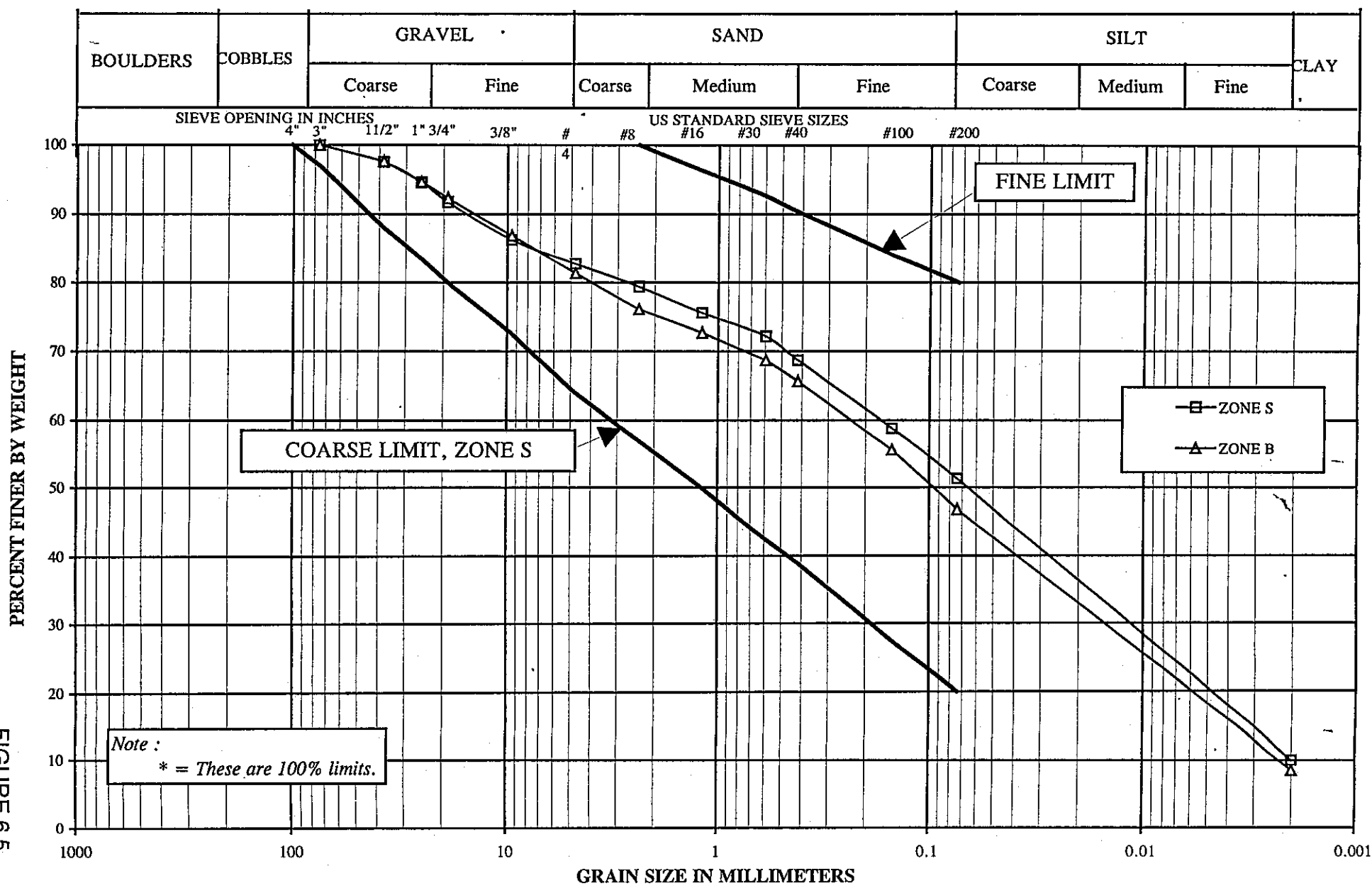


FIGURE 6.4

Project : 1627
Date : April 18, 1997



MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT SETTLEMENT ANALYSES

Apr. 21, 1997
 KNIGHT PIESOLD LTD.
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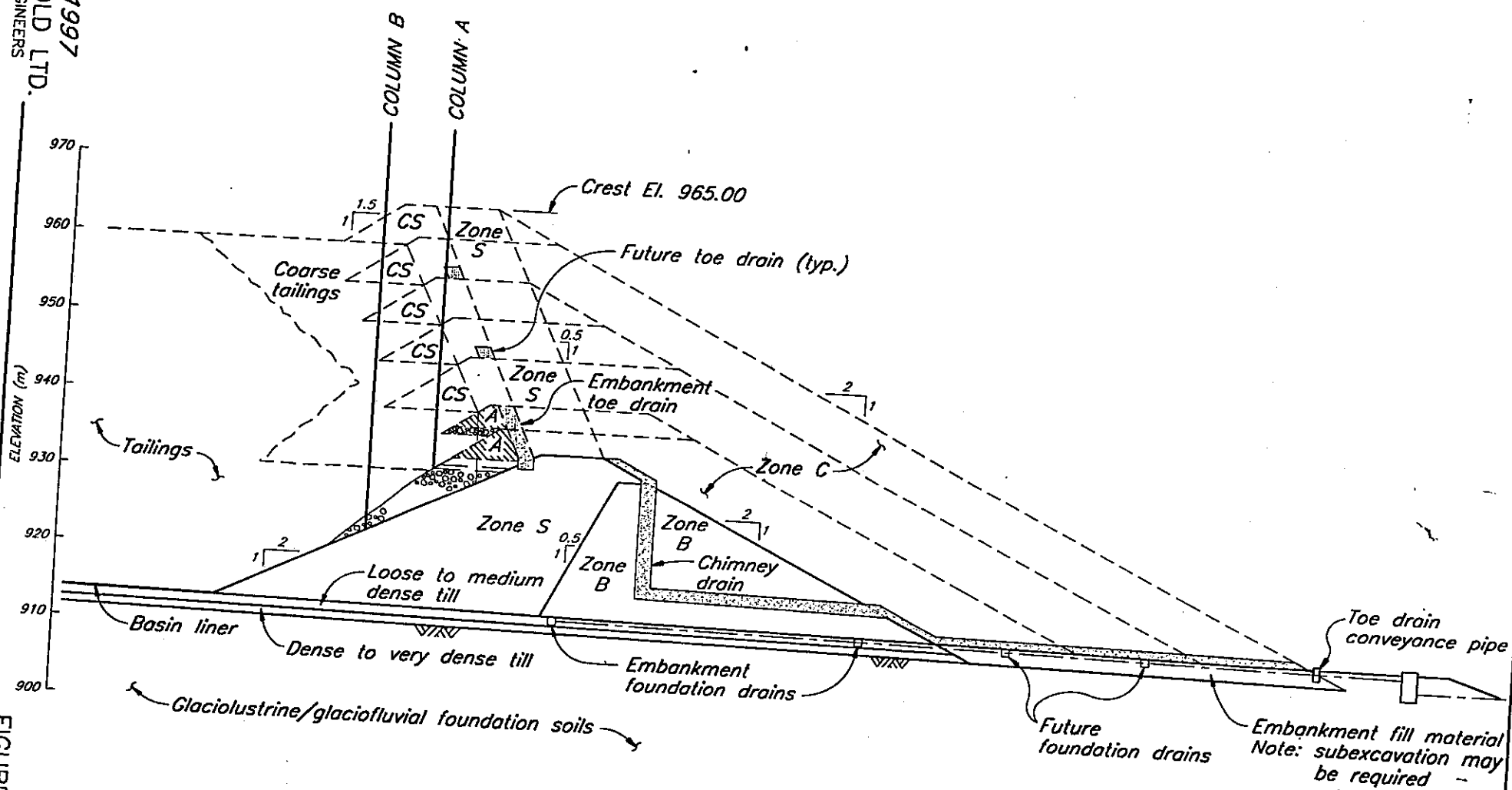
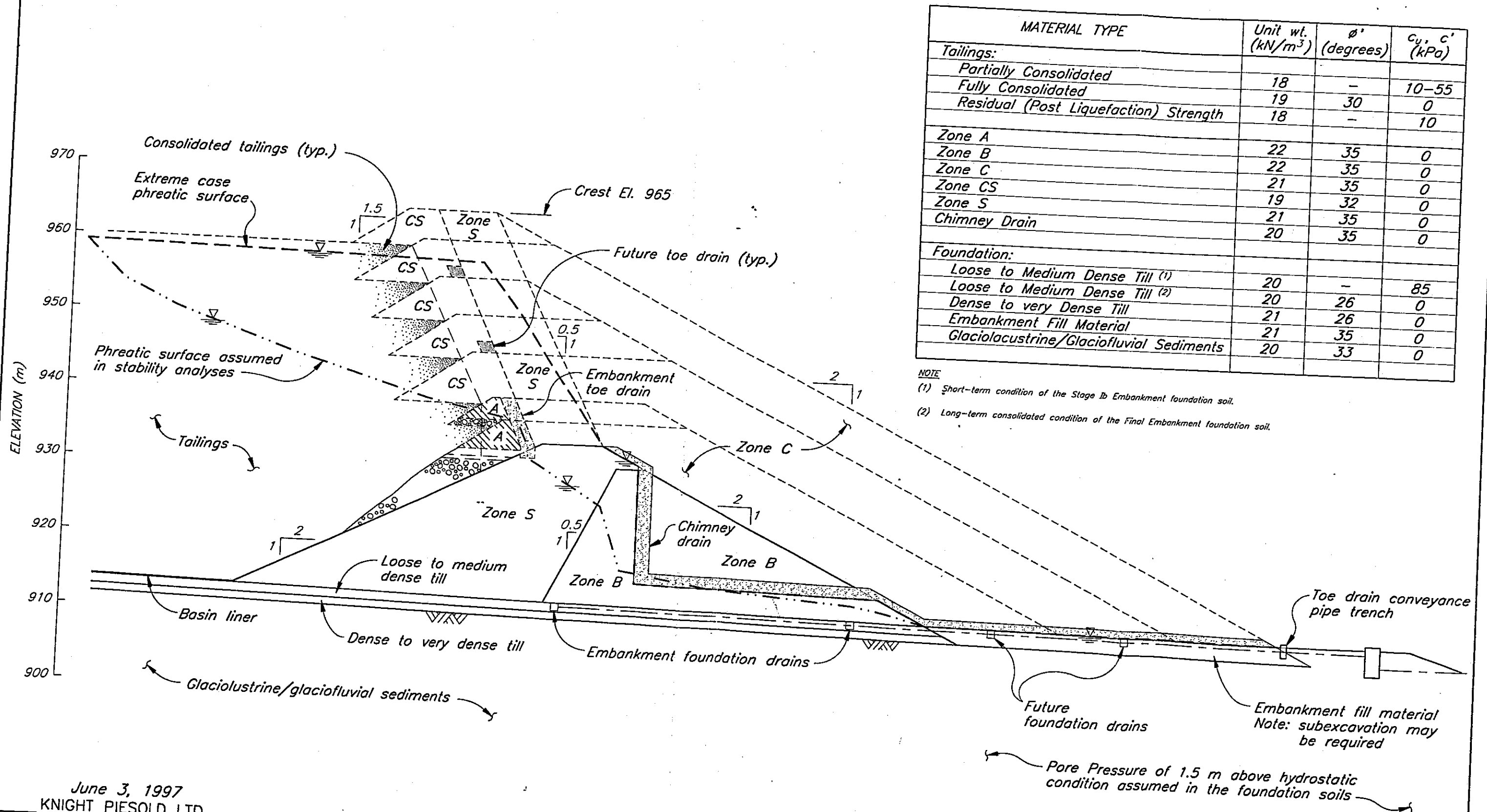


FIGURE 6.6

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT STABILITY ANALYSES
GEOMETRY AND MATERIAL PARAMETERS

1627.B7



NOTE

- (1) Short-term condition of the Stage 1b Embankment foundation soil.
 (2) Long-term consolidated condition of the Final Embankment foundation soil.

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT STABILITY ANALYSES
STATIC STABILITY DURING OPERATIONS

June 3, 1997
 KNIGHT PIESOLD LTD.
 CONSULTING ENGINEERS

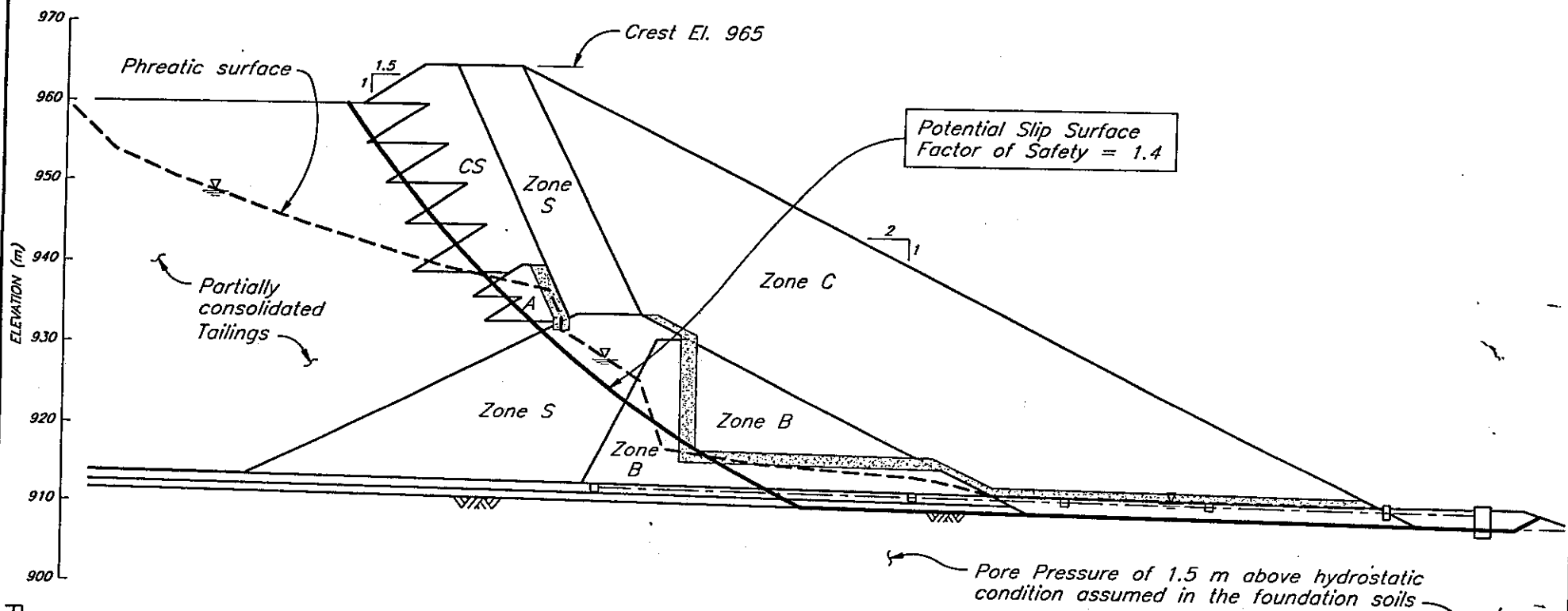
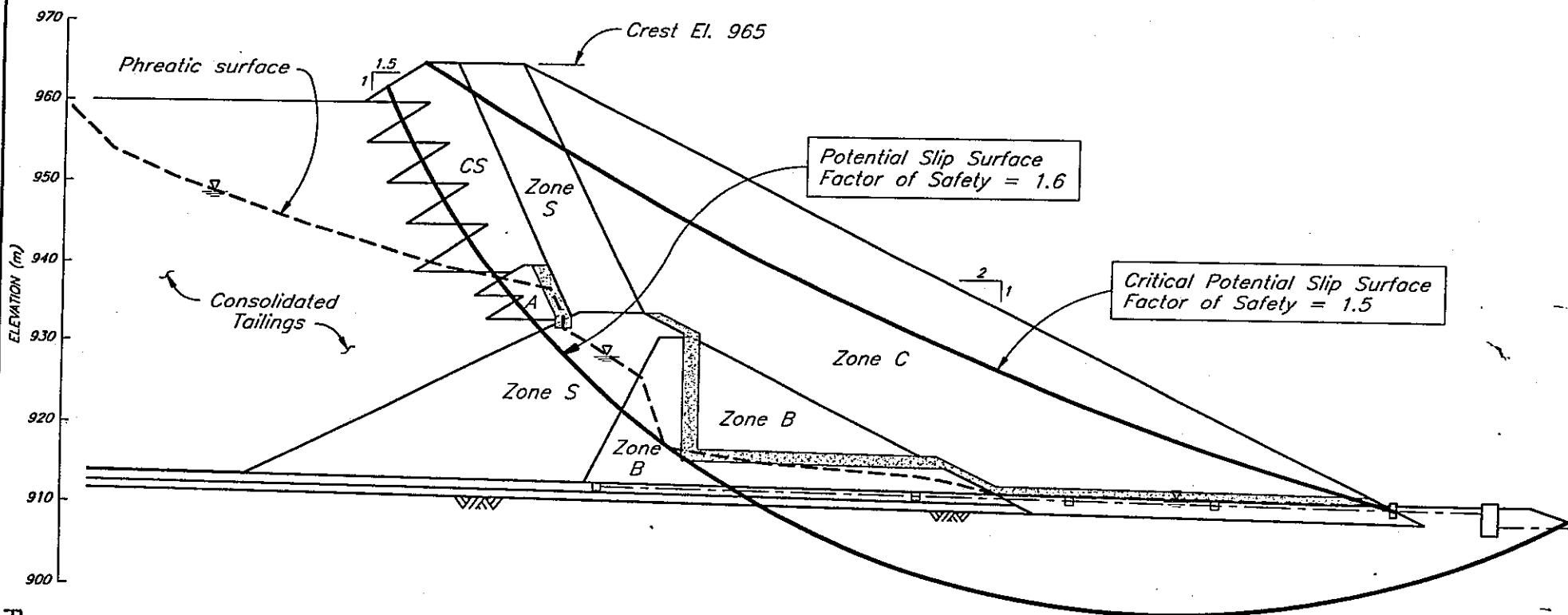


FIGURE 6.8

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT STABILITY ANALYSES
STATIC STABILITY POST-CLOSURE

May 7, 1997
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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT STABILITY SENSITIVITY ANALYSIS

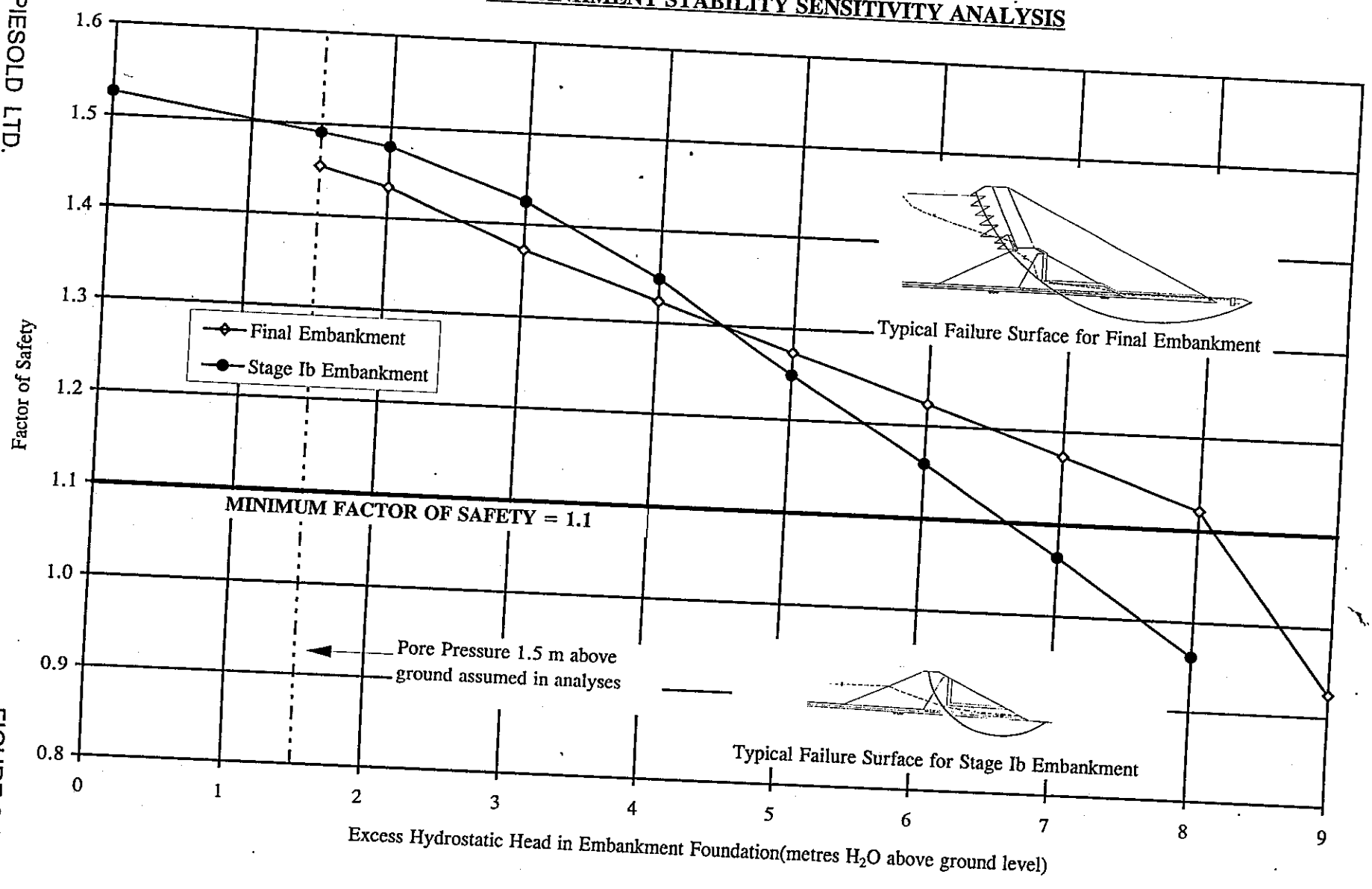


FIGURE 6.10

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT STABILITY ANALYSES
PSEUDOSTATIC STABILITY DURING OPERATIONS

May 16, 1997
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

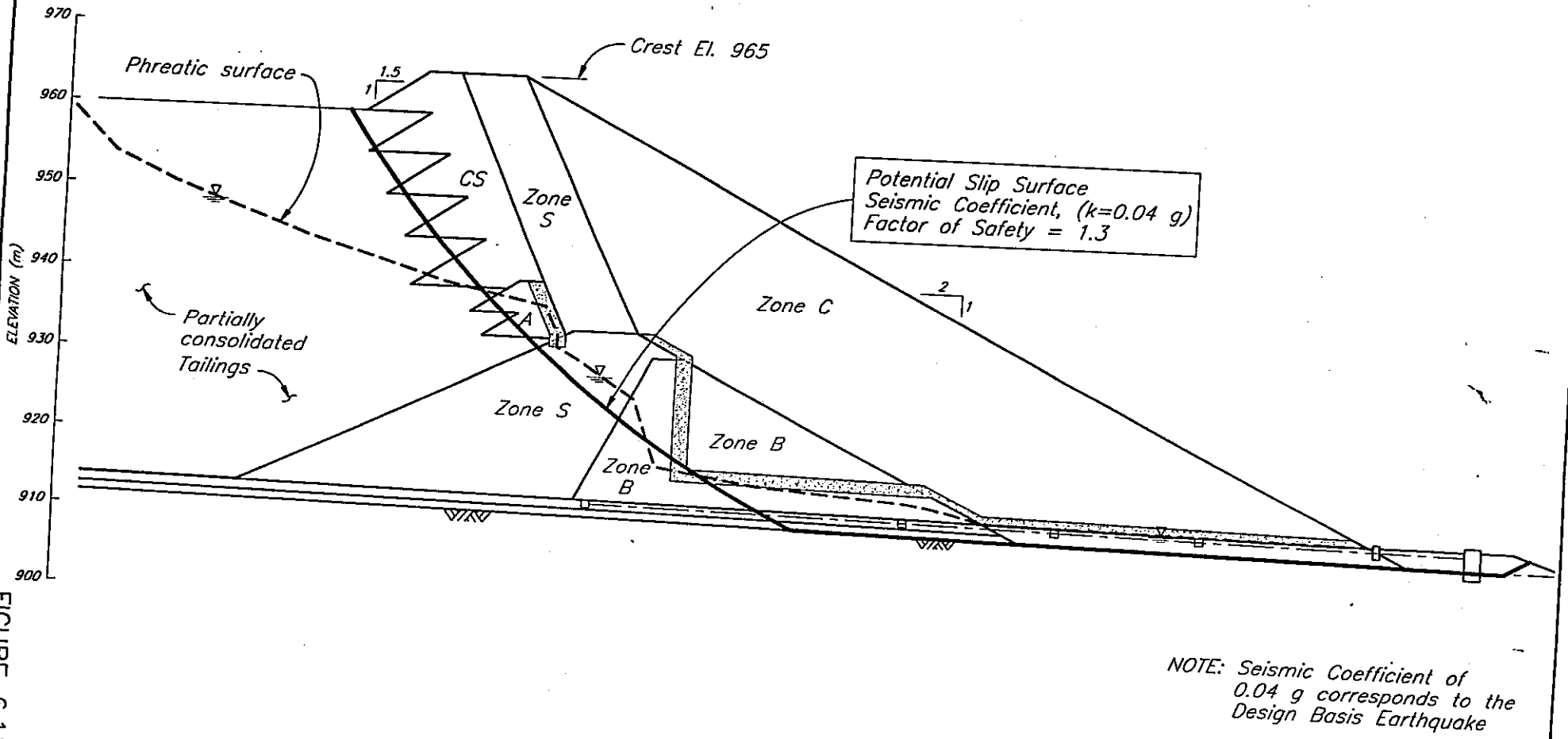
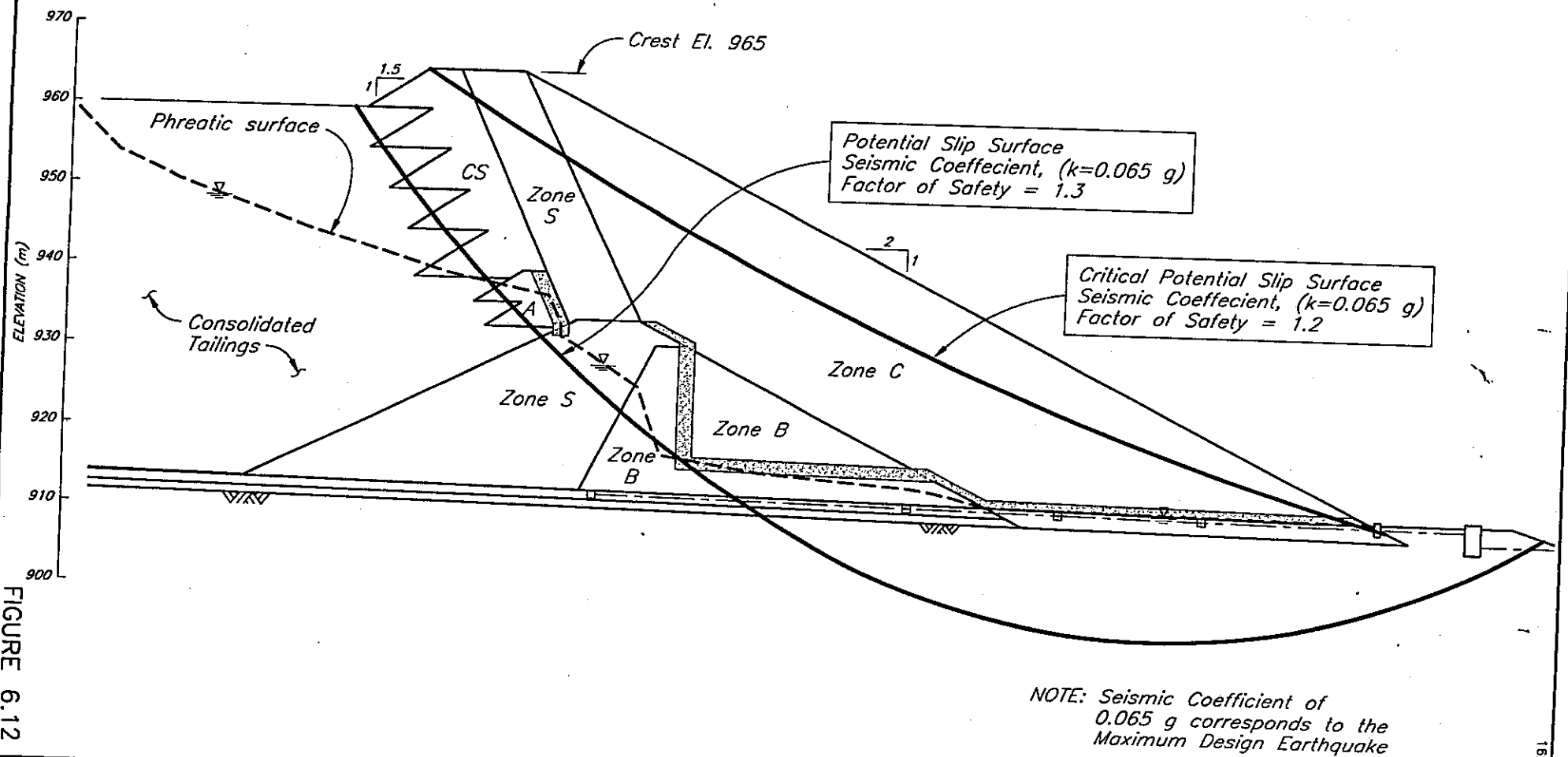


FIGURE 6.11

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT STABILITY ANALYSES
PSEUDOSTATIC STABILITY POST-CLOSURE

May 16, 1997
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS



MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT STABILITY ANALYSES
TAILINGS RESIDUAL STRENGTH (POST-LIQUEFACTION)

May 16, 1997
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CONSULTING ENGINEERS

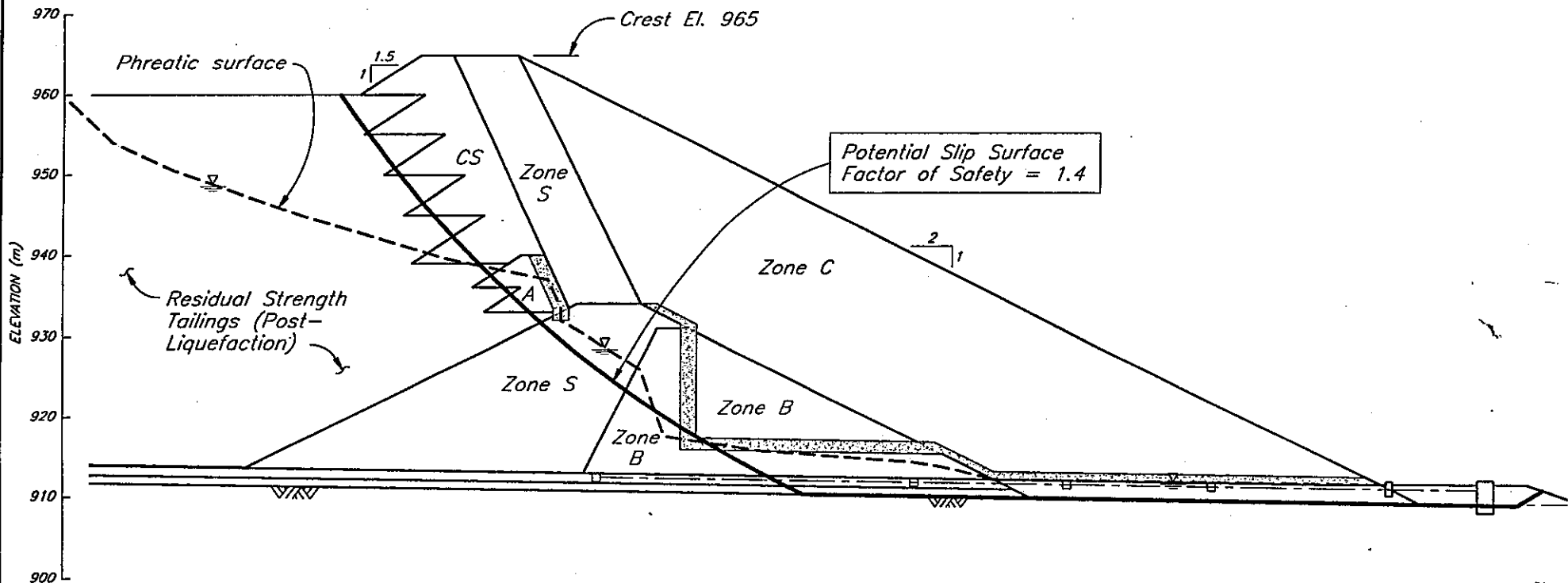
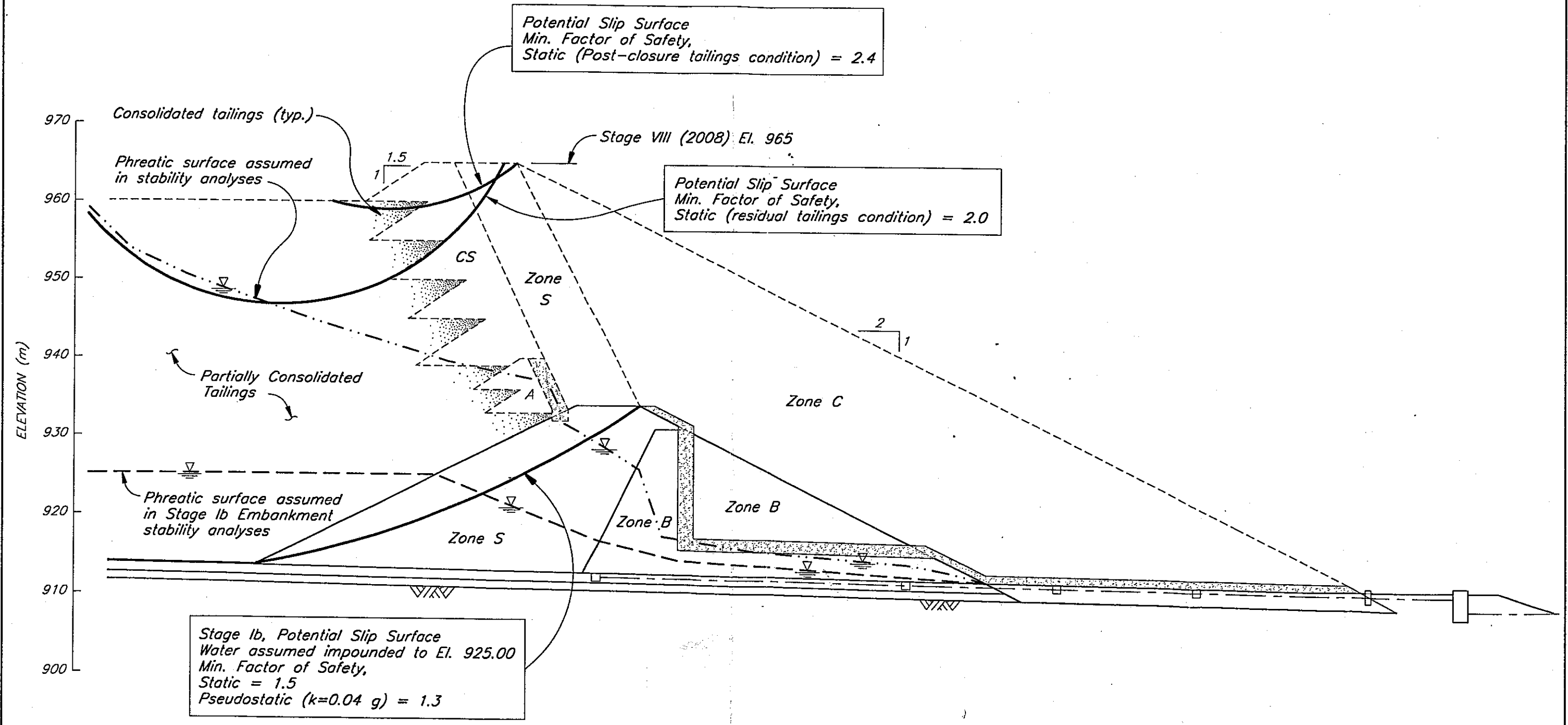


FIGURE 6.13

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
UPSTREAM EMBANKMENT STABILITY ANALYSES



C:\D:\FILE\1627\FIG\B2 1:500 Plot 1-0.5

FIGURE 6.14

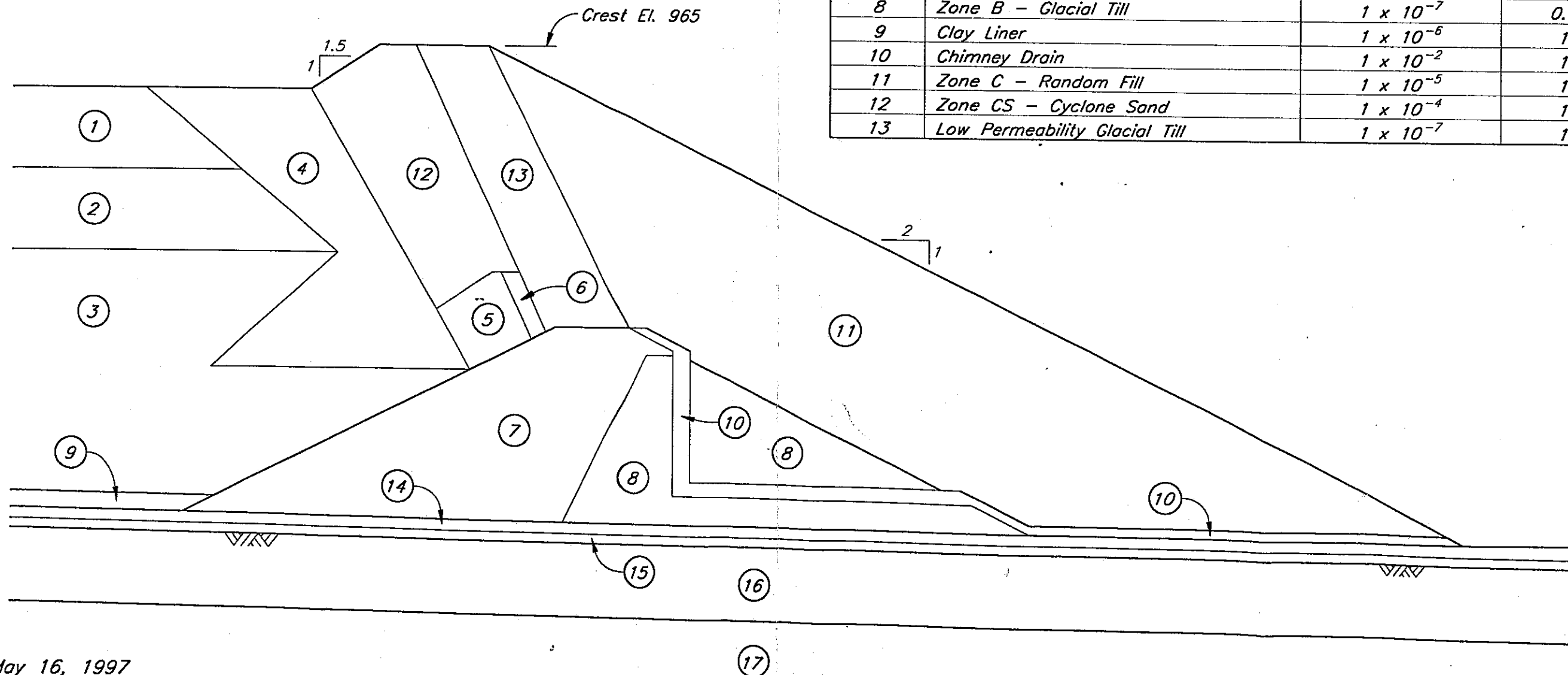
MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
EMBANKMENT SEEPAGE ANALYSES
SUMMARY OF MATERIAL PARAMETERS

FOUNDATION FILL

ZONE NUMBER	ZONE	DEPTH (m)	HYDRAULIC CONDUCTIVITY (cm/s)	CONDUCTIVITY RATIO
14	Loose to Medium Dense Till	0 - 0.6	1×10^{-7}	1
14	Loose to Medium Dense Till	0.6 - 1.2	1×10^{-7}	1
15	Dense to Very Dense Till	1.2 - 2.2	1×10^{-6}	1
16	Silt, Sand	2.2 - 10.2	1×10^{-4}	1
16	Silt	10.2 - 12.7	1×10^{-4}	1
17	Basal Till	>12.7	1×10^{-6}	1

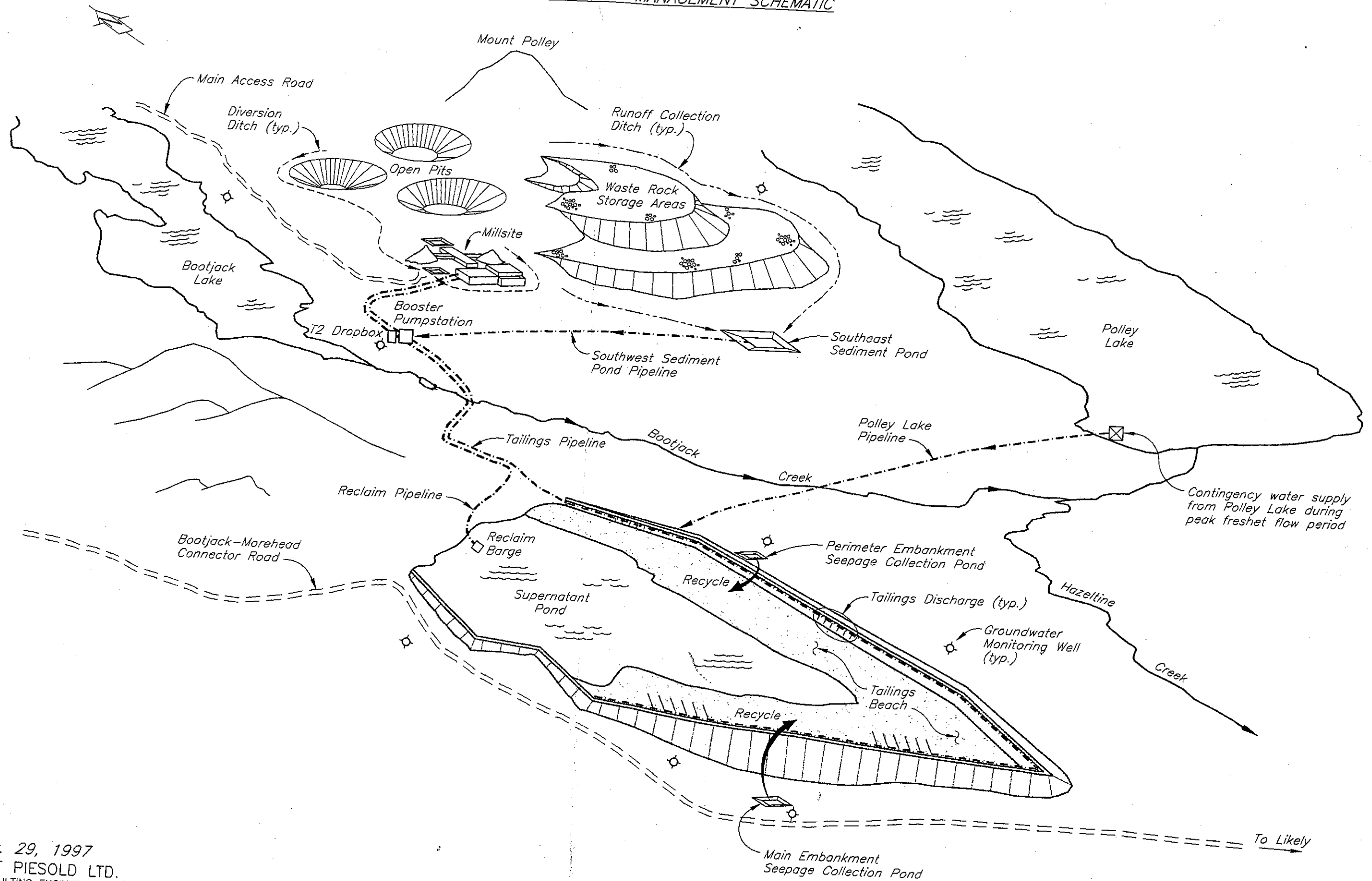
EMBANKMENT FILL

ZONE NUMBER	ZONE	HYDRAULIC CONDUCTIVITY (cm/s)	CONDUCTIVITY RATIO
1	Tailings El. >946 m	1×10^{-5}	1
2	Tailings El. 934-946 m	5×10^{-6}	1
3	Tailings El. <934 m	1×10^{-6}	1
4	Coarse Tailings	5×10^{-5}	0.2
5	Zone A - Glacial Till	1×10^{-6}	1
6	Vertical Filter Drain	1×10^{-4}	1
7	Zone S - Low Permeability Glacial Till	1×10^{-7}	0.1
8	Zone B - Glacial Till	1×10^{-7}	0.1
9	Clay Liner	1×10^{-6}	1
10	Chimney Drain	1×10^{-2}	1
11	Zone C - Random Fill	1×10^{-5}	1
12	Zone CS - Cyclone Sand	1×10^{-4}	1
13	Low Permeability Glacial Till	1×10^{-7}	1



MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
SITE WATER MANAGEMENT SCHEMATIC

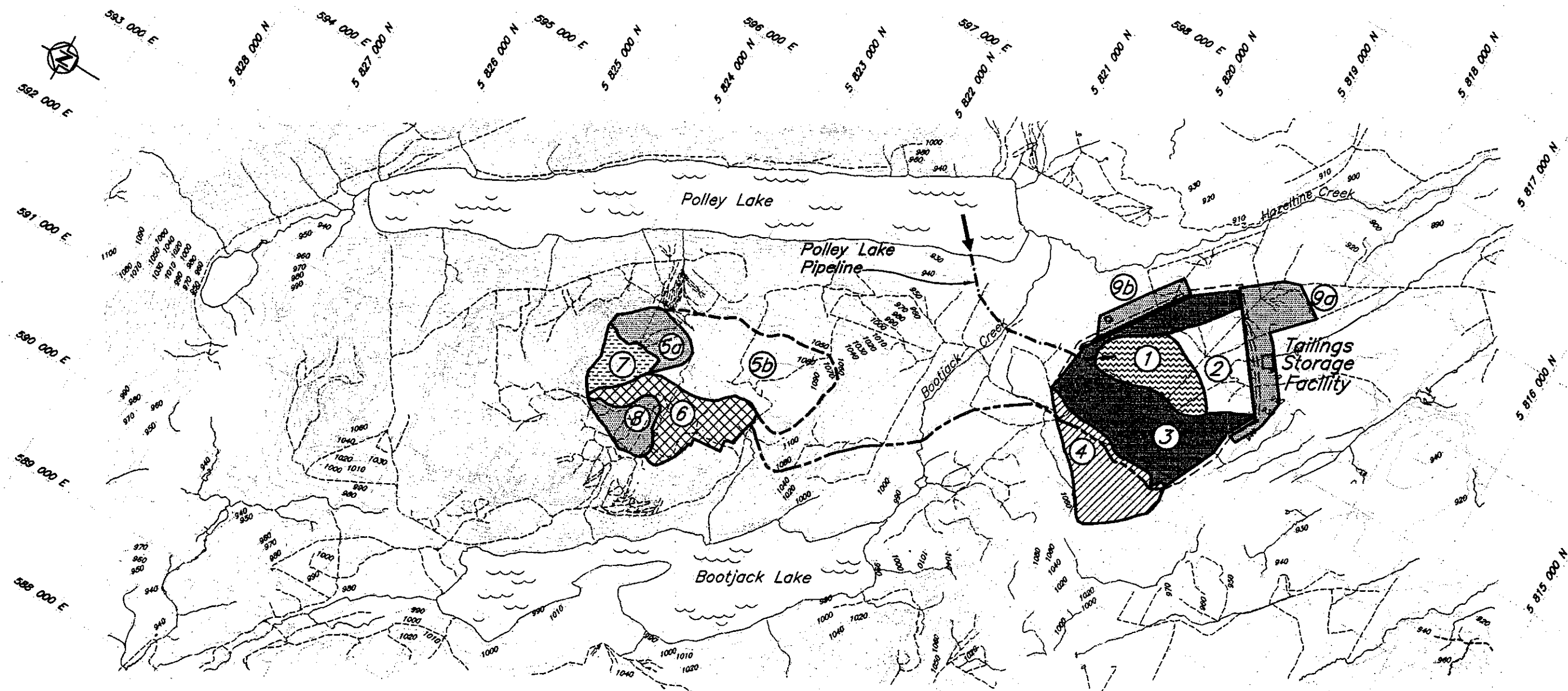
1627.B11



DAO FILE: 1627.POL B11 Plot scale 1=2 STD. 1

Apr. 29, 1997
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MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
SCHEMATIC OVERVIEW OF WATER BALANCE COMPONENTS
YEAR 1

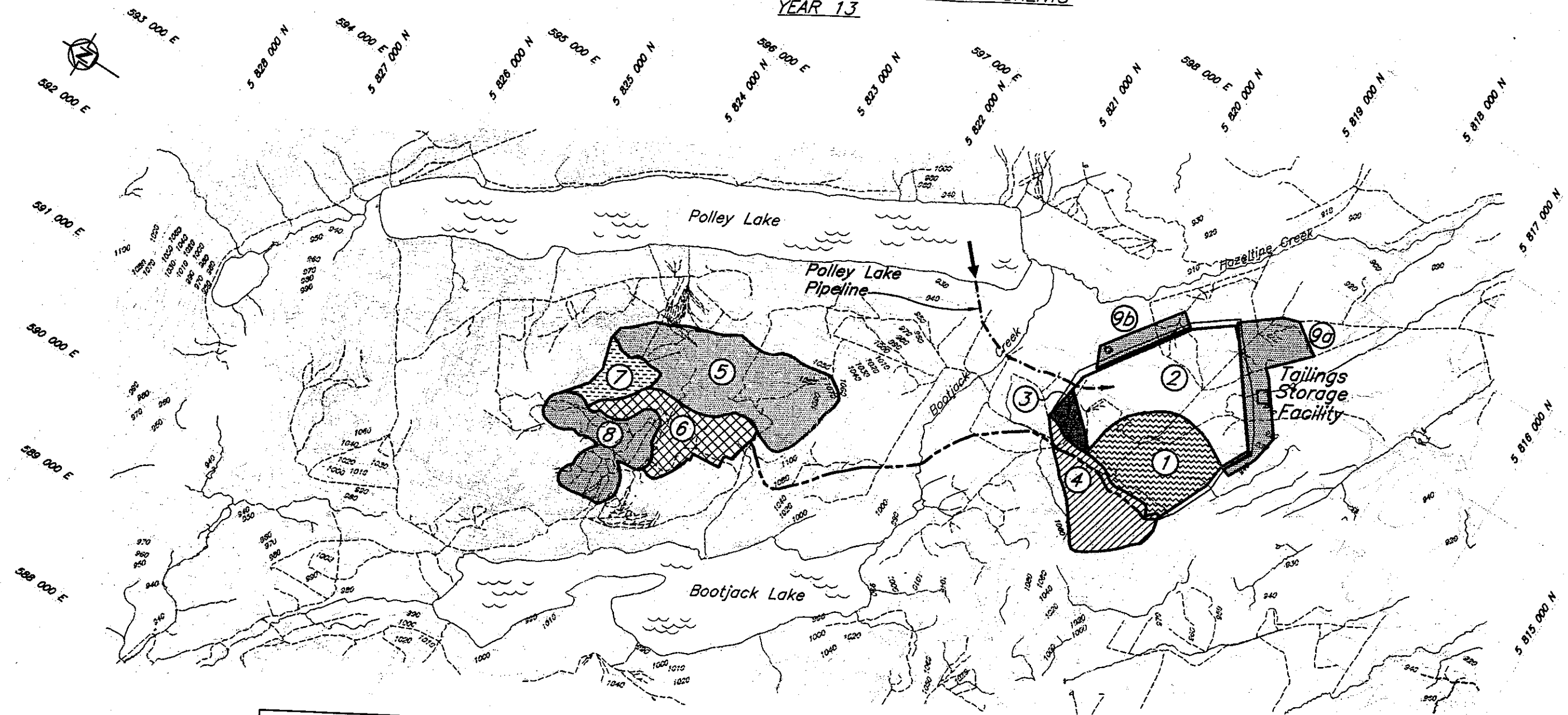


CATCHMENT AREAS IN WATER BALANCE FOR YEAR 1		
Catchment Area	Area No.	Area (ha)
Tailings Facility :		
Tailings Pond	1	48.6
Beach	2	50.3
Unprepared area	3	134.1
Upstream undiverted area	4	60.9
Downstream area	9a	47.9
Downstream area	9b	15.2
Waste Dump :		
Disturbed area	5a	27.2
Undisturbed area	5b	106.8
Mill Site	6	58.9
Area north of Mill Site	7	22.6
Open Pit	8	17.6

Scale 1000 500 0 1000 2000 Metres

1627.B5

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
SCHEMATIC OVERVIEW OF WATER BALANCE COMPONENTS
YEAR 13



CATCHMENT AREAS USED IN WATER BALANCE FOR YEAR 13		
Catchment Area	Area No.	Area (ha)
Tailings Facility :		
Tailings Pond	1	101.0
Beach	2	122.0
Unprepared area	3	10.0
Upstream undiverted area	4	60.9
Downstream area	9a	47.9
Downstream area	9b	15.2
Waste Dump	5	134.0
Mill Site	6	58.9
Area north of Mill Site	7	24.3
Open Pit	8	64.7



MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY
SCHEMATIC ILLUSTRATION OF WATER BALANCE - YEAR 1 & 13
Average Year Precipitation

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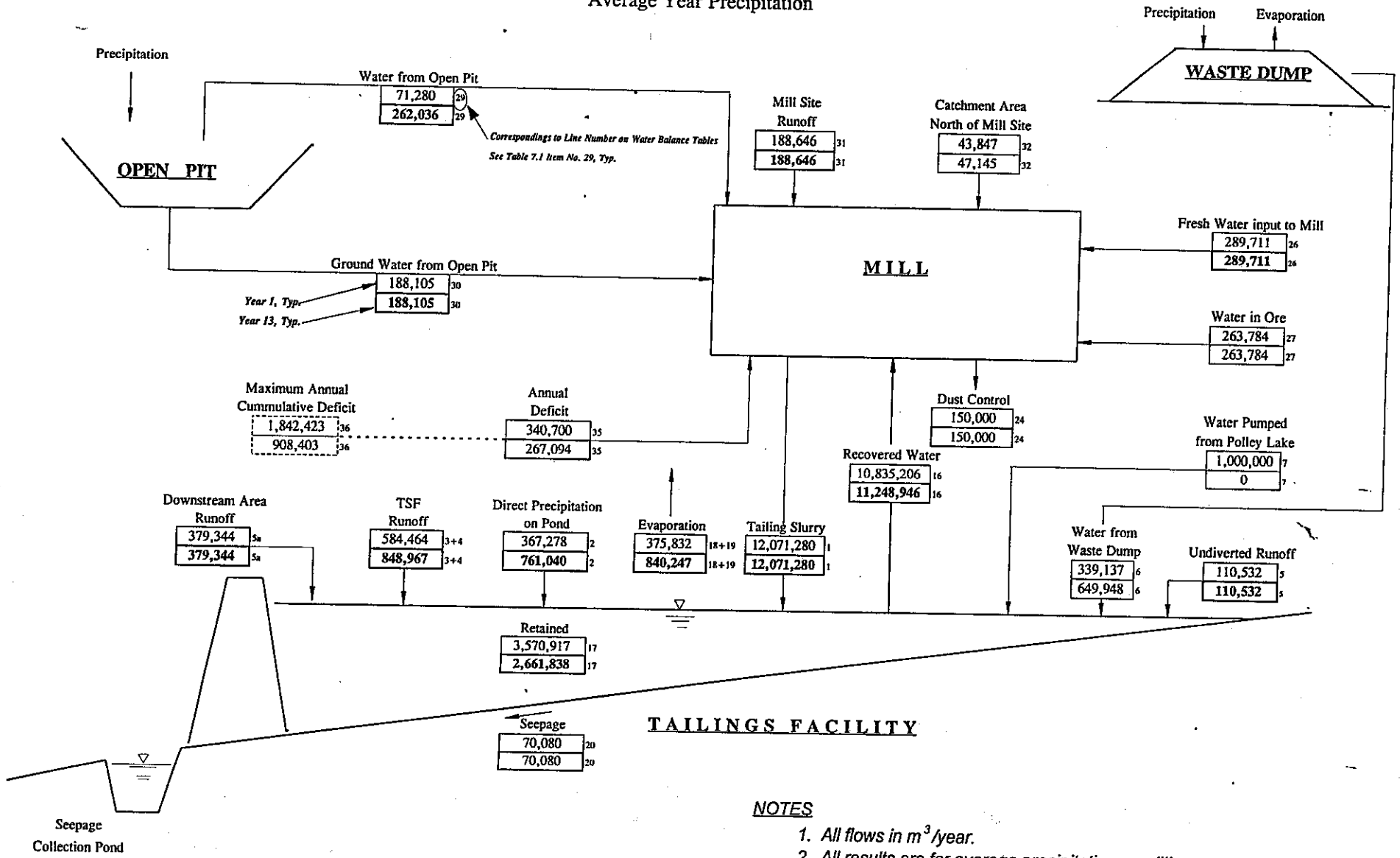


FIGURE 7.4

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
MAIN EMBANKMENT FOUNDATION DRAIN FLOWS

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

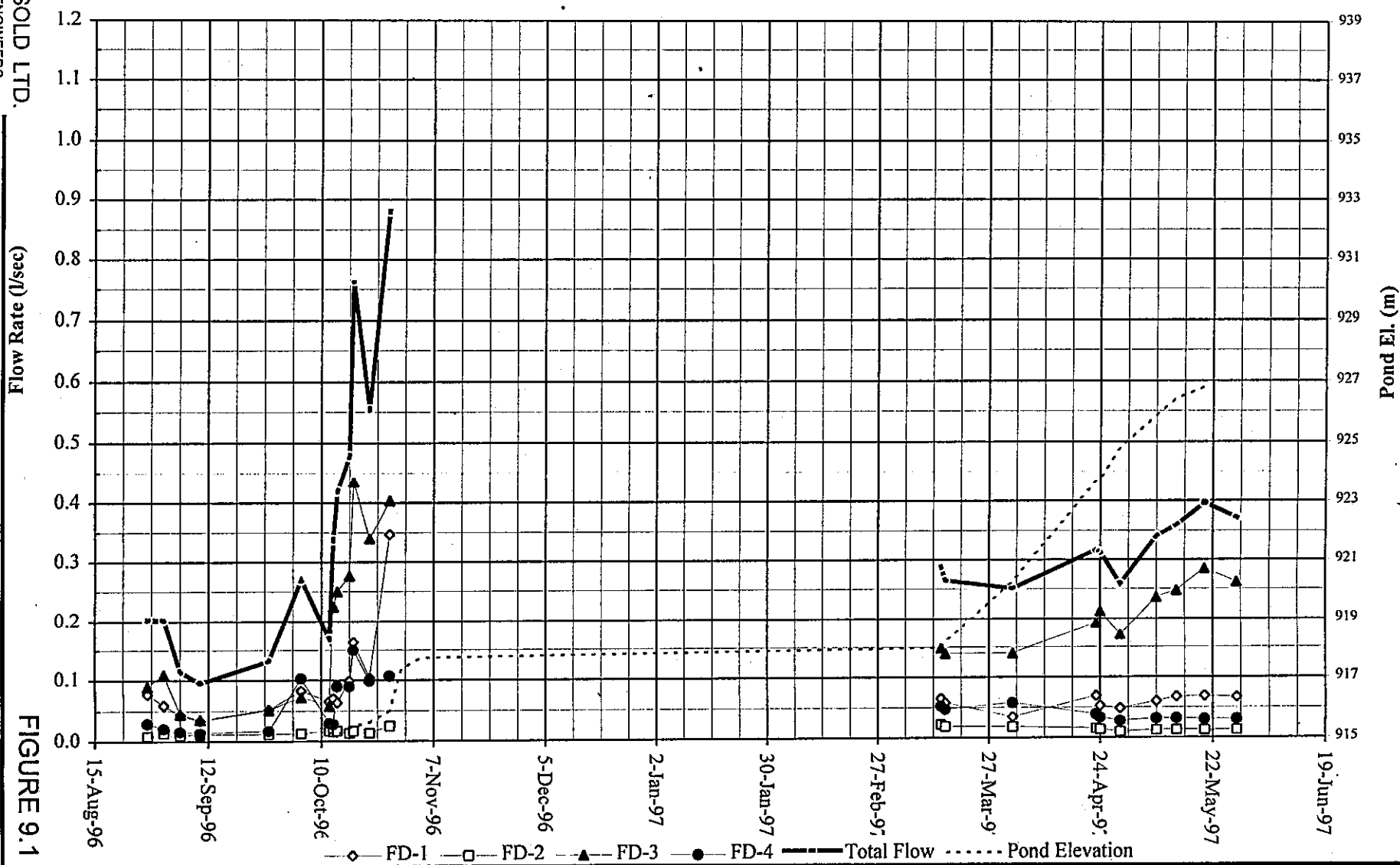
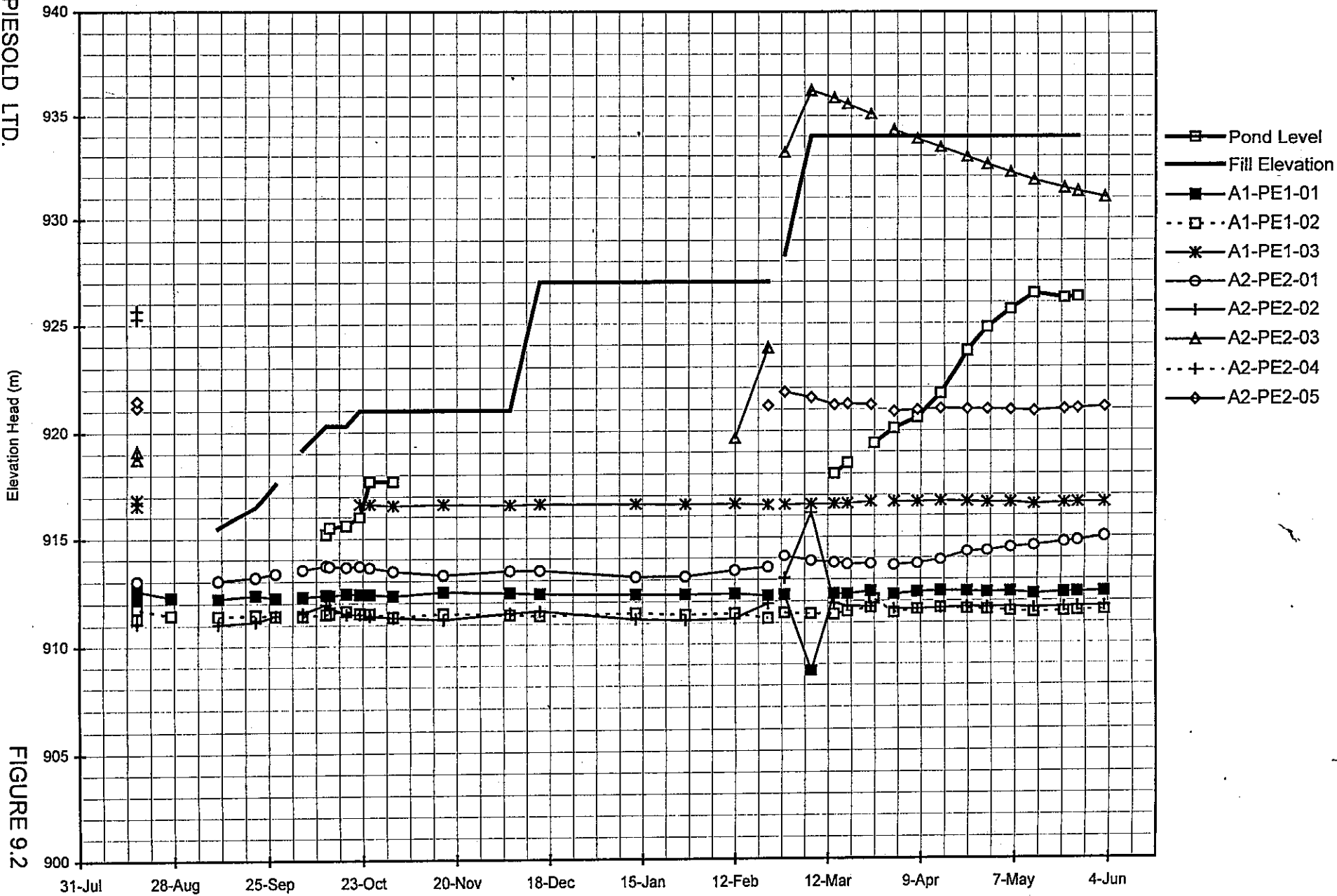


FIGURE 9.1

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
SUMMARY PLOT PIEZOMETER PLANE A

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS



MOUNT POLLEY MINING CORPORATION
TAILINGS STORAGE FACILITY
SUMMARY PLOT PIEZOMETER PLANE B

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FIGURE 9.3

MOUNT POLLEY MINING CORPORATION
TAILINGS STORAGE FACILITY
SUMMARY PLOT PIEZOMETER PLANE C

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

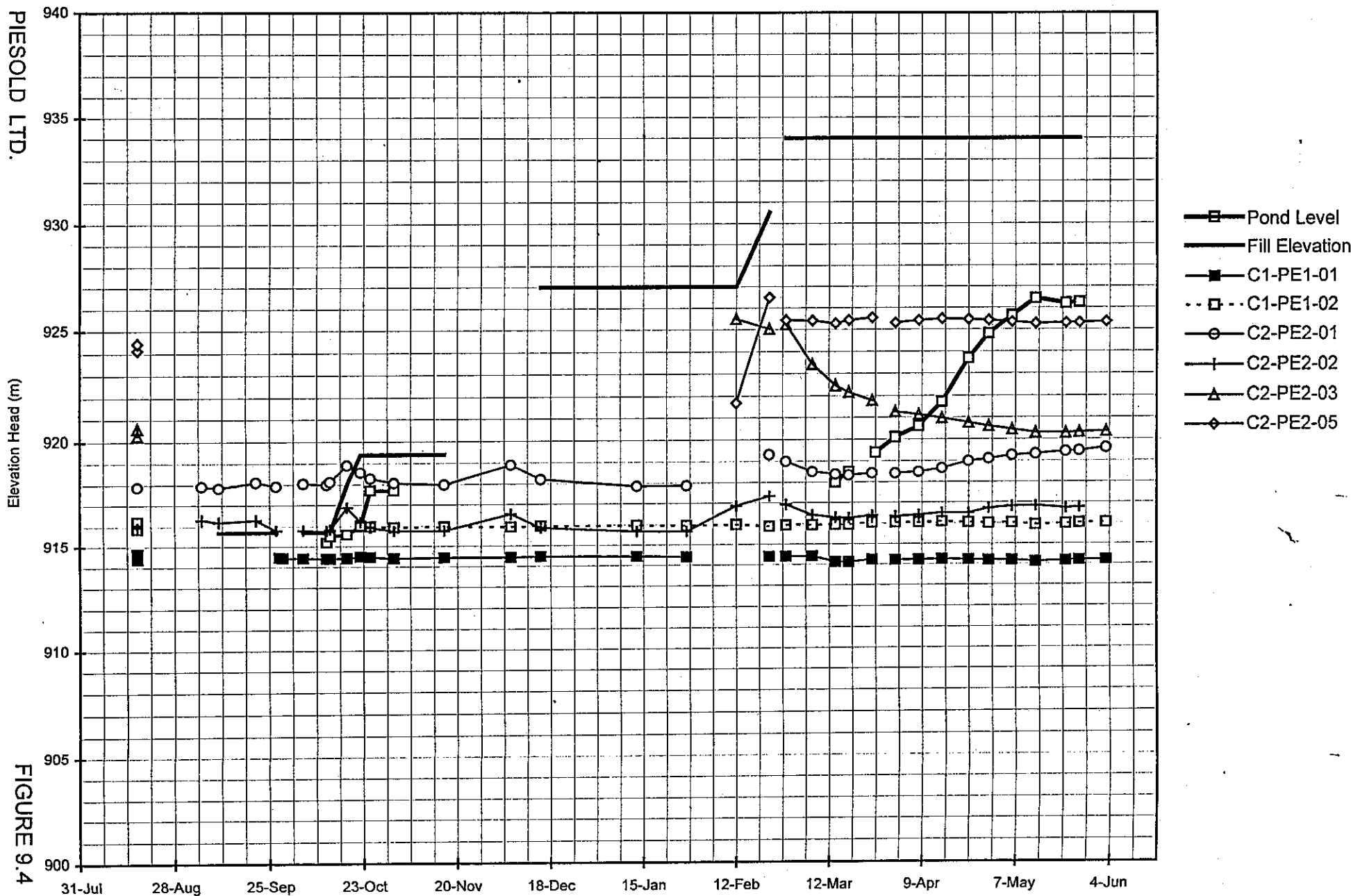
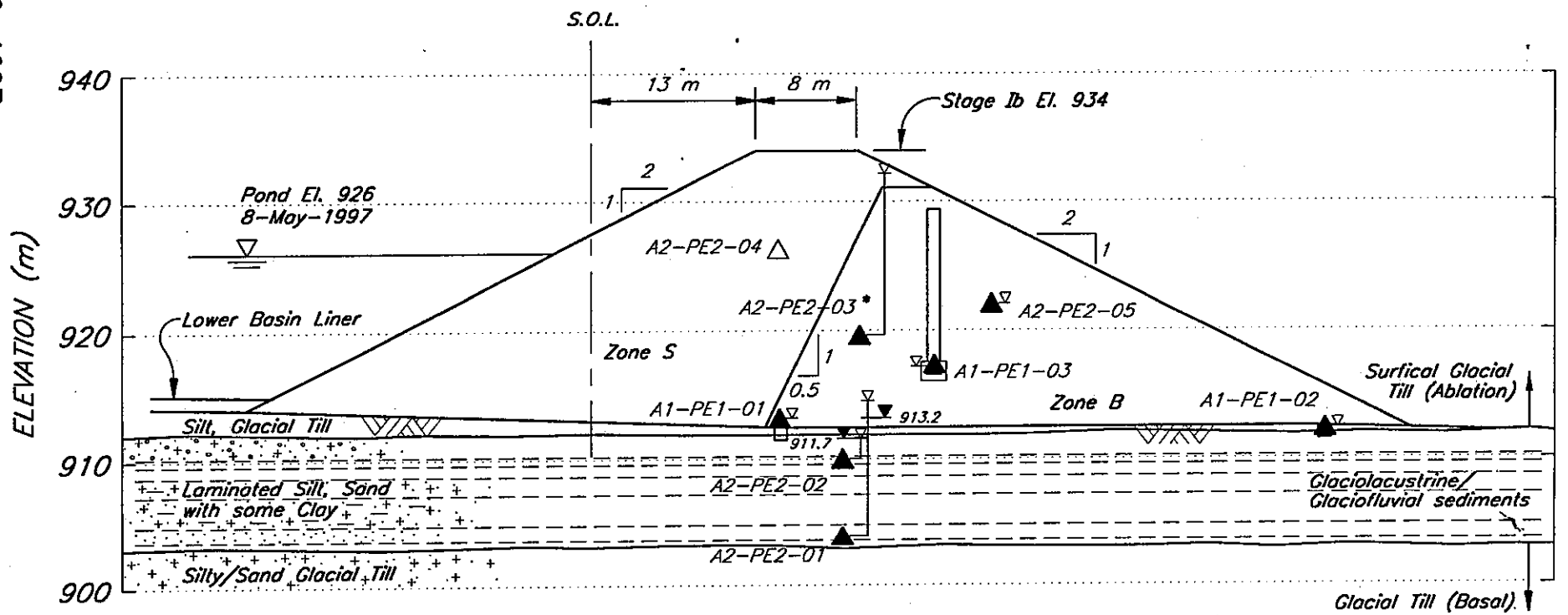


FIGURE 9.4

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
PIEZOMETER PLANE A
(CENTRE Ch. 20+00)

May 16, 1997
 KNIGHT PIESOLD LTD.
 CONSULTING ENGINEERS



LEGEND

- ▲ Piezometer working
- △ Piezometer not working
- 913.2 ▼ Initial pressure after installation
- A2-PE2-03* Denotes piezometers with pore pressures still dissipating after fill placement.

NOTE: Readings taken May 13, 1997

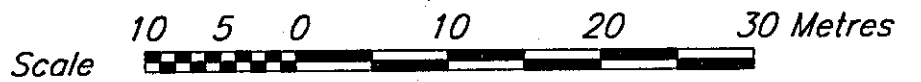
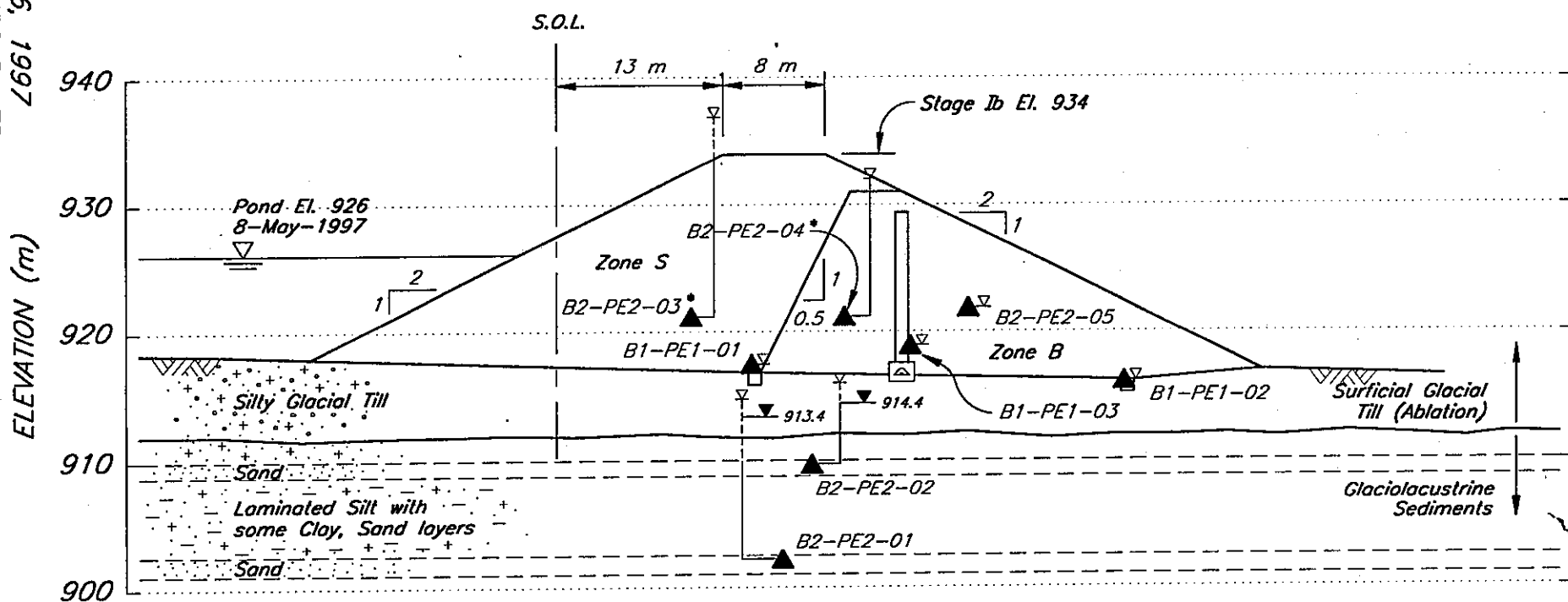


FIGURE 9.5

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
PIEZOMETER PLANE B
(LEFT ABUTMENT Ch. 22+50)

May 16, 1997
 KNIGHT PIESOLD LTD.
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LEGEND

- ▲ Piezometer working
- △ Piezometer not working
- 913.4 ▽ Initial pressure after installation
- B2-PE2-03* Denotes piezometers with pore pressures still dissipating after fill placement

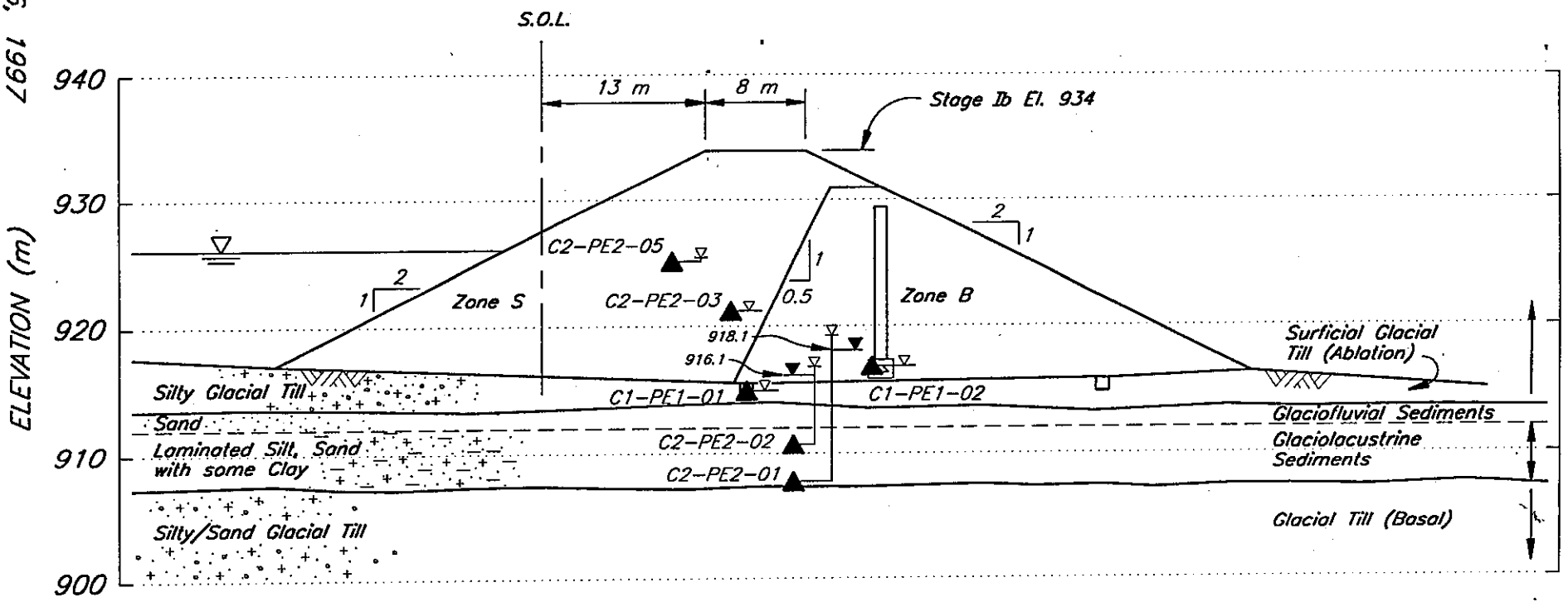
NOTE: Readings taken May 13, 1997

Scale 10 5 0 10 20 30 Metres

FIGURE 9.6

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
PIEZOMETER PLANE C
(RIGHT ABUTMENT Ch. 18+40)

May 16, 1997
 KNIGHT PIESOLD LTD.
 CONSULTING ENGINEERS



LEGEND

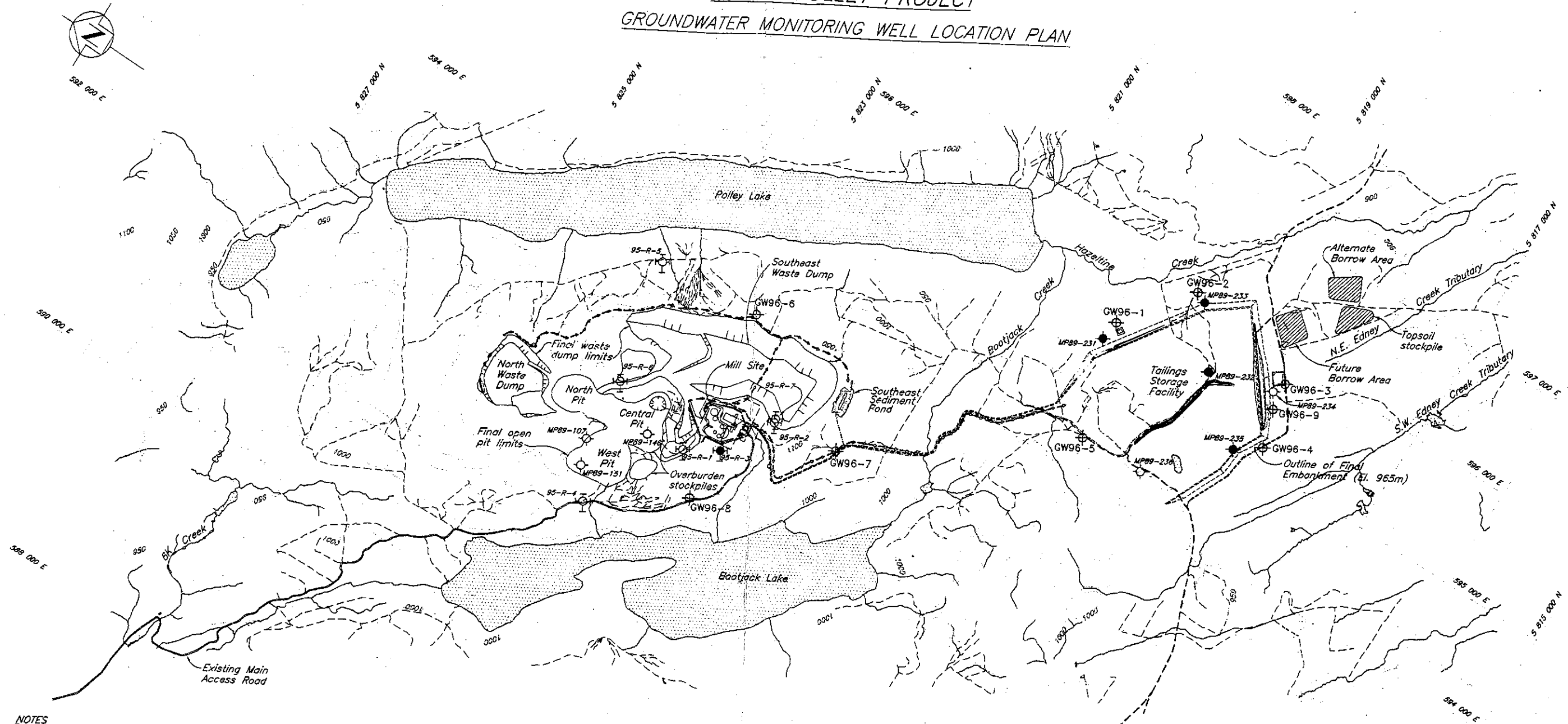
- ▲ Piezometer working
- △ Piezometer not working
- 916.1 ▽ Initial pore pressure after installation (baseline)
- ▽ Pore pressure measured May 13, 1997

Scale 10 5 0 10 20 30 Metres

FIGURE 9.7

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
GROUNDWATER MONITORING WELL LOCATION PLAN

1627.B12



NOTES

1. Open Pits and Waste Dumps are shown in their final configurations.
2. 1989 Monitoring Wells consist of 38 mm PVC with slotted screens.
3. 1995 Monitoring Wells consist of 110mm PVC well pipe installed primarily as a water supply source. Wells are screened at multiple intervals.
4. Monitoring installation 95-R-3 has been blocked at a depth of approximately 70 metres below the collar. This installation is no longer operable as a screen interval is not accessible.
5. 1996 Monitoring Wells consist of 50 mm PVC with one slotted screen section.
6. All previously installed monitoring wells with the tailing basin have been decommissioned.

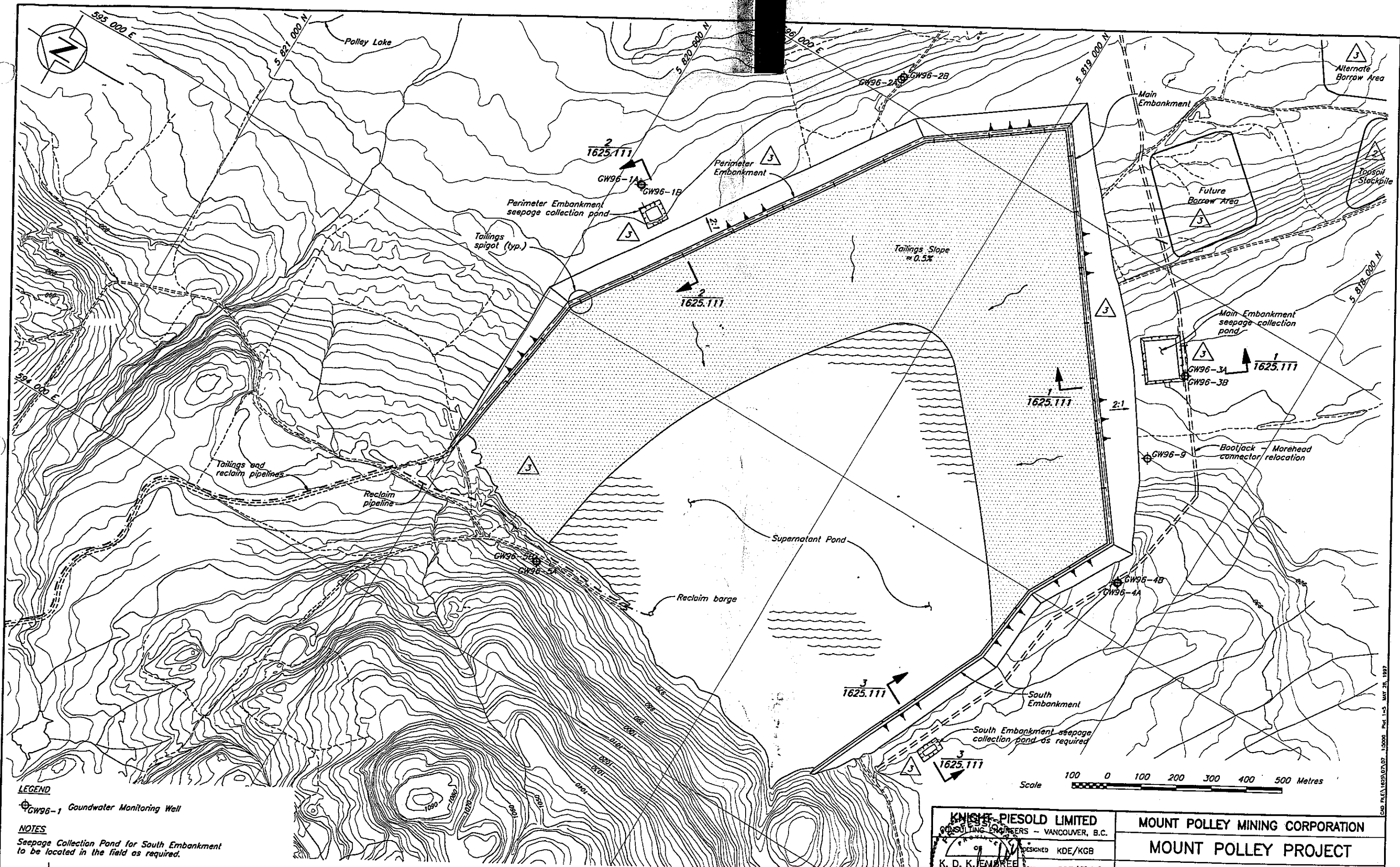
LEGEND

- 1989 Groundwater Monitoring Well
- 1996 Groundwater Monitoring Well
- Decommissioned / Lost Groundwater Well
- 1995 Groundwater Supply Well



Well Status			
Identification	Status	Identification	Status
MP89-107	Unknown	GW96-1A	Good
MP89-146	Unknown	GW96-1B	Good
MP89-151	Unknown	GW96-2A	Good
MP89-231	Lost/Decommissioned	GW96-2B	Good
MP89-232	Decommissioned	GW96-3A	Good
MP89-233	Lost/Decommissioned	GW96-3B	Good
MP89-234	Good	GW96-4A	Good
MP89-235	Lost/Decommissioned	GW96-4B	Good
MP89-236	Broken, Repairable	GW96-5A	Good
95-R-1	Good	GW96-5B	Good
95-R-2	Good	GW96-6	Good
95-R-3	Blocked	GW96-7	Good
95-R-4	Good	GW96-8A	Good
95-R-5	Good	GW96-8B	Good
95-R-6	Good	GW96-9	Good
95-R-7	Good		

May 16, 1997
KNIGHT PIESOLD LTD.
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LEGEND
 GW96-1 Groundwater Monitoring Well

NOTES
 Seepage Collection Pond for South Embankment to be located in the field as required.

1625.111	TAILINGS STORAGE FACILITY - TAILINGS EMBANKMENT - SECTIONS & DETAILS	3	MAY 30/97	REVISED EMBANKMENT	RBS	1	MAY 26/95	ISSUED FOR DESIGN REPORT	
000		2	APR. 4/96	REVISED ROAD AND POND		0	APR. 6/95	ISSUED FOR REVIEW	
REFERENCE DRAWINGS		REV.	DATE	DESCRIPTION	APPROVED	REV.	DATE	DESCRIPTION	APPROVED
					REVISIONS	REVISIONS			

KNIGHT-PIESOLD LIMITED
 CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED: KDE/KGB
 DRAWN: RDT/M.A.L.
 CHECKED: KGB
 APPROVED: KGB

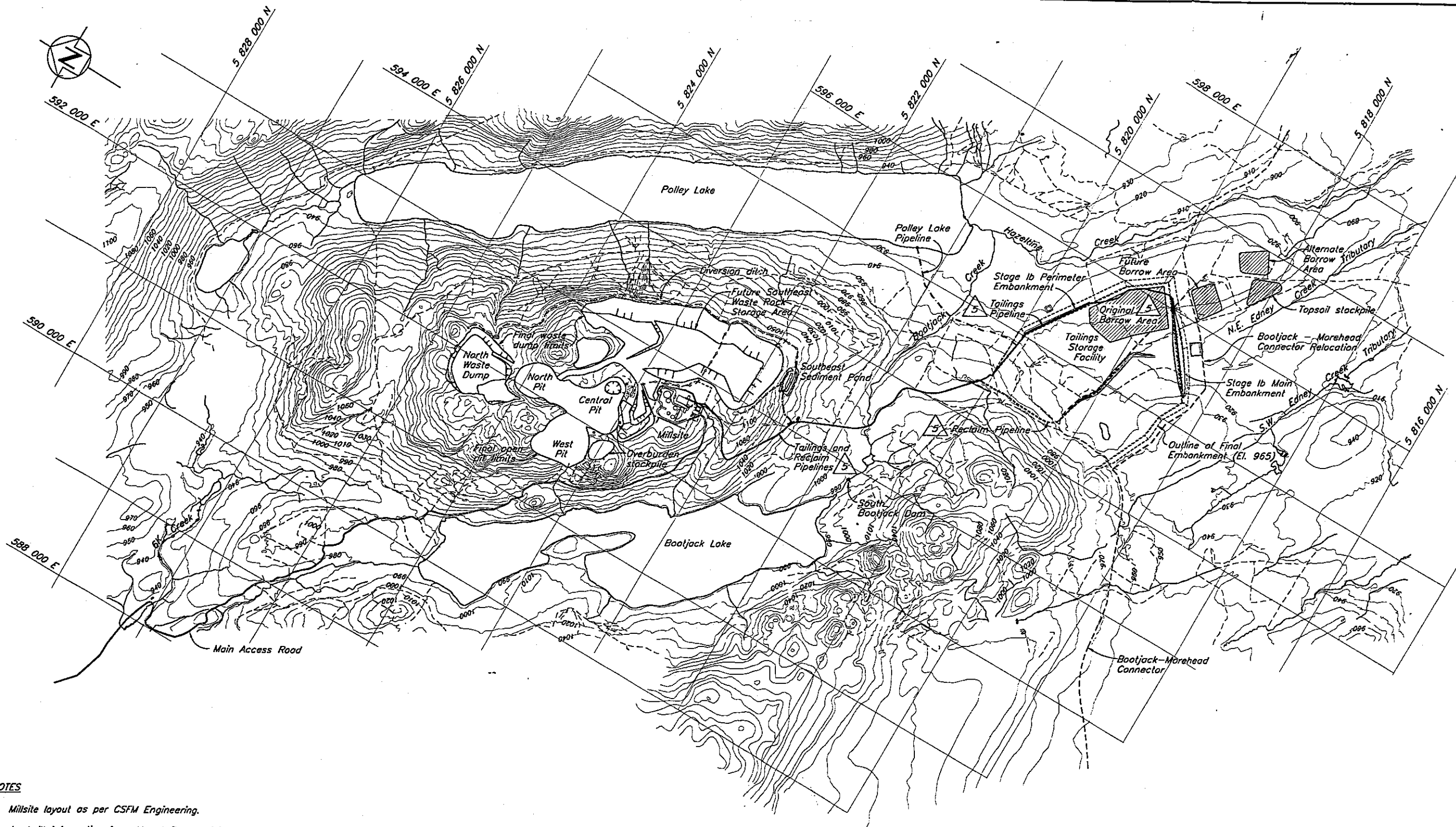
DATE: APRIL 6, 1995

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY
FINAL ARRANGEMENT

CND FILE 1625.07.07 15000 Plot 1-3 May 26, 1997



NOTES

1. Millsite layout as per CSFM Engineering.
2. As-built information from Mount Polley Mining Corporation.
3. Topography has not been updated from 1997 Flyover.



* SIGNATURES AND PROFESSIONAL SEAL ON PREVIOUS REVISION

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

*

DESIGNED KDE/KGB

DRAWN NSD/VY

CHECKED *

APPROVED *

OVERALL SITE PLAN

DATE **JUNE 2, 1995**

SCALE AS SHOWN

DRG. NO. **510-12-01-1625.200**

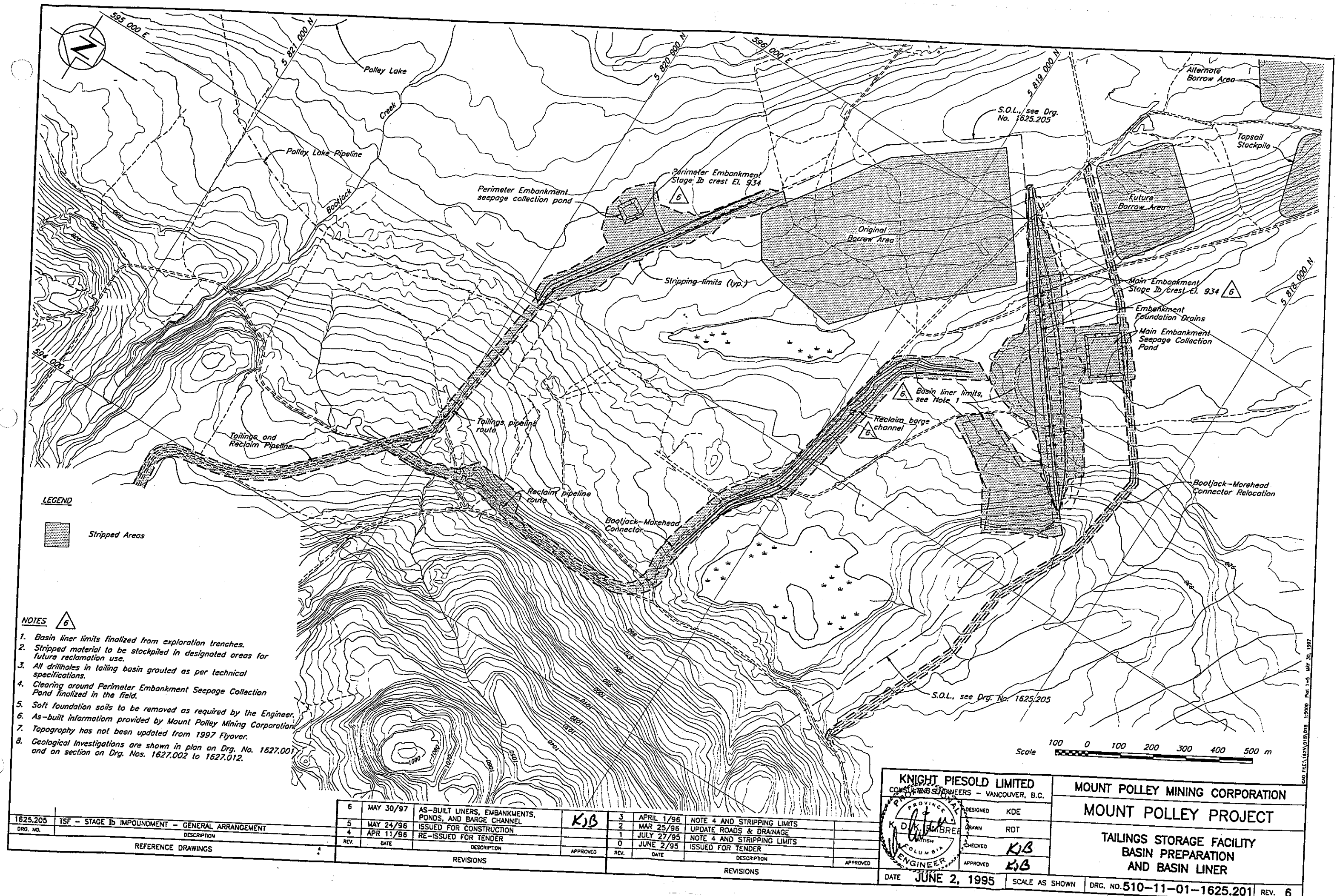
REV. **5**

5	AUG 14/97	AS-BUILT PIPELINES	
4	MAY 30/97	AS-BUILT STAGE 1b EMBANKS, PONDS BARGE CHAN & SE SEDIMENT POND	
3	MAY 24/96	ISSUED FOR CONSTRUCTION	
2	APRIL 1/95	MILLSITE AND CONTROL POND REVISED	
1	MAR 25/96	UPDATE OPEN PITS, WASTE DUMP, SITE DRAINAGE & ROADS	
0	JUNE 2/95	ISSUED FOR TENDER	

REV.	DATE	DESCRIPTION	APPROVED
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DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
	REFERENCE DRAWINGS			REVISIONS	

C:\P\510-12-01-1625.200\019 1-20000 Pld 1-20 AUG 14, 1997



LEGEND

Stripped Areas

NOTES

1. Basin liner limits finalized from exploration trenches.
2. Stripped material to be stockpiled in designated areas for future reclamation use.
3. All drillholes in tailing basin grouted as per technical specifications.
4. Clearing around Perimeter Embankment Seepage Collection Pond finalized in the field.
5. Soft foundation soils to be removed as required by the Engineer.
6. As-built information provided by Mount Polley Mining Corporation.
7. Topography has not been updated from 1997 Flyover.
8. Geological Investigations are shown in plan on Drg. No. 1627.001 and on section on Drg. Nos. 1627.002 to 1627.012.

DRG. NO.	DESCRIPTION
1625.205	TSF - STAGE 1b IMPOUNDMENT - GENERAL ARRANGEMENT
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
6	MAY 30/97	AS-BUILT LINERS, EMBANKMENTS, PONDS, AND BARGE CHANNEL	KJB
5	MAY 24/96	ISSUED FOR CONSTRUCTION	
4	APR 11/96	RE-ISSUED FOR TENDER	
REVISIONS			

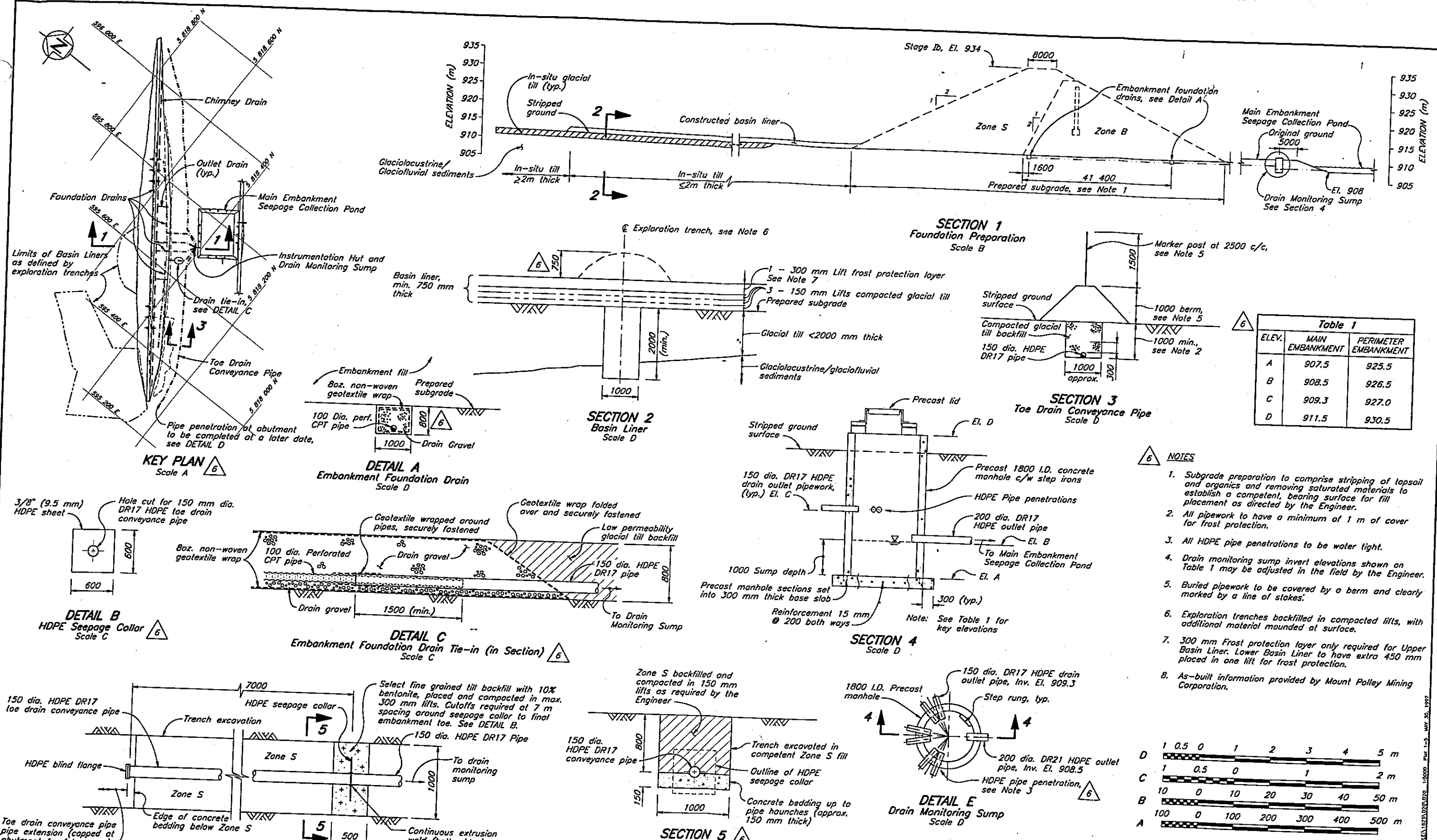
REV.	DATE	DESCRIPTION	APPROVED
3	APRIL 1/96	NOTE 4 AND STRIPPING LIMITS	
2	MAR 25/96	UPDATE ROADS & DRAINAGE	
1	JULY 27/95	NOTE 4 AND STRIPPING LIMITS	
0	JUNE 2/95	ISSUED FOR TENDER	
REVISIONS			

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

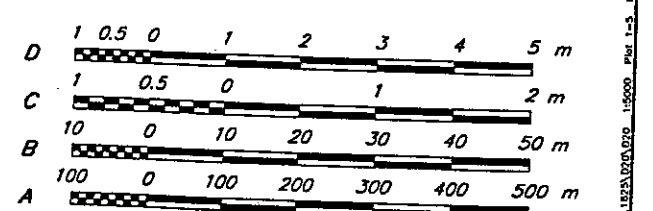
DESIGNED KDE
DRAWN RDT
CHECKED KJB
APPROVED KJB

DATE JUNE 2, 1995

MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY
BASIN PREPARATION
AND BASIN LINER



- NOTES**
- Subgrade preparation to comprise stripping of topsoil and organics and removing saturated materials to establish a competent, bearing surface for fill placement as directed by the Engineer.
 - All pipework to have a minimum of 1 m of cover for frost protection.
 - All HDPE pipe penetrations to be water tight.
 - Drain monitoring sump invert elevations shown on Table 1 may be adjusted in the field by the Engineer.
 - Buried pipework to be covered by a berm and clearly marked by a line of stakes.
 - Exploration trenches backfilled in compacted lifts, with additional material mounded at surface.
 - 300 mm Frost protection layer only required for Upper Basin Liner. Lower Basin Liner to have extra 450 mm placed in one lift for frost protection.
 - As-built information provided by Mount Polley Mining Corporation.



KNIGHT-PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C. K. D. KENNEDY ENGINEER		MOUNT POLLEY MINING CORPORATION MOUNT POLLEY PROJECT TAILINGS STORAGE FACILITY FOUNDATION PREPARATION AND BASEIN LINER SECTION AND DETAILS	
DESIGNED	KDE	DRAWN	ROD/WAL/NSD
CHECKED	KJB	APPROVED	KJB
DATE		JUNE 2, 1995	
SCALE		AS SHOWN	
DRG. NO.		510-15-01-1625 202	
REV		6	

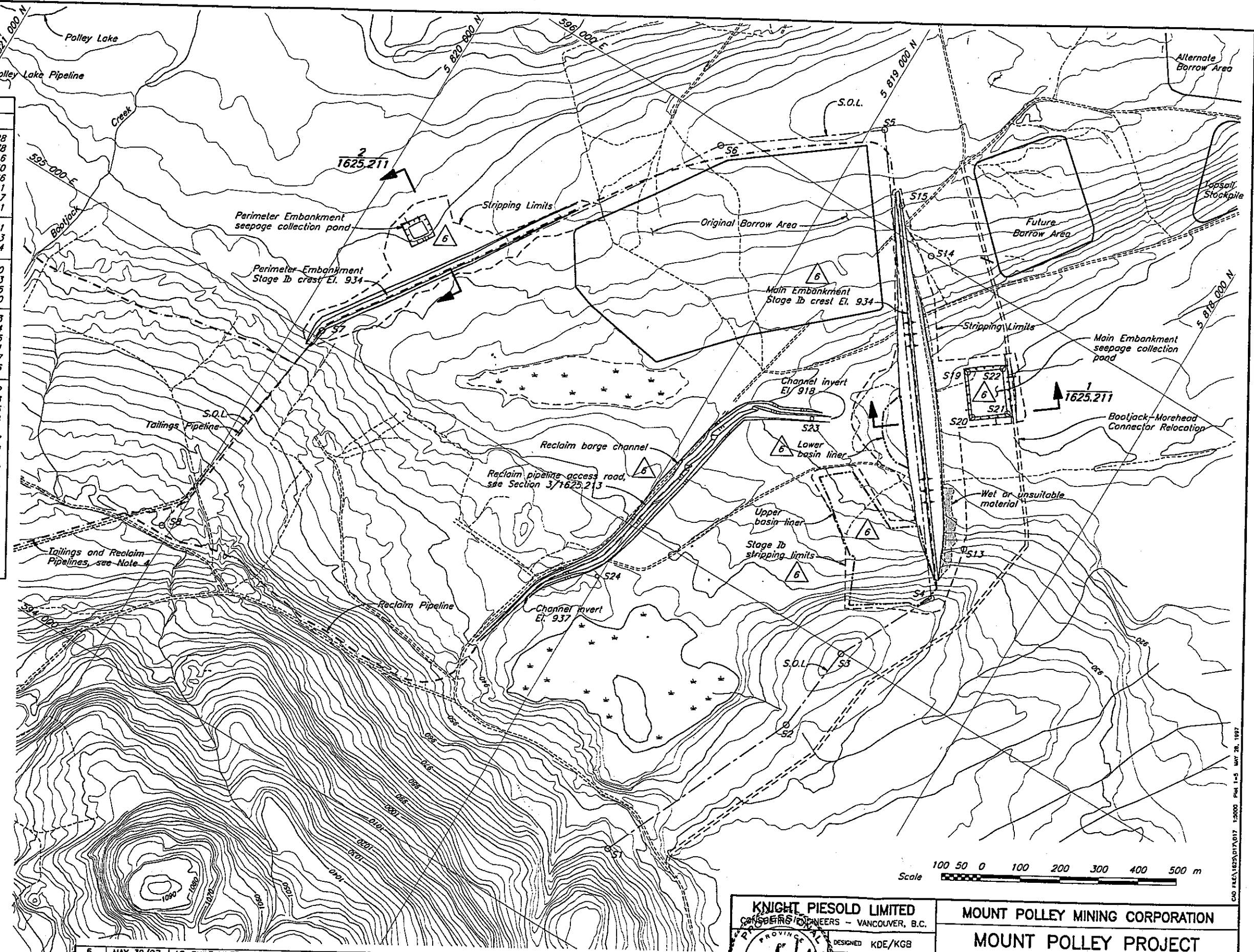
1625.210	TAILINGS STORAGE FACILITY - MAIN & PERIMETER EMBANKMENTS - PLAN	4	APR 18/96	UPDATE FOR EXPLORATION TRENCH	
1625.207	TAILINGS STORAGE FACILITY - TAILINGS DAM CHIMNEY DRAIN	3	MAR 25/96	UPDATE DRAINAGE & SEEPAGE COLLAR	
1625.111	TAILINGS STORAGE FACILITY - TAILINGS EMBANKMENT - SECTIONS & DETAILS	2	JAN 18/96	REVISIONS FOR REVIEW COMMENTS	
DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
6	MAY 30/97	AS-BUILT EMBANK., REVISED DRAIN DETAILS	KJB		
5	MAY 24/96	ISSUED FOR CONSTRUCTION			
0	JUNE 2/95	ISSUED FOR TENDER			

ORIGINAL SETTING OUT POINTS			
Description	Point	Northing	Easting
Setting Out Line (S.O.L.)	S1	5 818 622.590	594 258.688
	S2	5 818 392.402	594 765.778
	S3	5 818 365.375	594 995.246
	S4	5 818 238.539	595 240.350
	S5	5 818 966.983	596 208.866
	S6	5 819 304.035	595 955.881
	S7	5 819 932.926	595 020.397
	S8	5 820 025.632	594 375.061
Stripping Limits	S13	5 818 233.372	595 392.851
	S14	5 818 696.416	595 997.943
	S15	5 818 828.350	596 066.694
Main Embankmt. Seepage Collection Pond	S19	5 818 461.203	595 790.290
	S20	5 818 391.047	595 697.013
	S21	5 818 317.351	595 752.085
	S22	5 818 387.678	595 845.590
Reclaim Barge Channel	S23	5 818 743.870	595 479.103
	CS	5 818 856.841	595 365.834
	BC	5 818 879.675	595 408.055
	EC	5 818 903.862	595 375.481
	PI5	5 818 899.065	595 397.857
	S24	5 819 007.126	594 840.706
Bootjack - Morehead Connector Relocation	C1	5 818 550.264	595 840.492
	BC	5 818 447.016	595 949.303
	EC	5 818 430.386	595 930.655
	PI1	5 818 437.922	595 940.674
	C2	5 818 243.100	595 432.097
	BC	5 818 123.222	595 522.260
	EC	5 818 112.295	595 505.514
	PI2	5 818 117.199	595 514.252
	C3	5 818 096.998	595 273.949
	BC	5 818 009.797	595 322.894
	EC	5 818 002.473	595 241.322
	PI3	5 817 987.827	595 283.752
	C4	5 818 228.844	594 248.367
	BC	5 818 333.078	594 283.514
	EC	5 818 307.478	594 171.448
	PI4	5 818 354.995	594 220.025

LEGEND

C1 - Curve No. 1 (typ.)
 BC - Begin Curve
 EC - End Curve
 PI1 - Point of Intersection for Curve No. 1

- NOTES**
1. Stripping and clearing required 5m beyond seepage collection ponds and pipeworks.
 2. As-built information provided by Mount Polley Mining Corporation.
 3. Topography has not been updated for 1997 Flyover.
 4. Pipeline alignments to be updated based on as-built survey.



DRG. NO.	DESCRIPTION
1625.213	TSF - TAILINGS CONTROL AND SEEPAGE COLLECTION
1625.211	TSF - TAILINGS EMBANKMENT - SECTIONS AND DETAILS

REV.	DATE	DESCRIPTION	APPROVED
6	MAY 30/97	AS-BUILT LINERS, EMBANKMENTS, PONDS AND BARGE CHANNEL	KJB
5	MAY 24/96	ISSUED FOR CONSTRUCTION	
4	APR 1/96	DIVERSION DITCH NOTE AND CULVERT	

REV.	DATE	DESCRIPTION	APPROVED
3	MAR 22/96	UPDATE ROAD & BORROW AREA ADDED	
2	JAN. 18/96	REVISED SEEPAGE COLLECTION POND	
1	JULY 27/95	POINT S16 AND S17 DELETED	
0	JUNE 2/95	ISSUED FOR TENDER	

KNIGHT PIESOLD LIMITED
 CONSULTING ENGINEERS - VANCOUVER, B.C.

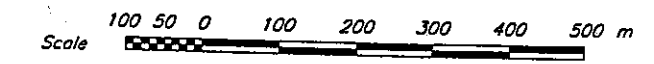
DESIGNED KDE/KGB
 DRAWN WAL/WY/NSD
 CHECKED KJB
 APPROVED KJB

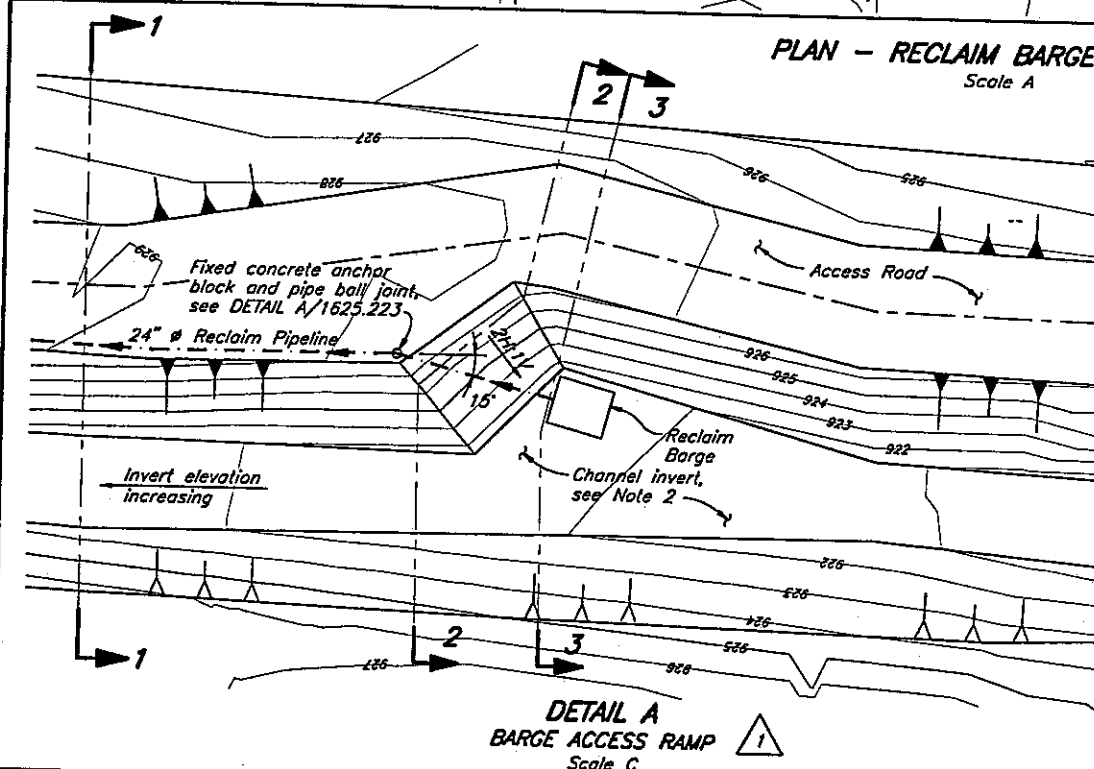
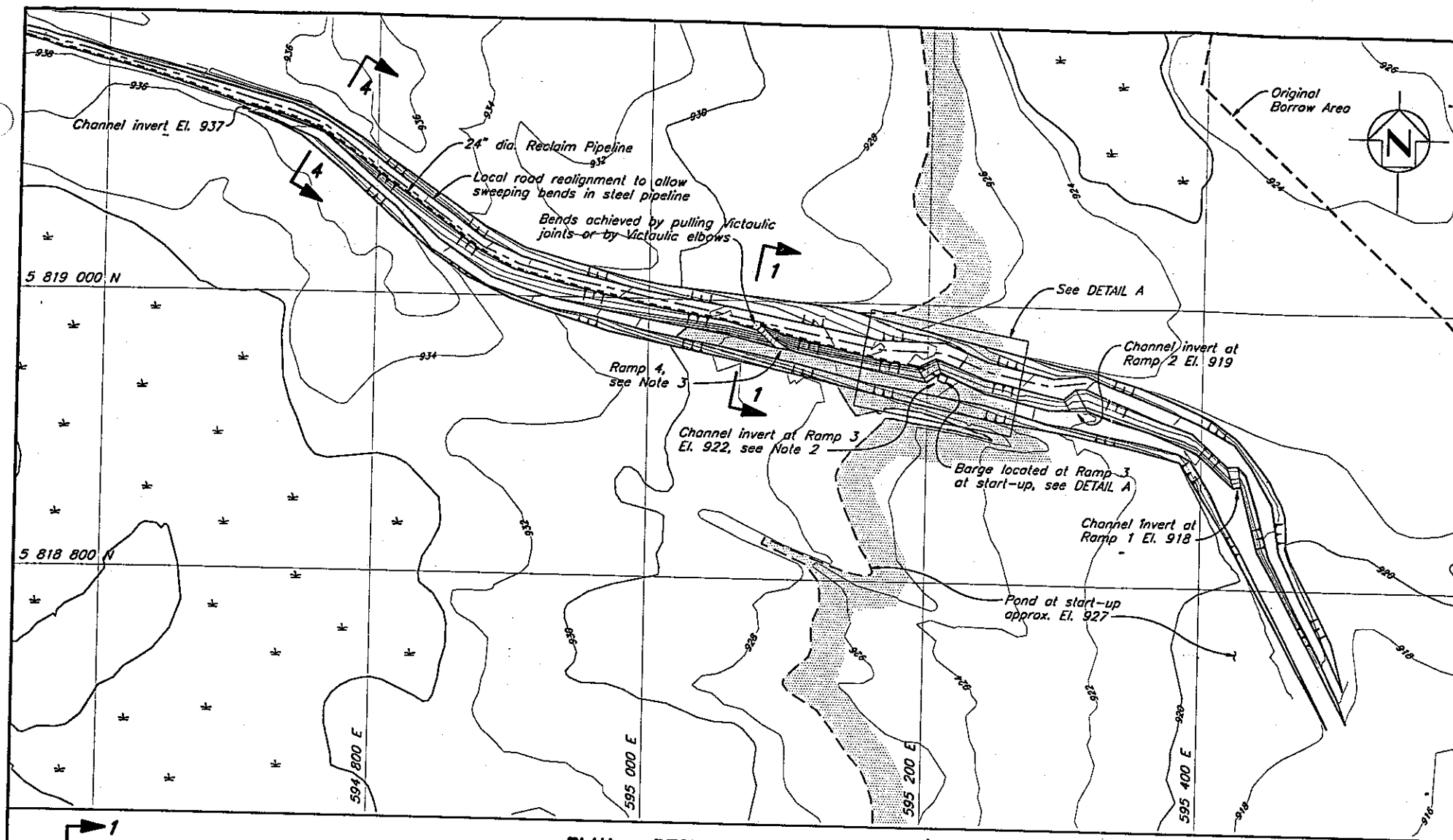
DATE **JUNE 2, 1995**

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

**TAILINGS STORAGE FACILITY
 STAGE 1b TAILINGS IMPOUNDMENT
 GENERAL ARRANGEMENT**



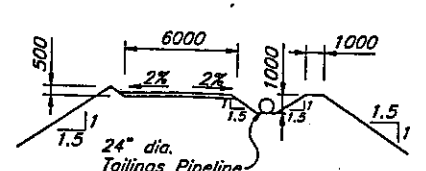
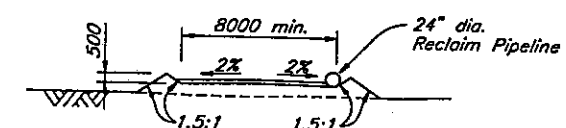
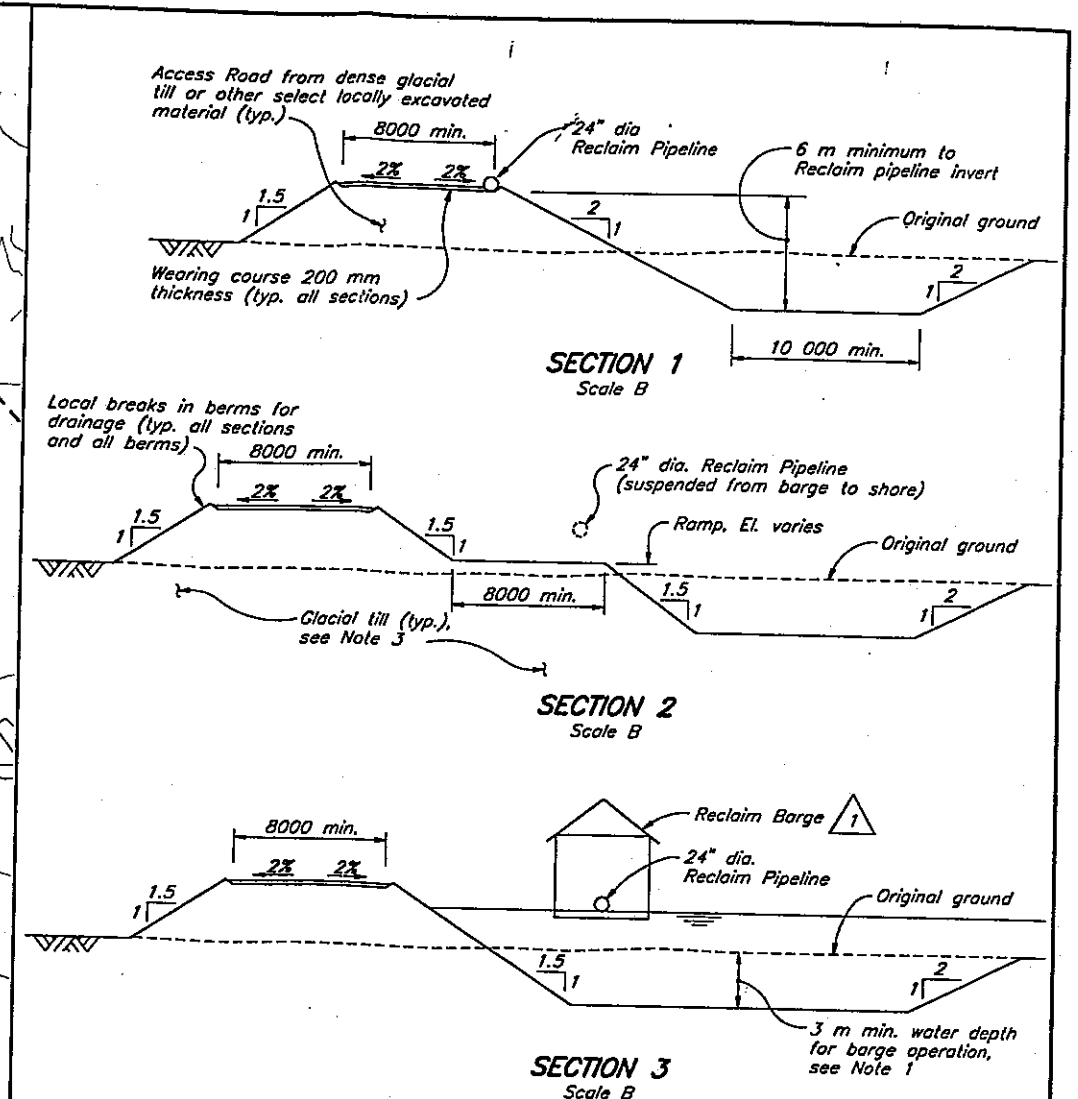


1625.223	TSF - RECLAIM PIPELINE DETAILS
1625.222	TSF - TAILINGS IMPOUNDMENT - TAILINGS & RECLAIM PIPEWORK - PLAN
1625.218	TSF - TAILINGS DISTRIBUTION & RECLAIM SYSTEM - PLAN
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
1	MAY 30/97	AS-BUILT RECLAIM BARGE CHANNEL	KJB
0	JULY 15/96	ISSUED FOR CONSTRUCTION	
REVISIONS			

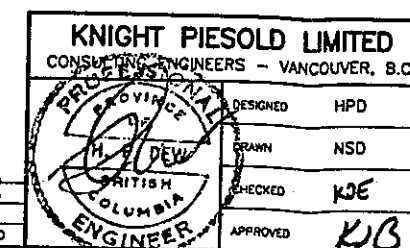
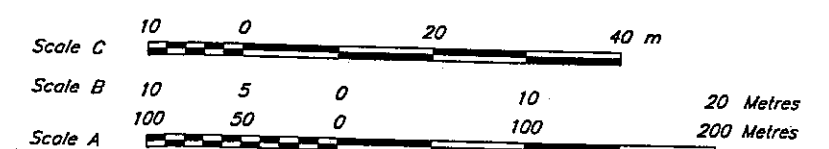
NOTES

1. Barge requires a minimum water depth of 3 m for operation and can operate over a 3 m range (see Drg. No. 1625.223).
2. Pond level at start-up approx. El. 927, with initial access road and ball joint at El. 928 and channel invert at El. 922 or lower.
3. Additional access ramps to be added as required at 3 m elevation increments. If the initial ramp is moved down channel from the assumed start-up location, additional reclaim pipe will be required.
4. Compacted glacial till placed along the barge channel excavation when higher permeability soils encountered (to meet basin liner requirements), as directed by the Engineer.
5. As-built information provided by Mount Polley Mining Corporation.
6. Topography has not been updated for 1997 Flyover.
7. Pipeline alignments to be updated based on as-built survey.

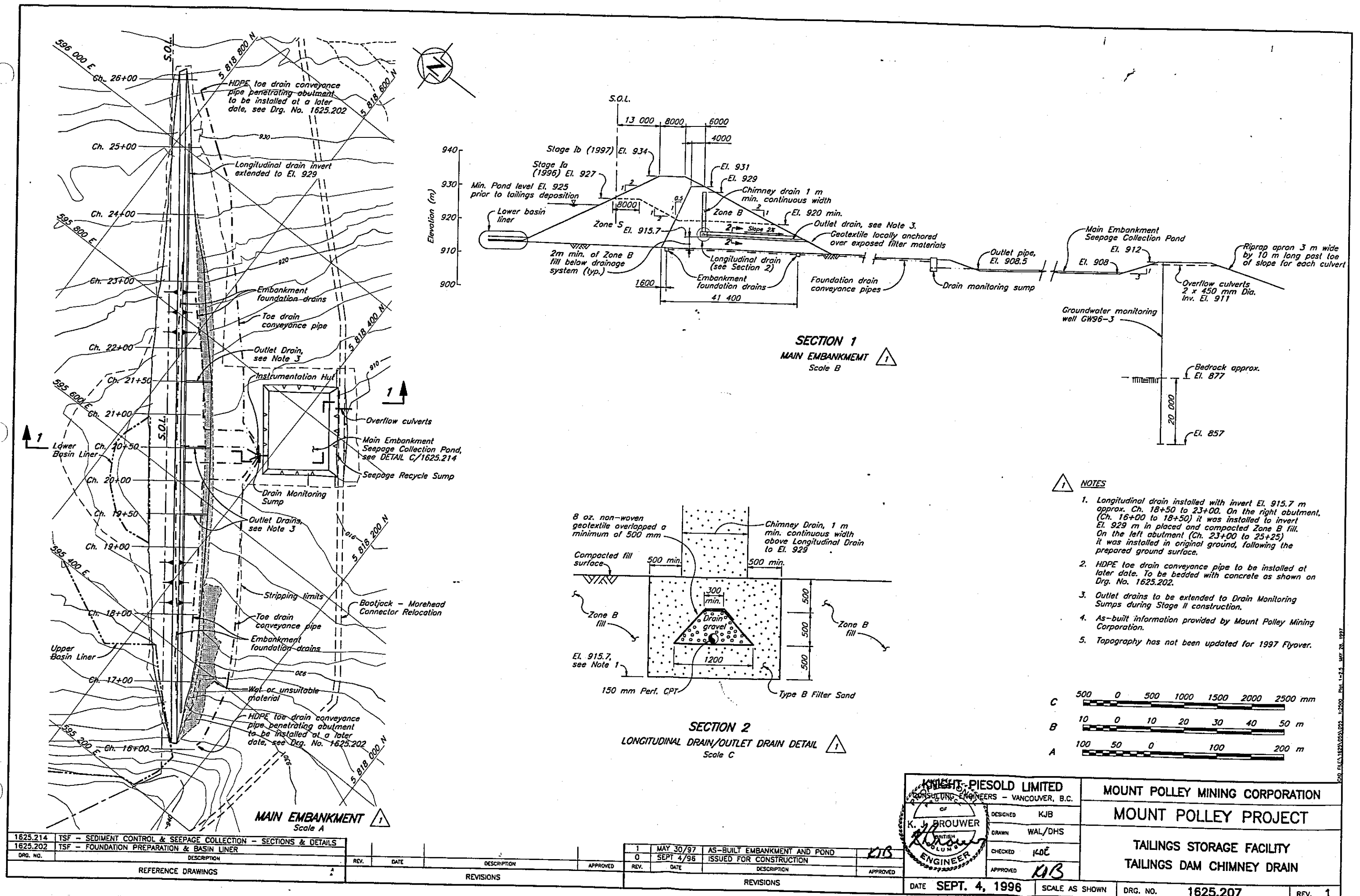


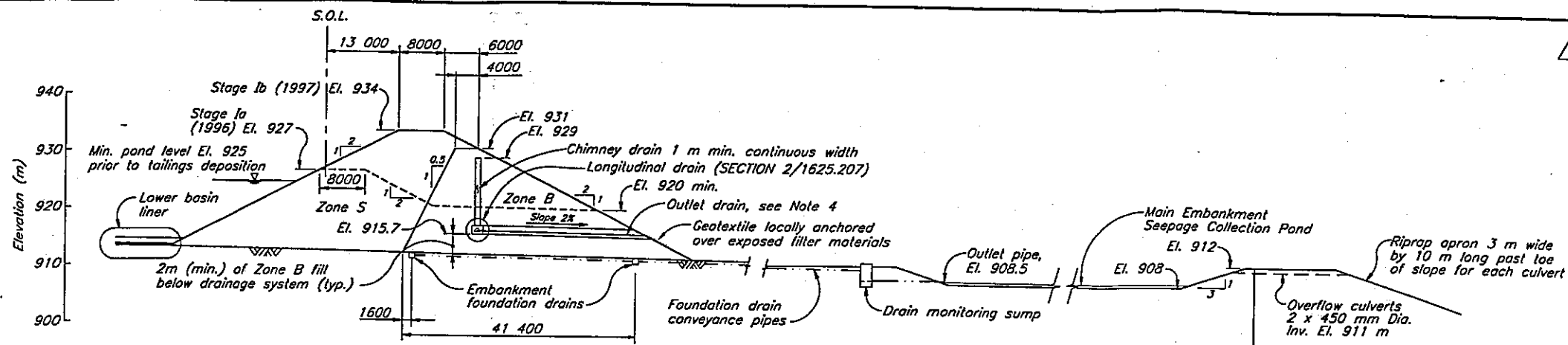
SECTION 4, 1625.218, 1625.222 Scale B

SECTION 5, 1625.218, 1625.222 Scale B

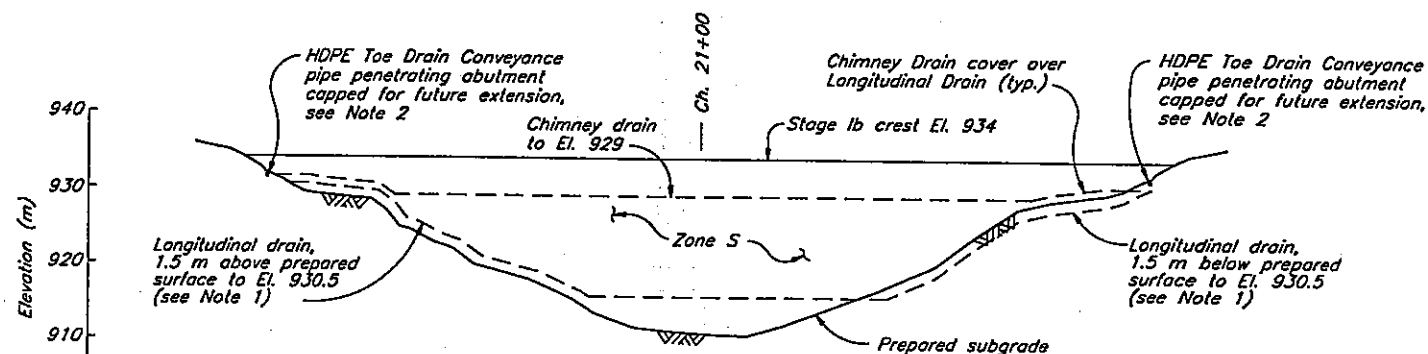


MOUNT POLLEY MINING CORPORATION	
MOUNT POLLEY PROJECT	
TAILINGS STORAGE FACILITY RECLAIM BARGE CHANNEL EXCAVATION DETAILS	
DESIGNED	HPD
DRAWN	NSD
CHECKED	KJE
APPROVED	KJB

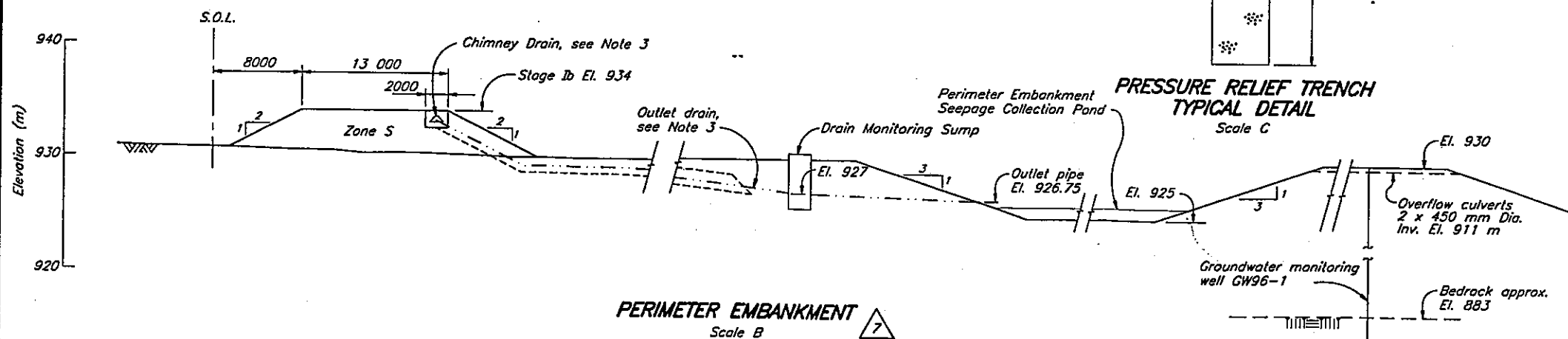




MAIN EMBANKMENT
Scale A



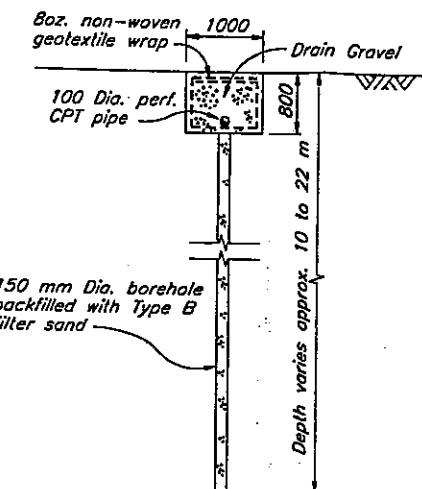
LONGITUDINAL SECTION OF MAIN EMBANKMENT
(Looking Downstream)
N.T.S.



PERIMETER EMBANKMENT
Scale B

Trench typically 3 m long,
backfilled with sandy gravel

PRESSURE RELIEF TRENCH
TYPICAL DETAIL
Scale C

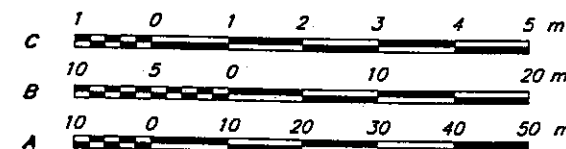


PRESSURE RELIEF WELL
TYPICAL DETAIL
Scale C

ZONE	MATERIAL TYPE	PLACEMENT AND COMPACTION REQUIREMENTS
Blanket/Toe Drain	Filter sand	Placed and spread in maximum 1.0 m 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). Vibratory compaction to 98% of Standard Proctor maximum dry density or as approved by the Engineer.
B	Glacial till	Placed, moisture conditioned and spread in maximum 600 mm thick layers (after compaction). Vibratory compaction to 98% of Standard Proctor maximum dry density or as approved by the Engineer.
Chimney Drain	Type B Filter Sand	Placed and spread in maximum 600 mm thick layers. Compaction as directed by the Engineer.

NOTES

- Longitudinal drain installed with invert El. 915.7 m approx. Ch. 18+50 to 23+00. On the right abutment, (Ch. 16+00 to 18+50) it was installed to invert El. 929 m in placed and compacted Zone B fill. On the left abutment (Ch. 23+00 to 25+25) it was installed in original ground, following the prepared ground surface.
- HDPE toe drain conveyance pipes for Main Embankment to be installed at a later date. Details shown on Drg. No. 1625.202.
- Chimney drain, longitudinal drain and Outlet drains for Perimeter Embankment to be installed during Staged II Construction.
- Outlet drains to be extended to Drain Monitoring Sumps during Stage II construction.
- Fill placement rates to be modified by the Engineer if excess pore pressures monitored in fill or foundation piezometers.
- Groundwater monitoring wells to be installed by others.
- As Built Information provided by Mount Polley Mining Corporation.



DRG. NO.	DESCRIPTION
1625.207	TSF - TAILINGS DAM CHIMNEY DRAIN
1625.202	TSF - FOUNDATION PREPARATION & BASIN LINER - SECTIONS & DETAILS

REV.	DATE	DESCRIPTION	APPROVED
7	MAY 30/97	AS-BUILT EMBANKMENTS AND PONDS	KJB
6	SEP 4/96	STAGE Ia ADDED, MODIFIED DRAINAGE DETAIL	
5	MAY 28/96	ISSUED FOR CONSTRUCTION	

REV.	DATE	DESCRIPTION	APPROVED
4	APR 19/96	EMBANKMENT EROSION PROTECTION	
3	APR 11/96	RE-ISSUED FOR TENDER	
2	APR 1/96	OVERFLOW CULVERTS ADDED	
1	MAR 22/96	UPDATE DRAINAGE	
0	JUNE 2/95	ISSUED FOR TENDER	

KNIGHT-PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

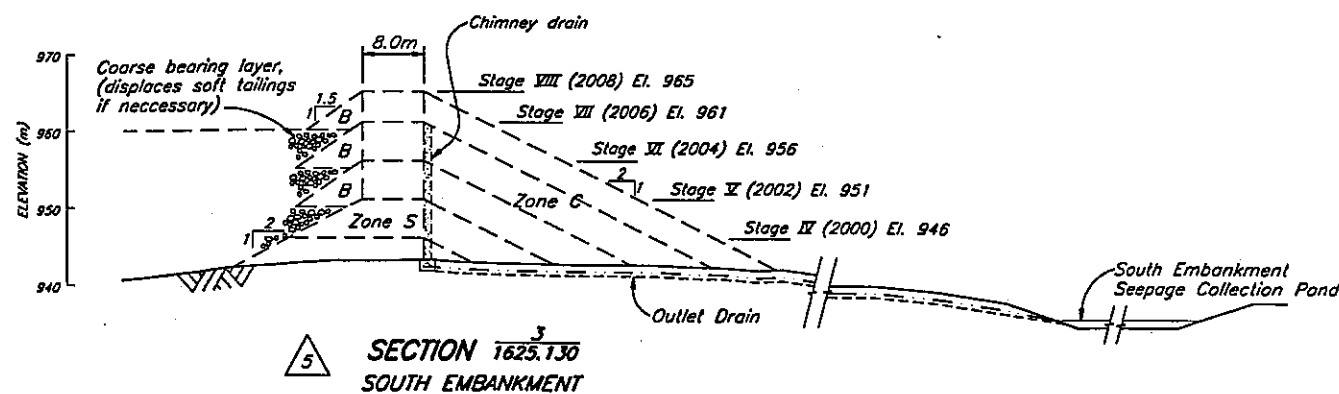
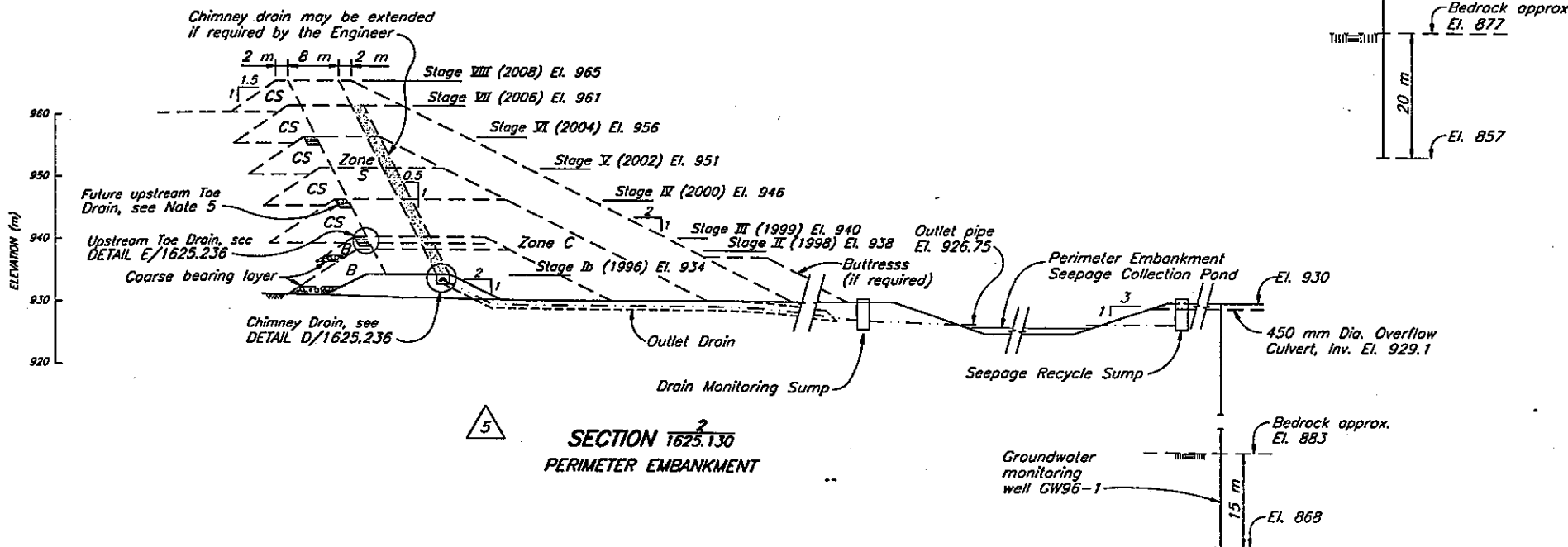
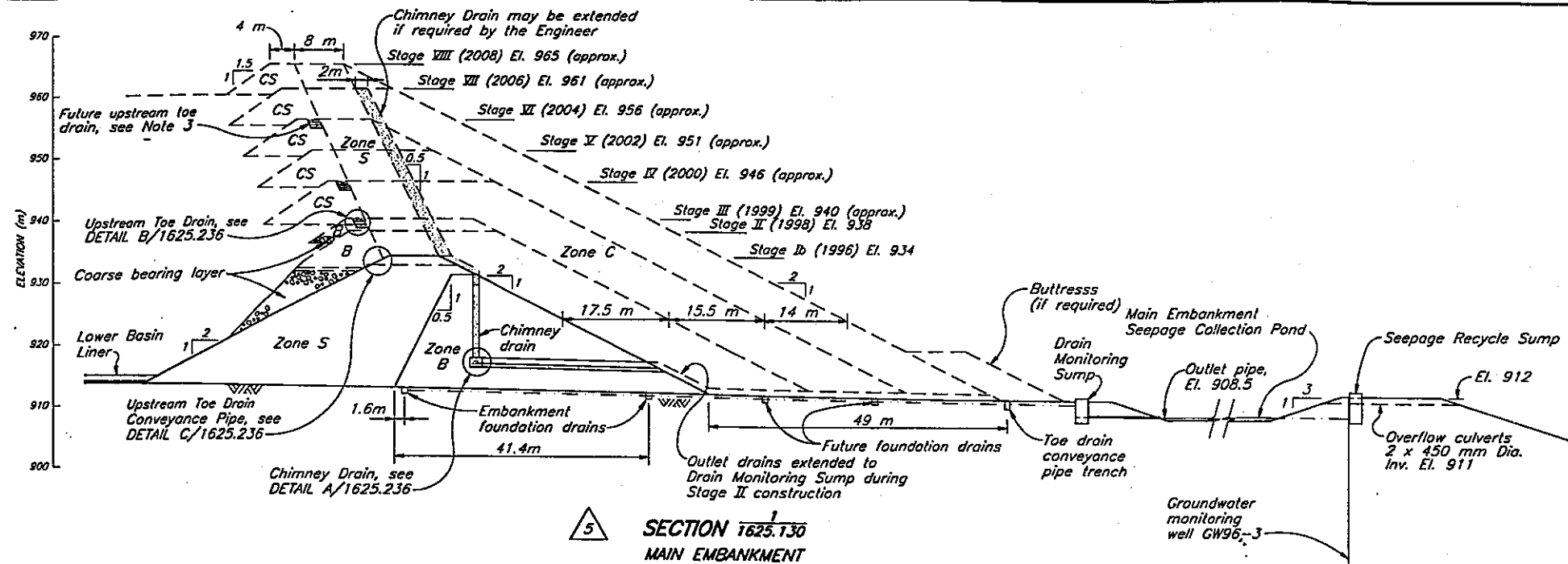
DESIGNED KDE
DRAWN WAL/VY
CHECKED KJB
APPROVED KJB

K. D. KEMMER
ENGINEER

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY
TAILINGS EMBANKMENT
SECTIONS AND DETAILS



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

DRG. 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

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	

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	

KNIGHT-PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.	
DESIGNED	KJB/KDE
DRAWN	HAL/VY
CHECKED	KOE
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

BOULDERS COBBLES GRAVEL SAND SILT CLAY

Coarse Fine Coarse Medium Fine Coarse Medium Fine

SIEVE OPENING IN INCHES

US STANDARD SIEVE SIZES

24" 12" 6" 4" 3" 2" 1 1/2" 1" 3/4" 3/8" 1/4" 1/2" 10 16 20 30 40 50 60 100 140 200

PERCENT FINER BY WEIGHT

100 90 80 70 60 50 40 30 20 10 0

500 300 200 100 50 30 20 10 5.0 3.0 2.0 1.0 0.5 0.3 0.2 0.1 .05 .03 .02 .01 .005 .003 .002 .001

GRAIN SIZE IN MILLIMETRES

Zone 5 Coarse Limit

Zone B Coarse Limit

2

GRAIN SIZE DISTRIBUTION CURVE

PERCENT FINER BY WEIGHT

GRAIN SIZE IN MILLIMETRES

COARSE LIMIT 150 mm

COARSE LIMIT 650 mm FROST PROTECTION LAYER

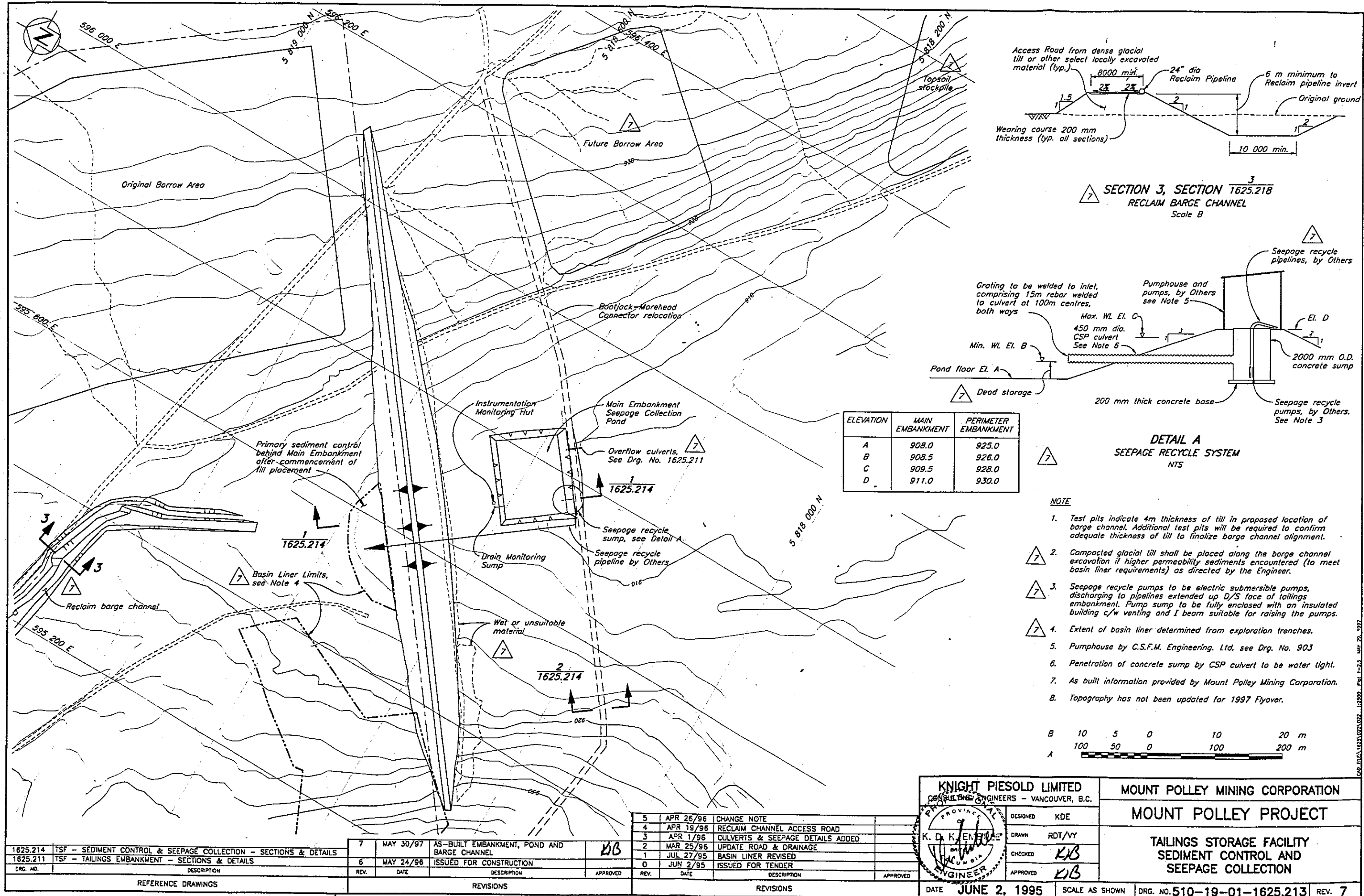
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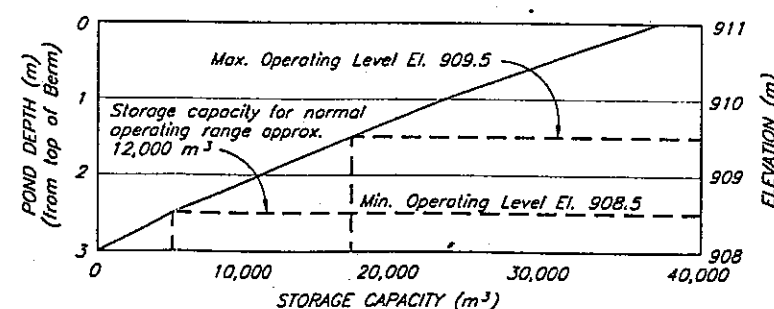
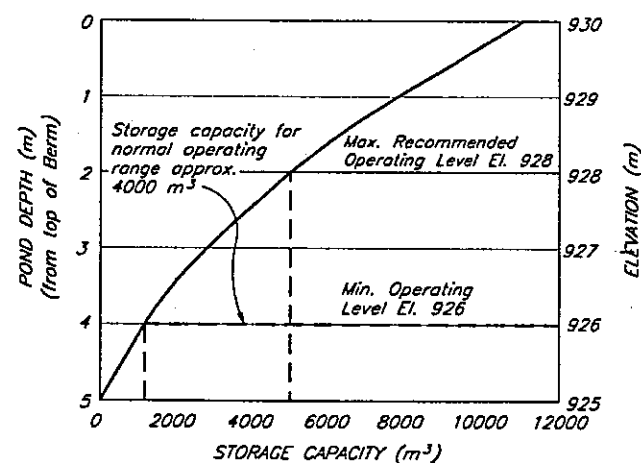
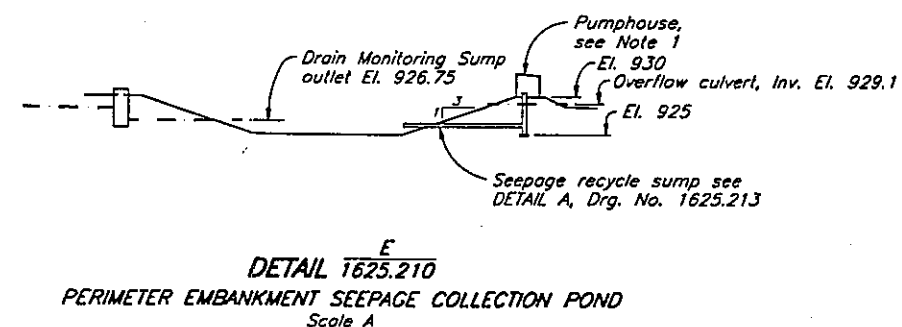
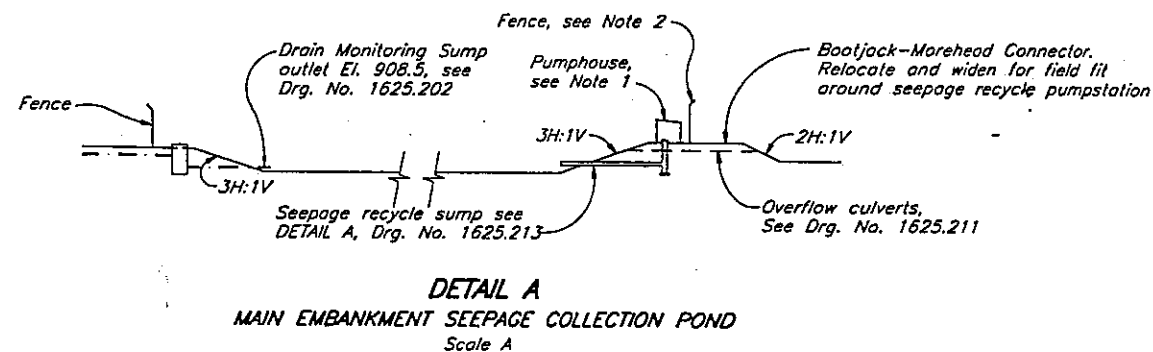
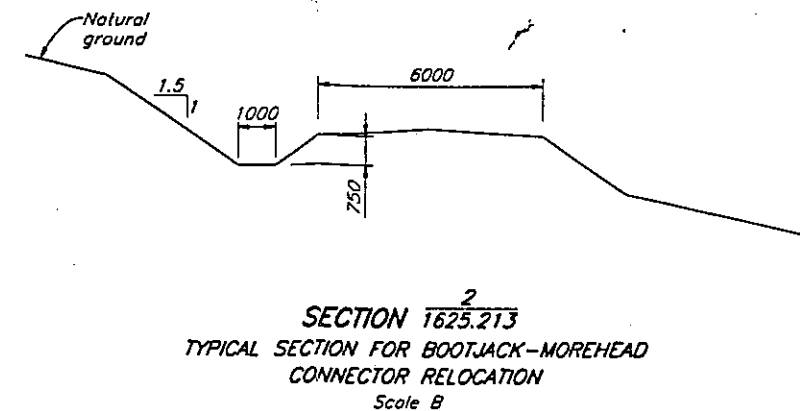
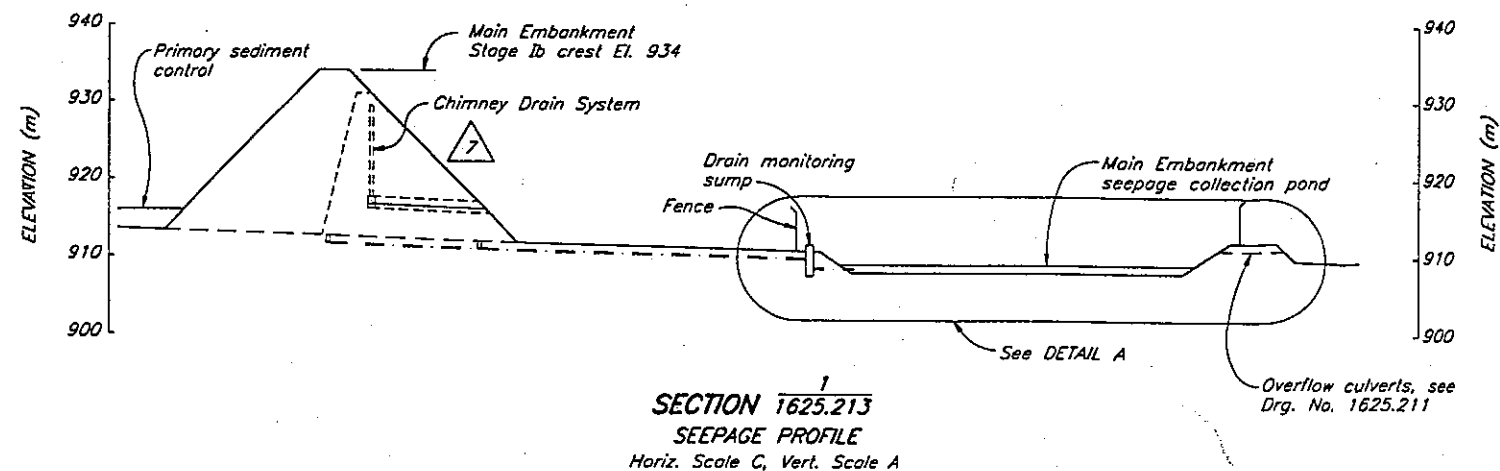
DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
REFERENCE DRAWINGS		REVISIONS			

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED	KDE
DRAWN	RDT
CHECKED	KJB
APPROVED	KJB

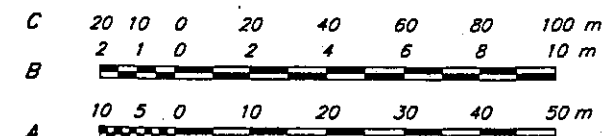
DRG. NO. 510-14-03-1625.212	REV. 2
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NOTES

1. Pump house by C.S.F.M. Engineering Ltd. see Drg. No. 903
2. Fence to be six feet high, chain link with 2 inch galvanized posts and two six foot wide access gates. Not yet installed (May 27, 1997)
3. As-built information provided by Mount Polley Mining Corporation.



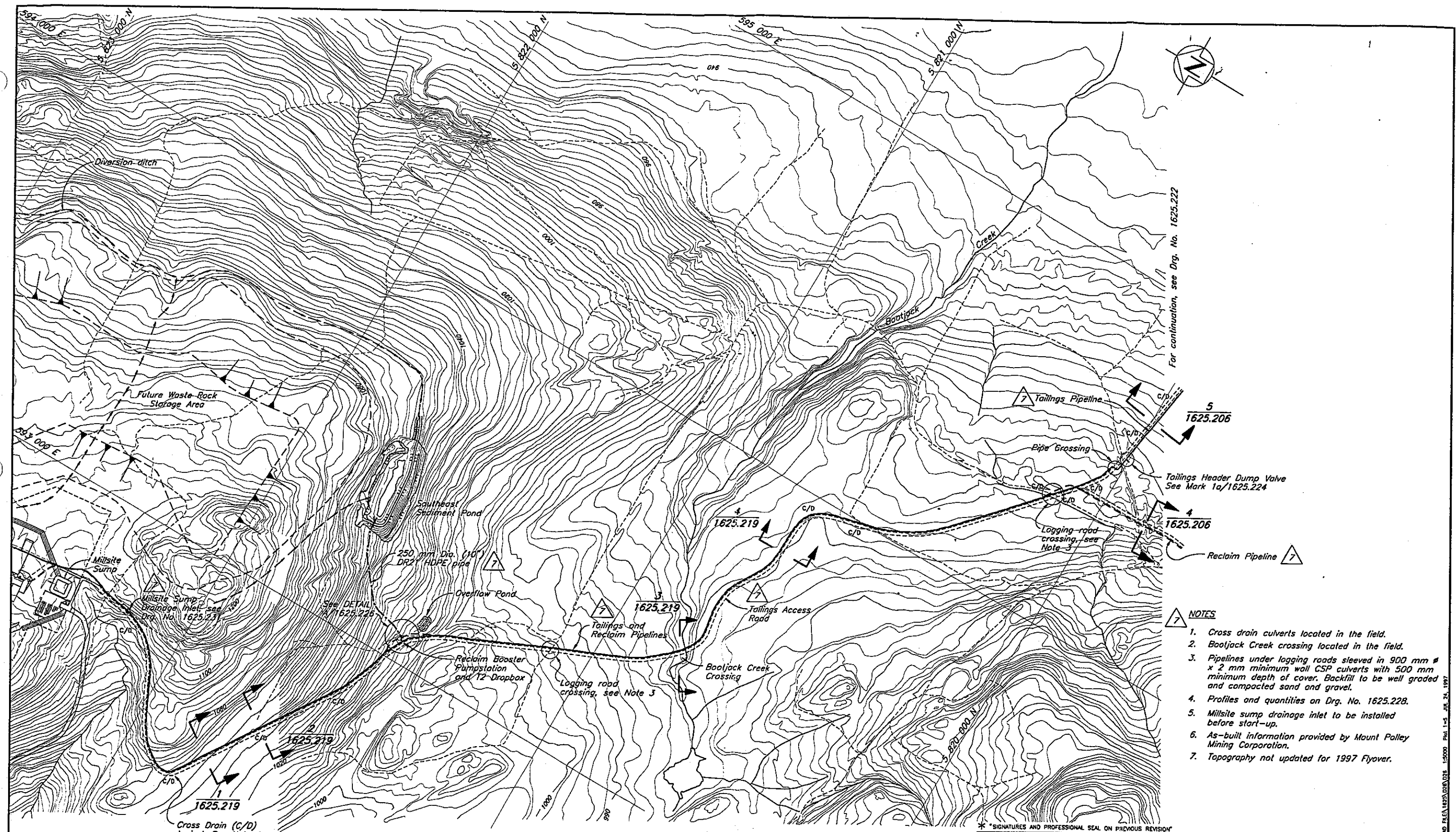
1625.213	TSF - SEDIMENT CONTROL AND SEEPAGE COLLECTION
1625.211	TSF - TAILINGS EMBANKMENT - SECTIONS AND DETAILS
1625.210	TSF - MAIN AND PERIMETER EMBANKMENTS - PLAN
1625.202	TSF - FOUNDATION PREPARATION & BASIN LINER - SECTIONS & DETAILS
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

7	MAY 30/97	AS-BUILT PONDS	KJB
6	JUN 6/96	FENCE NOTE ADDED	
5	MAY 24/96	RE-ISSUED FOR CONSTRUCTION	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

4	APR 1/96	OVERFLOW CULVERTS ADDED	
3	MAR 22/96	UPDATE DRAINAGE AND ROAD	
2	SEPT. 5/95	ISSUED FOR CONSTRUCTION	
1	JULY 27/95	RIPRAP APRON ADDED	
0	JUNE 2/95	ISSUED FOR TENDER	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

KNIGHT PIESOLD LIMITED	
CONSULTING ENGINEERS - VANCOUVER, B.C.	
DESIGNED	KDE
DRAWN	VY/NSD
CHECKED	KJB
APPROVED	KJB
DATE	JUNE 2, 1995

MOUNT POLLEY MINING CORPORATION	
MOUNT POLLEY PROJECT	
TAILINGS STORAGE FACILITY	
SEDIMENT CONTROL AND SEEPAGE	
COLLECTION - SECTIONS AND DETAILS	
DRG. NO.	510-19-02-1625.214
REV.	7



- NOTES**
1. Cross drain culverts located in the field.
 2. Bootjack Creek crossing located in the field.
 3. Pipelines under logging roads sleeved in 900 mm x 2 mm minimum wall CSP culverts with 500 mm minimum depth of cover. Backfill to be well graded and compacted sand and gravel.
 4. Profiles and quantities on Drg. No. 1625.228.
 5. Millsite sump drainage inlet to be installed before start-up.
 6. As-built information provided by Mount Polley Mining Corporation.
 7. Topography not updated for 1997 Flyover.

DRG. NO.	DESCRIPTION
1625.231	DRAINAGE PLAN - MILL SITE
1625.228	TSF - TAILINGS DISTRIBUTION AND RECLAIM SYSTEM - PROFILES
1625.226	TSF - RECLAIM BOOSTER PUMP STATION AREA - GENERAL ARRANGEMENT
1625.222	TSF - TAILINGS IMPOUNDMENT - TAILINGS AND RECLAIM PIPEWORK PLAN
1625.219	TSF - TAILINGS DISTRIBUTION & RECLAIM SYSTEM - SECTIONS & DETAILS
1625.206	TSF - RECLAIM BARGE CHANNEL - EXCAVATION DETAILS

REV.	DATE	DESCRIPTION	APPROVED
7	JUL 25/97	AS-BUILT PIPELINES	
6	MAY 30/97	AS-BUILT SOUTHEAST SEDIMENT POND	

REV.	DATE	DESCRIPTION	APPROVED
5	JULY 15/96	PIPELINES RELOCATED, SEE NOTE 5	
4	MAY 24/96	ISSUED FOR CONSTRUCTION	
3	APR 19/95	NOTE ADDED	
2	APR 1/96	MILLSITE AND CONTROL POND REVISED	
1	MAR 25/96	RE-ISSUED FOR TENDER	
0	JUNE 2/95	ISSUED FOR TENDER	

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

DESIGNED MBS
DRAWN VY/RDT/NSD
CHECKED *
APPROVED *

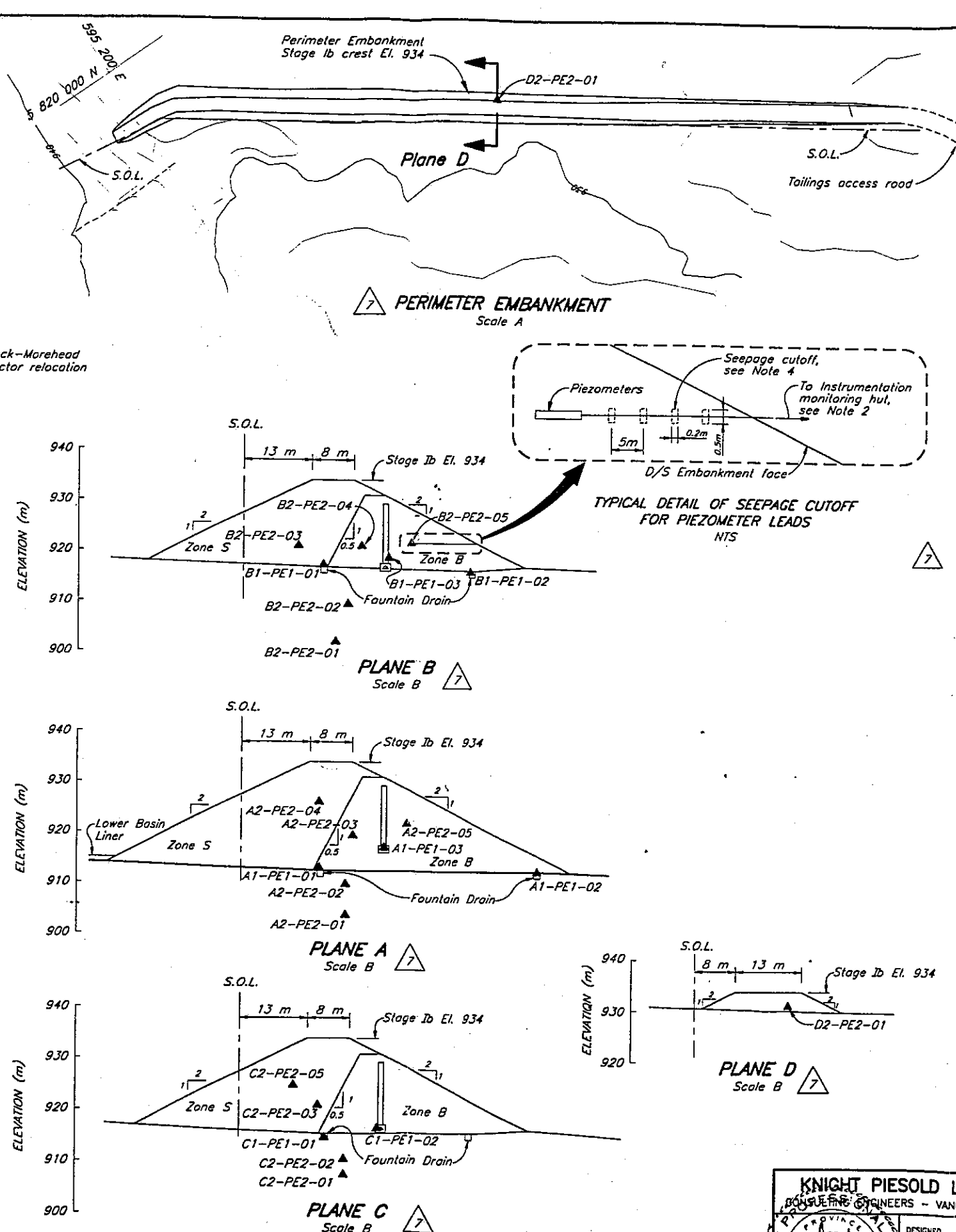
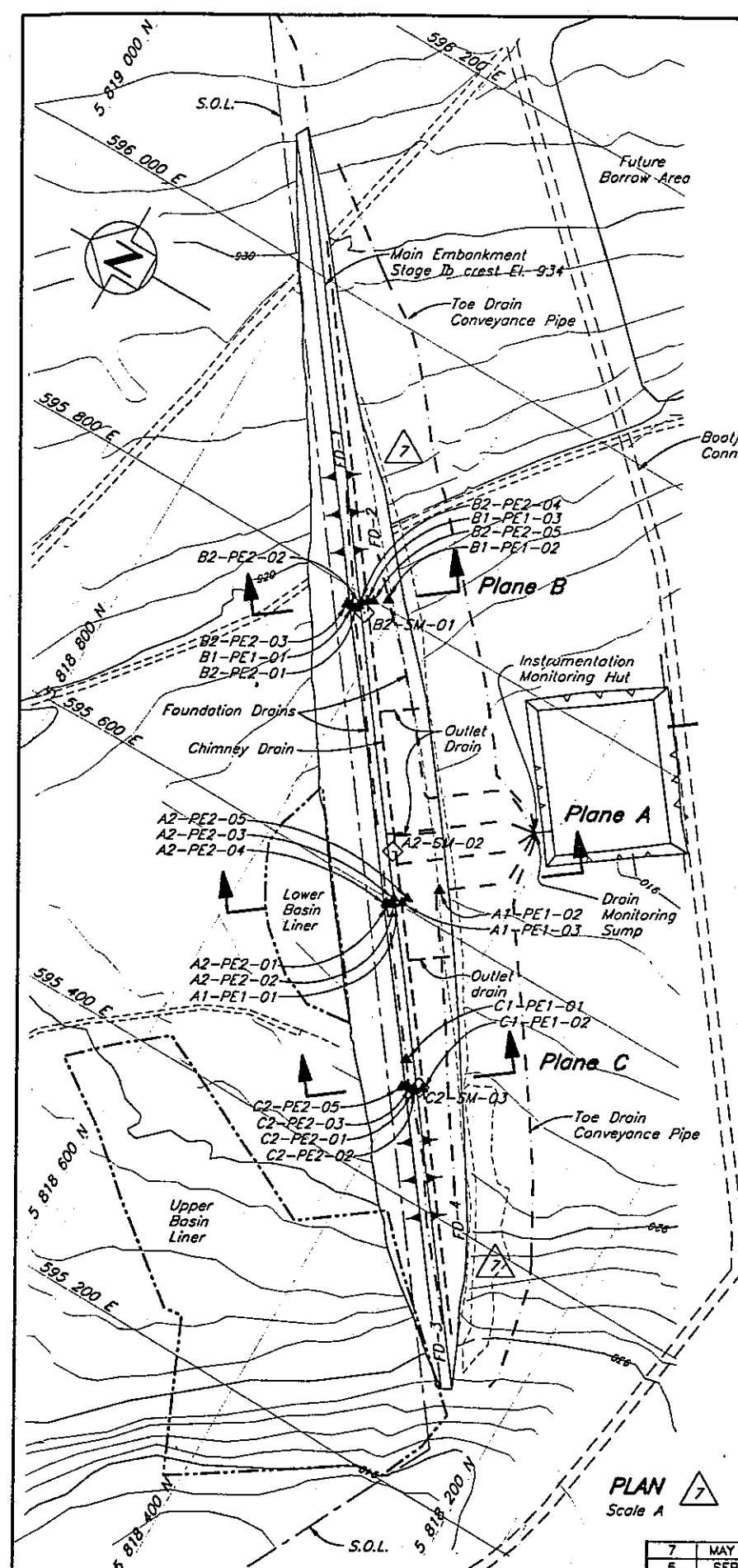
DATE **JUNE 2, 1995**

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

**TAILINGS STORAGE FACILITY
TAILINGS DISTRIBUTION AND
RECLAIM SYSTEM - PLAN**

SCALE AS SHOWN DRG. NO. **1625.218** REV. **7**



PIEZOMETER No.	LEAD LENGTH (m)	NORTHING	EASTING	ELEV.
A1-PE1-03	200	5 818 476.8220	595 602.380	917.17
A1-PE1-01	175	5 818 486.650	595 595.060	912.99
A1-PE1-02	150	5 818 456.420	595 626.250	912.14
A2-PE2-01	200	5 818 482.710	595 598.140	903.7
A2-PE2-02	200	5 818 482.710	595 598.140	909.8
A2-PE2-03	175	5 818 484.196	595 598.140	919.43
A2-PE2-04	200	5 818 487.510	595 595.995	926.07
A2-PE2-05	175	5 818 475.061	595 607.560	921.87
B1-PE1-03	305	5 818 622.780	595 797.260	918.69
B1-PE1-01	300	5 818 632.550	595 787.910	917.27
B1-PE1-02	275	5 818 609.040	595 806.770	915.95
B2-PE2-01	325	5 818 628.270	595 787.880	902.00
B2-PE2-02	325	5 818 627.470	595 790.660	909.50
B2-PE2-03	325	5 818 635.530	595 786.970	921.00
B2-PE2-04	330	5 818 626.940	595 794.190	921.00
B2-PE2-05	325	5 818 619.014	595 799.804	921.70
C1-PE1-01	325	5 818 410.500	595 496.070	914.70
C1-PE1-02	330	5 818 410.500	595 496.070	916.60
C2-PE2-01	350	5 818 392.410	595 478.240	907.50
C2-PE2-02	350	5 818 392.410	595 478.240	910.50
C2-PE2-03	325	5 818 399.106	595 478.824	920.97
C2-PE2-05	325	5 818 402.343	595 475.326	924.84
D1-PE1-01	90	-	-	-
D2-PE2-01	85	5 818 768.104	595 506.055	931.00

* D1-PE1-01 to be installed during Stage II construction.

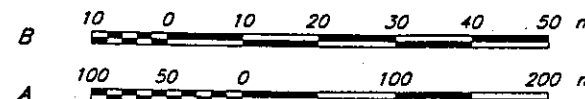
NOTES

1. Piezometers are vibrating type, RST model VW-2100 with a pressure rating of 100 psi or equivalent, connected to a readout panel via standard non-vented model VW-232 direct burial cable.
2. Piezometer leads are to be extended to Instrumentation Monitoring Hut after foundation preparation for final embankment during Stage II construction.
3. Future survey monuments not shown. A minimum of 2 monuments will be installed for each embankment raise.
4. Seepage cutoffs placed at 5m intervals with 10% bentonite added to fine grained till backfill, see Drg. No. 1625.221.
5. As-built information provided by Mount Polley Mining Corporation.
6. Topography has not been updated for 1997 flyover.
7. Installation details for borehole piezometers as shown on Drg. No. 1625.221.

LEGEND

- Plane I.D. (A, B etc.)
- Area (0-Tailings, 1-Drain, 2-Embankment)
- A0-PE1-01-Number I.D.
- Pressure Rating (1-Low, 2-High)
- Type of Instrumentation (PE-Piezometer electric, SM-Survey Monument)

- A1-PE1-01 Embankment drain piezometer (Foundation drain and Chimney drain)
- A2-PE2-01 Embankment foundation and fill piezometer
- A2-SM-01 Embankment survey monument



DRG. NO.	DESCRIPTION
1625.221	TSF - INSTRUMENTATION - SECTIONS AND DETAILS

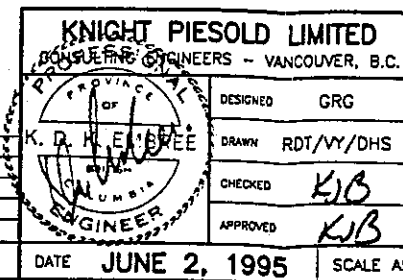
REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	APPROVED
7	MAY 30/97	AS-BUILT PIEZOMETER LOCATIONS	KJB
6	SEP 4/96	REVISED PIEZO. LOCATIONS	
5	MAY 24/96	ISSUED FOR CONSTRUCTION	
4	APR 1/96	PIEZOMETER INFORMATION ADDED	

REVISIONS

REV.	DATE	DESCRIPTION	APPROVED
3	MAR 25/96	ROAD UPDATED	
2	JAN 18/96	REVISED SEEPAGE COLLECTION POND	
1	JUL 27/95	BASIN GROUNDWATER DRAINS REVISED	
0	JUN 2/95	ISSUED FOR TENDER	

REVISIONS



MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

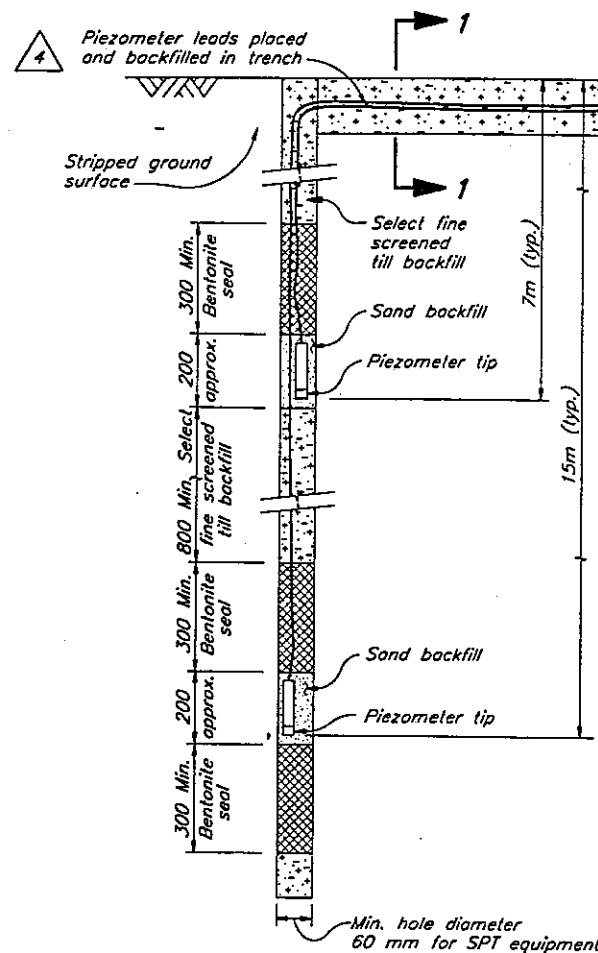
TAILINGS STORAGE FACILITY
INSTRUMENTATION

DATE JUNE 2, 1995

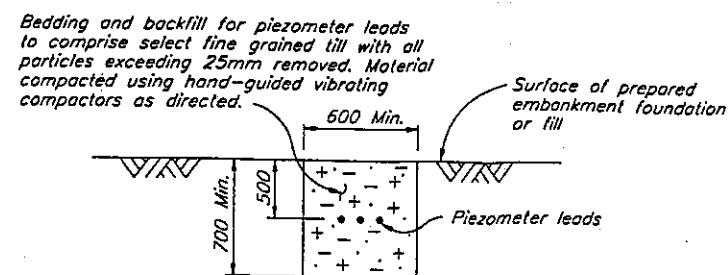
SCALE AS SHOWN

DRG. NO. 510-77-01-1625.220

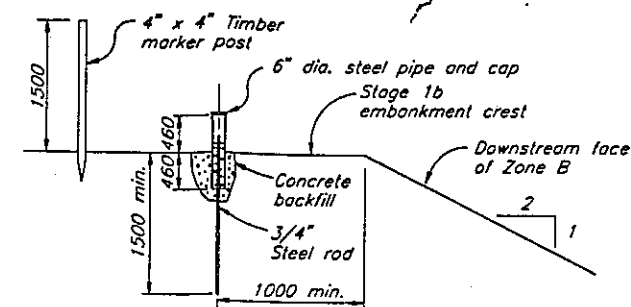
REV. 7



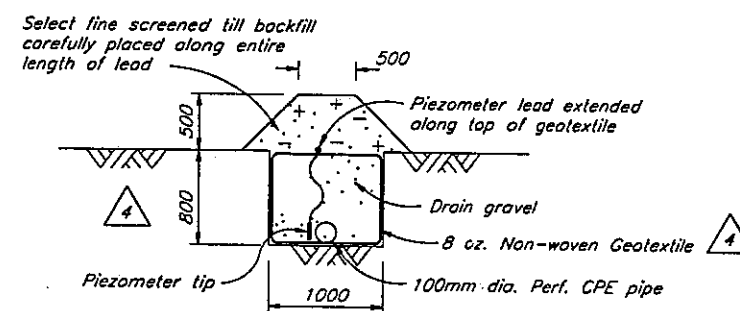
DETAIL A
INSTALLATION OF PIEZOMETERS
IN BOREHOLES
N.T.S.



SECTION 1
TYPICAL SECTION THROUGH PIEZOMETER LEAD
TRENCH IN PREPARED EMBANKMENT FOUNDATION
OR IN ZONE S AND B FILL
N.T.S.



DETAIL OF
SURFACE MOVEMENT MONUMENT
N.T.S.



DETAIL C
TYPICAL PIEZOMETER INSTALLATION IN
EMBANKMENT FOUNDATION DRAIN OR TOE DRAIN
N.T.S.

NOTES

1. Dimensions are in millimeters unless otherwise noted.
2. Tailings piezometers to be installed during future investigation programs.

Scale 1000 500 0 1000 2000 mm

1625.220	TAILINGS STORAGE FACILITY - INSTRUMENTATION
DRG. NO.	DESCRIPTION

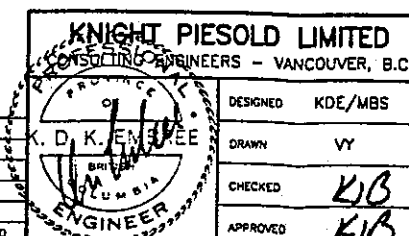
REFERENCE DRAWINGS

REV.	DATE	DESCRIPTION	APPROVED
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REVISIONS

4	MAY 30/97	PARSHALL FLUME DELETED	
3	MAR 24/96	ISSUED FOR CONSTRUCTION	
2	APR 1/96	NOTE ADDED	
1	JAN. 18/96	GROUNDWATER DRAINS REMOVED	
0	JUNE 2/95	ISSUED FOR TENDER	
REV.	DATE	DESCRIPTION	APPROVED

REVISIONS



DATE JUNE 2, 1995

SCALE AS SHOWN

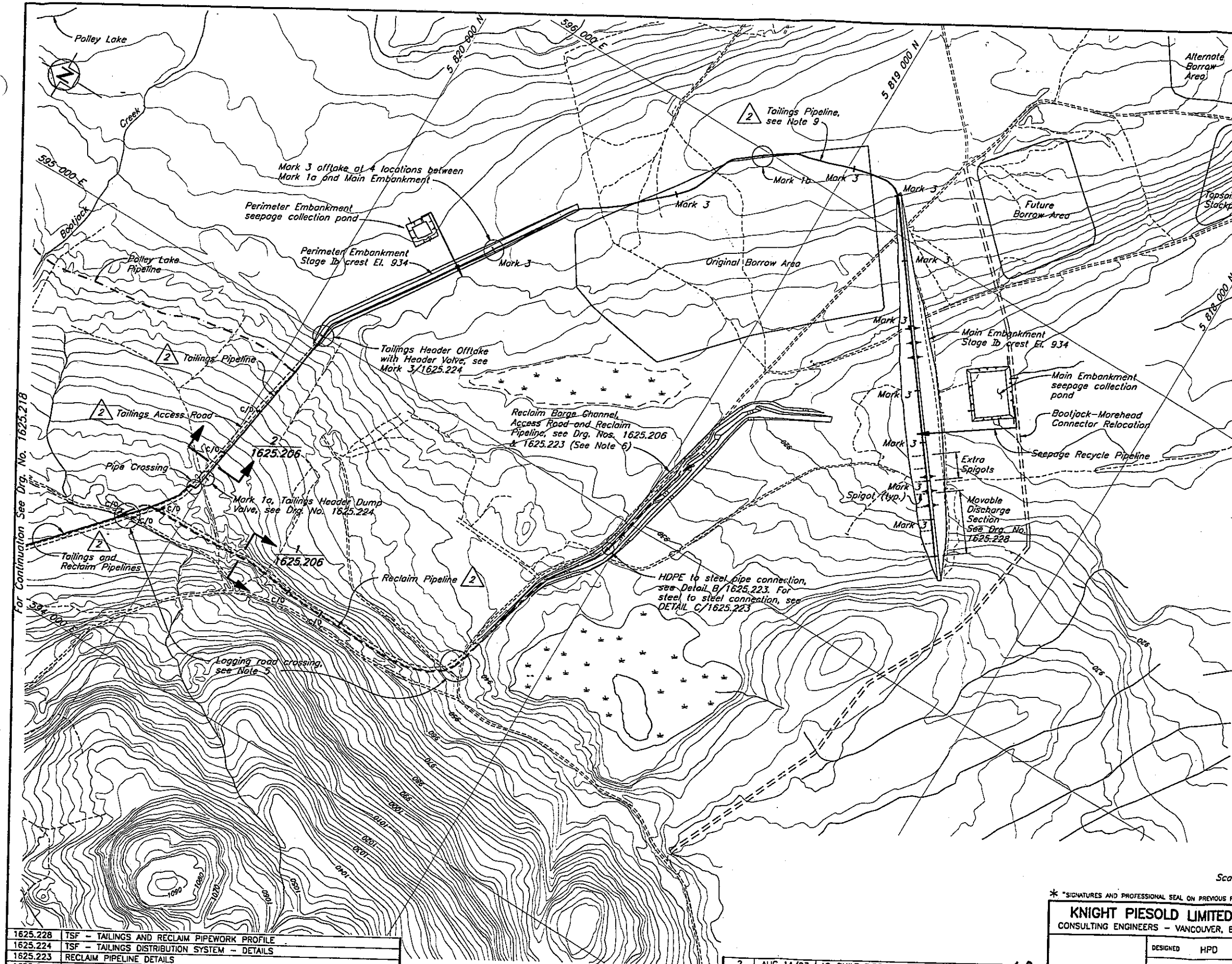
MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY
INSTRUMENTATION
SECTIONS AND DETAILS

DRG. NO. 510-77-02-1625.221

REV. 4



NOTES

1. Tailings and reclaim pipeline profiles shown on Drg. No. 1625.228.
2. Mark 3 offtakes temporarily omitted, (flange locations shown). Pipe sections have flanged joints to permit Mark 3 offtakes to be installed as required.
3. Mark 2 and 4 offtakes have been revised and are included on the movable discharge section, as shown on Drg. No. 1625.224.
4. All bends in tailings and reclaim HDPE pipelines are made using natural flexibility of pipe unless otherwise noted. Minimum bend radius to be 25 pipe diameter.
5. Pipelines at logging road crossings to be sleeved in 900 mm ϕ x 2mm minimum wall CSP culvert with 500 mm minimum depth of cover. Backfill to be well graded and compacted sand and gravel.
6. Reclaim pipeline installed to original ground at El. 925 m. Additional ramps for barge to be added as required.
7. As-built information provided by Mount Polley Mining Corporation.
8. Topography has not been updated for 1997 Flyover.
9. Tailings pipeline installed on grade between Perimeter and Main Embankments. Access is provided by a rough trail near the pipeline.

For Continuation See Drg. No. 1625.218

1625.228	TSF - TAILINGS AND RECLAIM PIPEWORK PROFILE
1625.224	TSF - TAILINGS DISTRIBUTION SYSTEM - DETAILS
1625.223	RECLAIM PIPELINE DETAILS
1625.218	TAILINGS DISTRIBUTION AND RECLAIM SYSTEM - PLAN
1625.206	TSF - RECLAIM BARGE CHANNEL - EXCAVATION DETAILS
DWG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

2	AUG 14/97	AS-BUILT PIPELINES	
1	MAY 30/97	AS-BUILT BARGE CHANNEL, EMBANKMENTS, AND PONDS	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

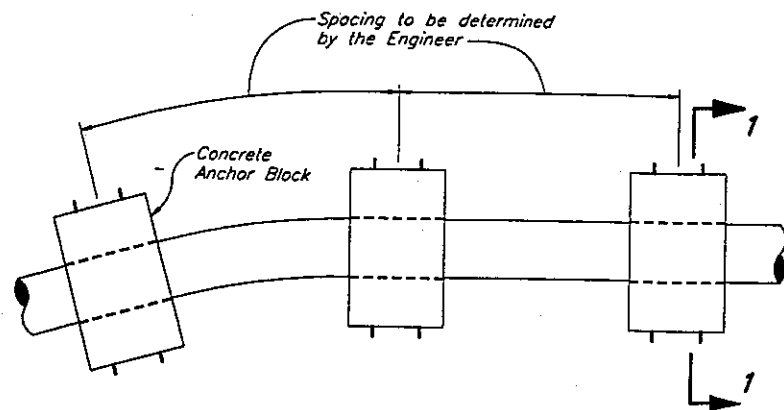
* SIGNATURES AND PROFESSIONAL SEAL ON PREVIOUS REVISION

KNIGHT PIESOLD LIMITED	
CONSULTING ENGINEERS - VANCOUVER, B.C.	
*	DESIGNED HPD
	DRAWN AW/RDT
	CHECKED *
	APPROVED *

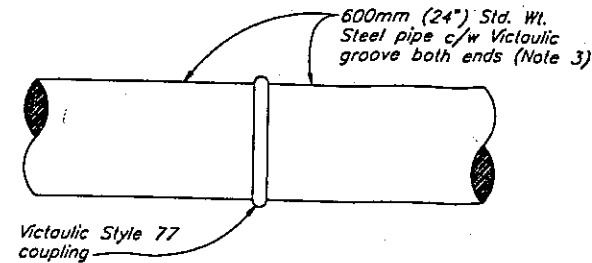
MOUNT POLLEY MINING CORPORATION	
MOUNT POLLEY PROJECT	
TAILINGS STORAGE FACILITY	
TAILINGS IMPOUNDMENT	
TAILINGS AND RECLAIM PIPEWORK PLAN	

DATE JULY 15, 1996	SCALE AS SHOWN	DWG. NO. 1625.222	REV. 2
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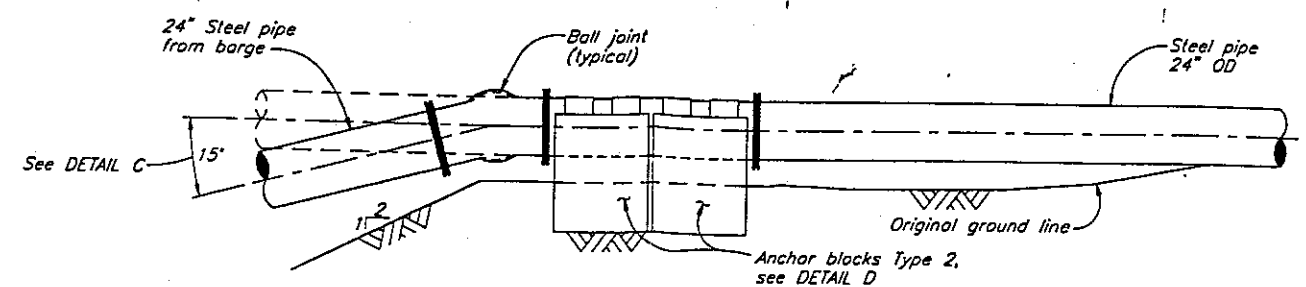
CAD FILE: 1625.222.DWG 1:50000 Plot 1-5 AUG 14, 1997



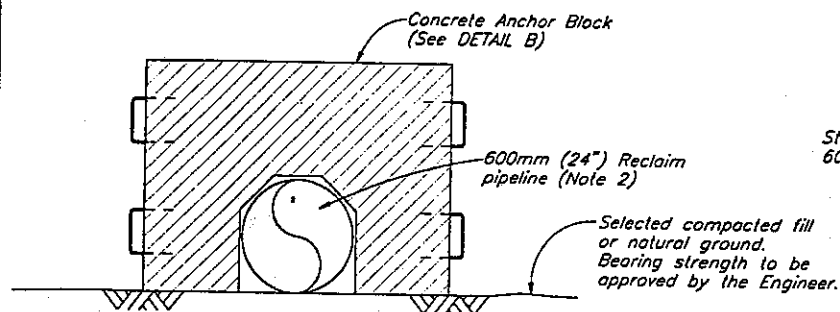
PIPELINE BEND ANCHORING
Scale B



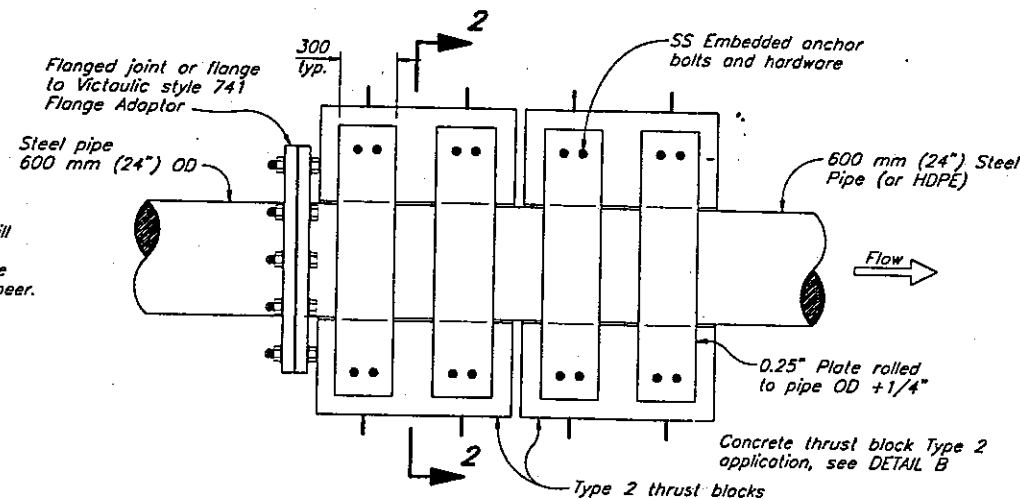
DETAIL C, 1625.222
STEEL RECLAIM PIPE CONNECTION
Scale A



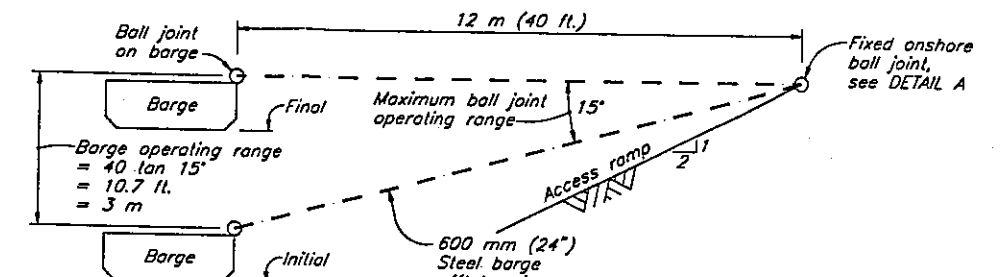
DETAIL A, 1625.206
ONSHORE BALL JOINT
Scale B



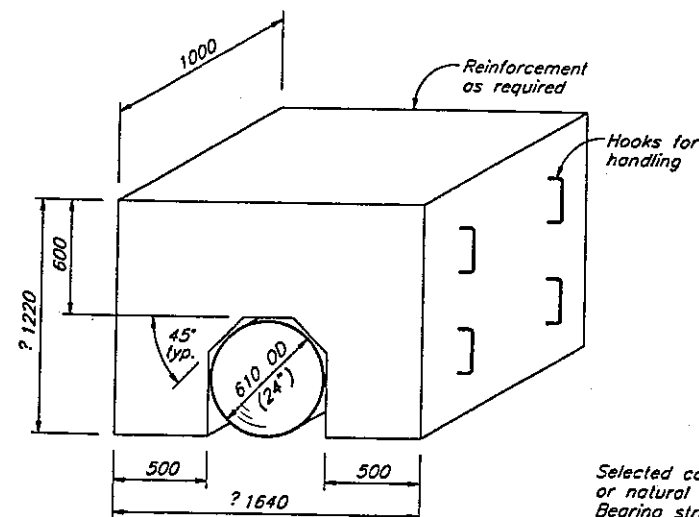
SECTION 1
CONCRETE ANCHOR BLOCK - TYPE 1 APPLICATION
Scale A



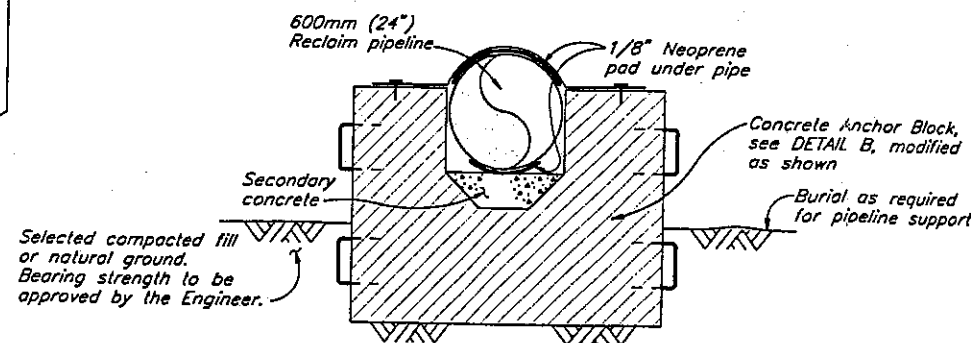
DETAIL D, 1625.222
CONCRETE THRUST BLOCK - TYPE 2 APPLICATION
CONNECTION BETWEEN STEEL AND HDPE PIPE
CONNECTION AT RECLAIM BOOSTER PUMPSTATION DISCHARGE
AND CONNECTION AT BARGE OFFTAKE BALL JOINT
Scale A



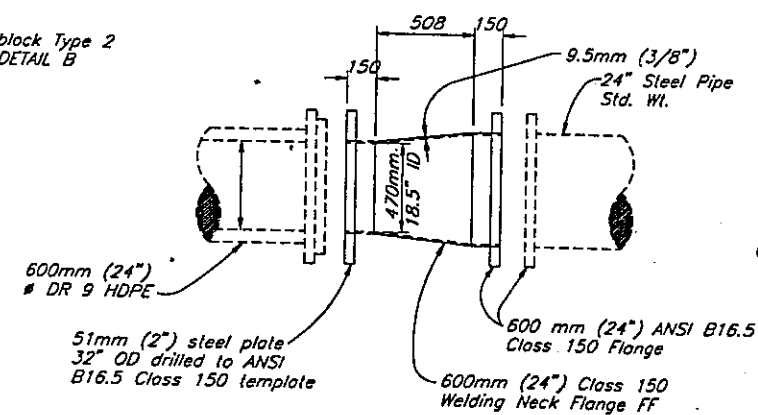
DETAIL C
BARGE OPERATING RANGE - SCHEMATIC



DETAIL B
TYPICAL PORTABLE CONCRETE BLOCK FOR 24" OD PIPE
(4.5 TONNE)
Scale A



SECTION 2
CONCRETE THRUST BLOCK - TYPE 2 APPLICATION
Scale A



DETAIL
REDUCER, SPECIAL, 24" HDPE TO STEEL
INSIDE DIAMETER ADAPTER
Scale A

NOTES

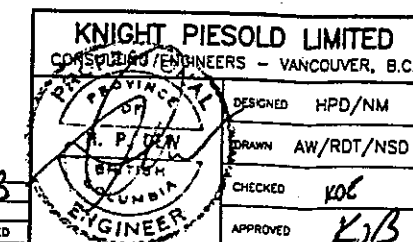
1. Concrete anchoring blocks to be used at barge ball joint and at locations where pipeline changes from steel to HDPE.
2. Anchor blocks may be used for reclaim or tailings pipeline as required by the Engineer. Modifications will be required for pipe diameter other than 24".
3. Victaulic grooves to be rolled if pipe wall thickness is less than 0.375".

B	2000	1000	0	2000	4000 mm
A	1000	500	0	1000	2000 mm

1625.224	TAILINGS DISTRIBUTION SYSTEM - DETAILS
1625.222	TAILINGS IMPOUNDMENT - TAILINGS AND RECLAIM PIPEWORK PLAN
1625.206	TSF - RECLAIM BARGE CHANNEL - EXCAVATION DETAILS
DRG. NO.	DESCRIPTION

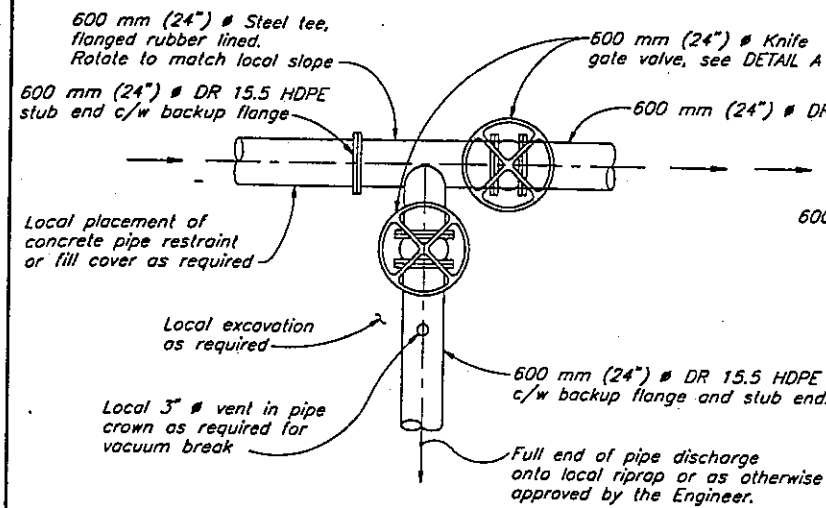
REV.	DATE	DESCRIPTION	APPROVED
1	MAY 30/97	REFERENCE TO DRAWINGS REVISED	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	

REV.	DATE	DESCRIPTION	APPROVED
1	MAY 30/97	REFERENCE TO DRAWINGS REVISED	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	



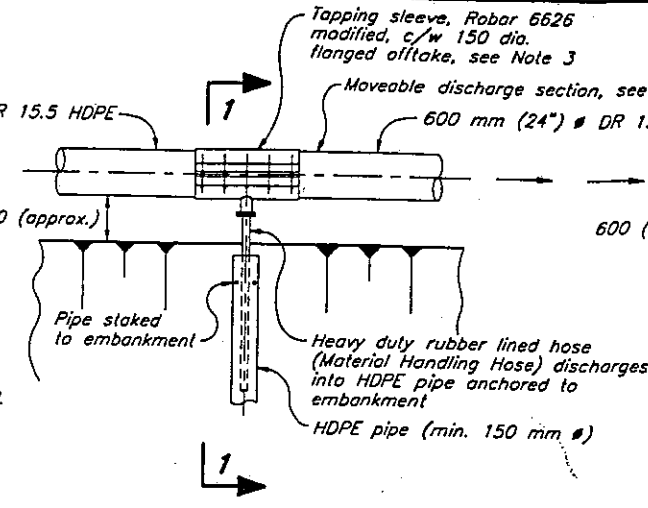
MOUNT POLLEY MINING CORPORATION
MOUNT POLLEY PROJECT
TAILINGS STORAGE FACILITY
RECLAIM PIPELINE DETAILS

DATE JULY 15, 1996 SCALE AS SHOWN DRG. NO. 1625.223 REV. 1



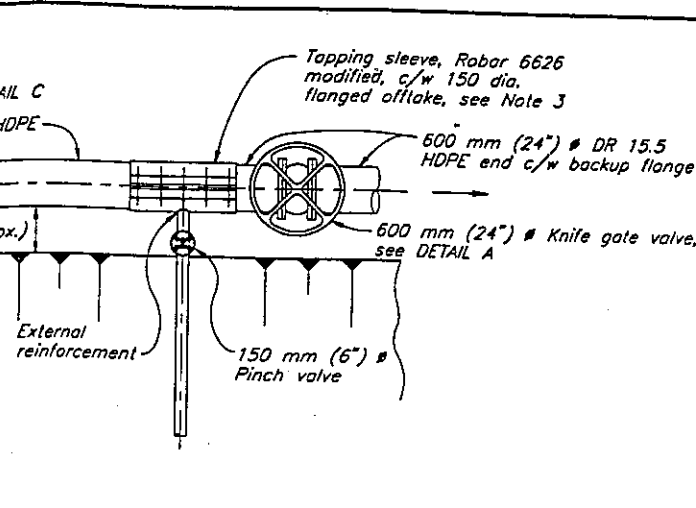
TAILINGS HEADER DUMP VALVE
(MARK 1/1625.222)

Scale A



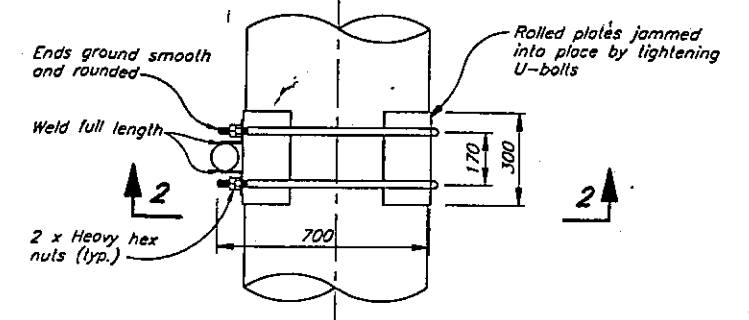
TYP. TAILINGS HEADER OFFTAKE
(MARK 2/1625.222)

Scale A

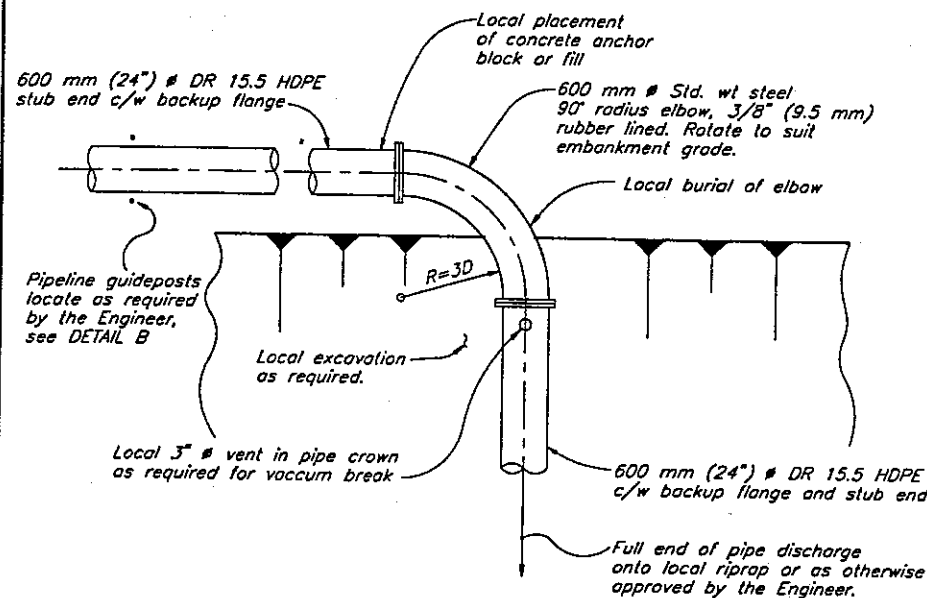


TYP. TAILINGS HEADER OFFTAKE WITH HEADER VALVE
(MARK 3/1625.222)

Scale A

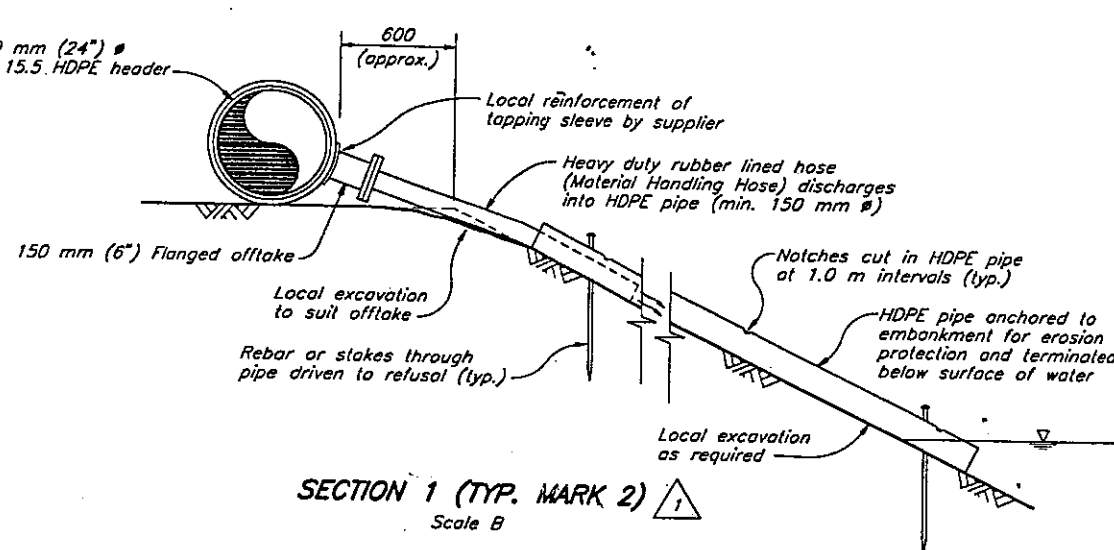


PIPE RESTRAINT FOR 24" HDPE
(Locate as required by the Engineer)
NTS



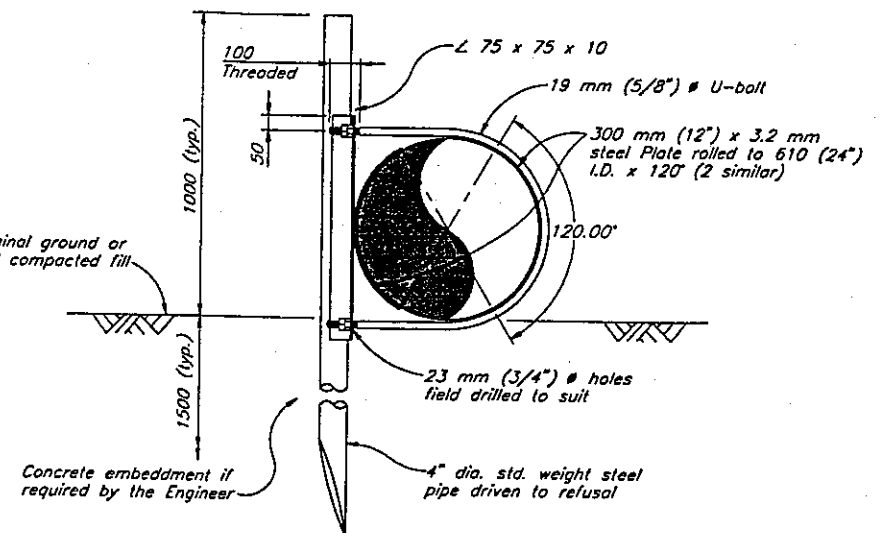
ALTERNATE TAILINGS HEADER PIPELINE TERMINATION
(MARK 4/1625.222)

Scale A



SECTION 1 (TYP. MARK 2)

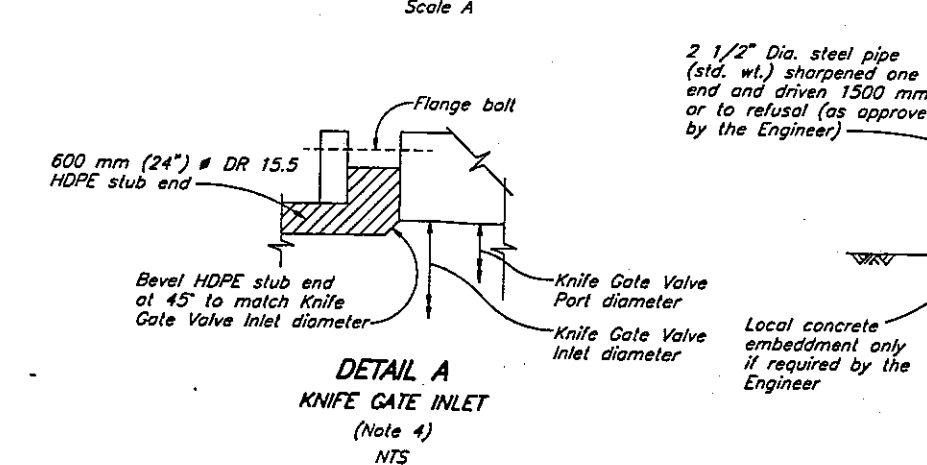
Scale B



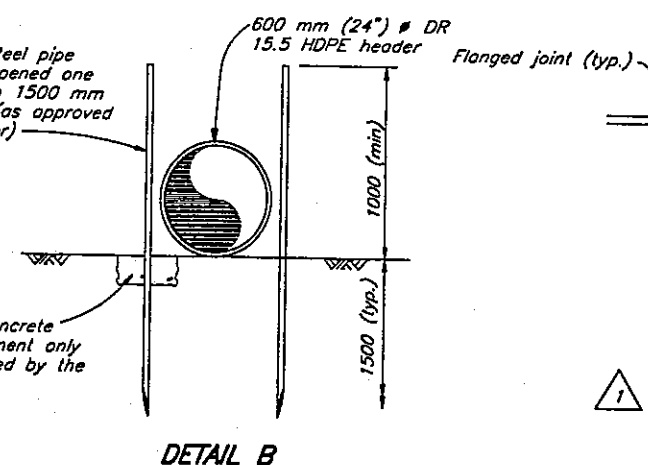
SECTION 2
NTS

NOTES

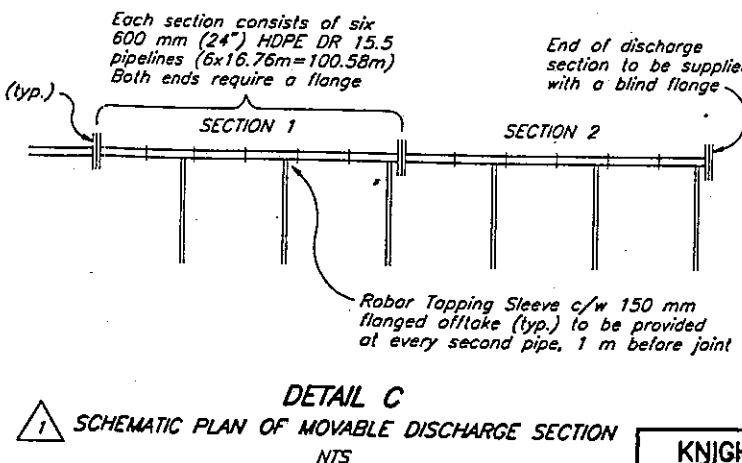
1. Rubber lining to be Linotex PCR or approved equivalent.
2. Pipe restraint by local burial of pipeline or as otherwise required by the Engineer to control movement due to thermal and hydraulic forces.
3. Robar 6626 c/w 1/4" rubber lining of offtake and external reinforcement of offtake to sleeve joint.
4. HDPE Pipe ID exceeds that of knife gate valve and is to be field bevelled to match.
5. HDPE pipelines to be connected under cool conditions with snaking allowance made for additional thermal contraction of empty pipeline.
6. Mark 2 and 3 offtakes to be added as required.



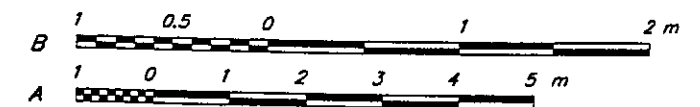
DETAIL A
KNIFE GATE INLET
(Note 4)
NTS



DETAIL B
GUIDEPOST
Scale B



DETAIL C
SCHEMATIC PLAN OF MOVABLE DISCHARGE SECTION
NTS



1625.222	TSF - TAILINGS AND RECLAIM PIPEWORK PLAN
1625.228	TSF - TAILINGS AND RECLAIM PIPEWORK PROFILES
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
1	MAY 30/97	REVISED DISCHARGE SECTION	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	

REV.	DATE	DESCRIPTION	APPROVED
1	MAY 30/97	REVISED DISCHARGE SECTION	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

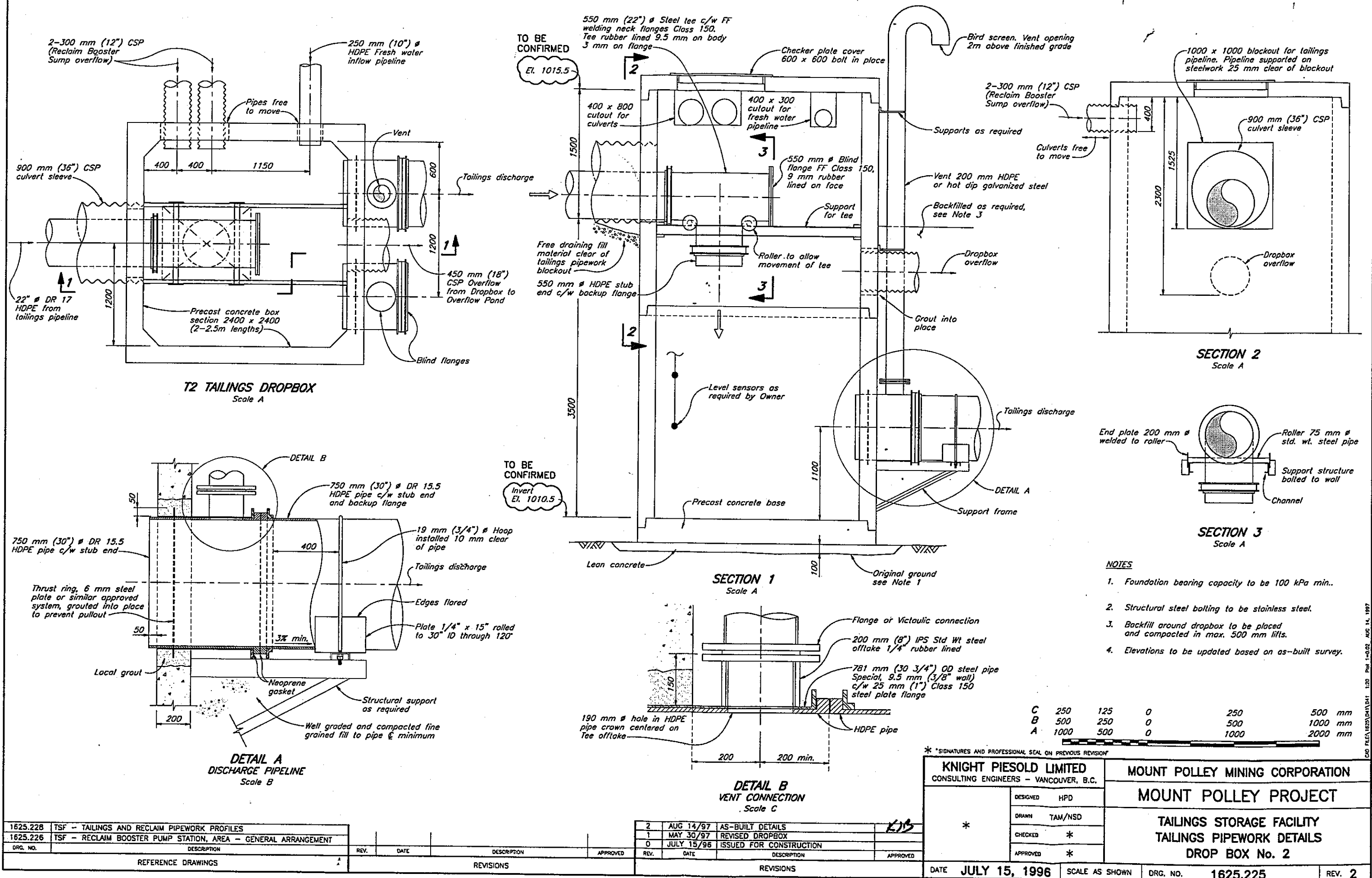
DESIGNED HPD
DRAWN AW/ROD
CHECKED KJB
APPROVED KJB

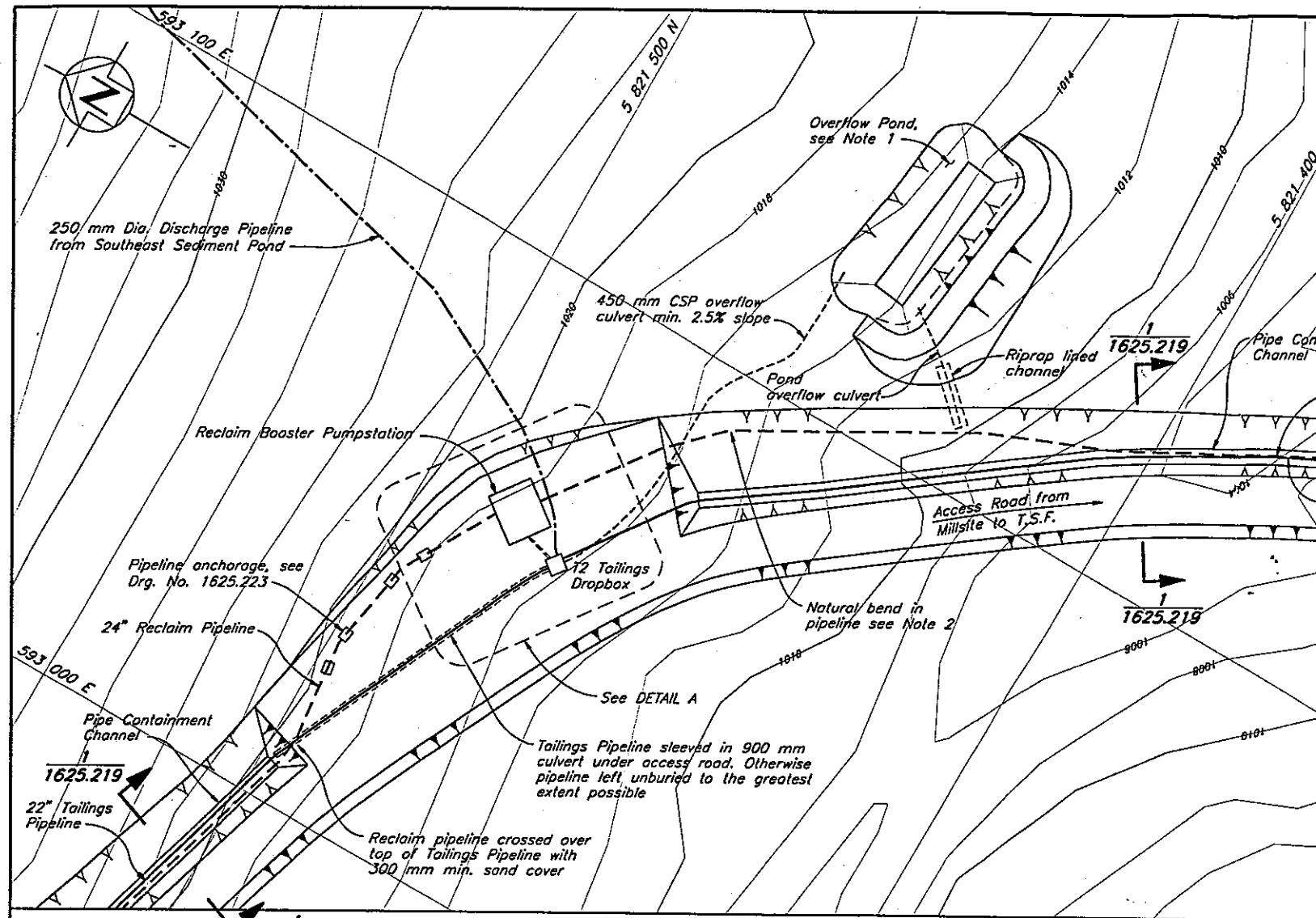
DATE JULY 15, 1996

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY
TAILINGS DISTRIBUTION SYSTEM
DETAILS





2 **DETAIL A - SCHEMATIC**
RECLAIM BOOSTER PUMPSTATION, T2 TAILINGS DROPBOX AND OVERFLOW POND

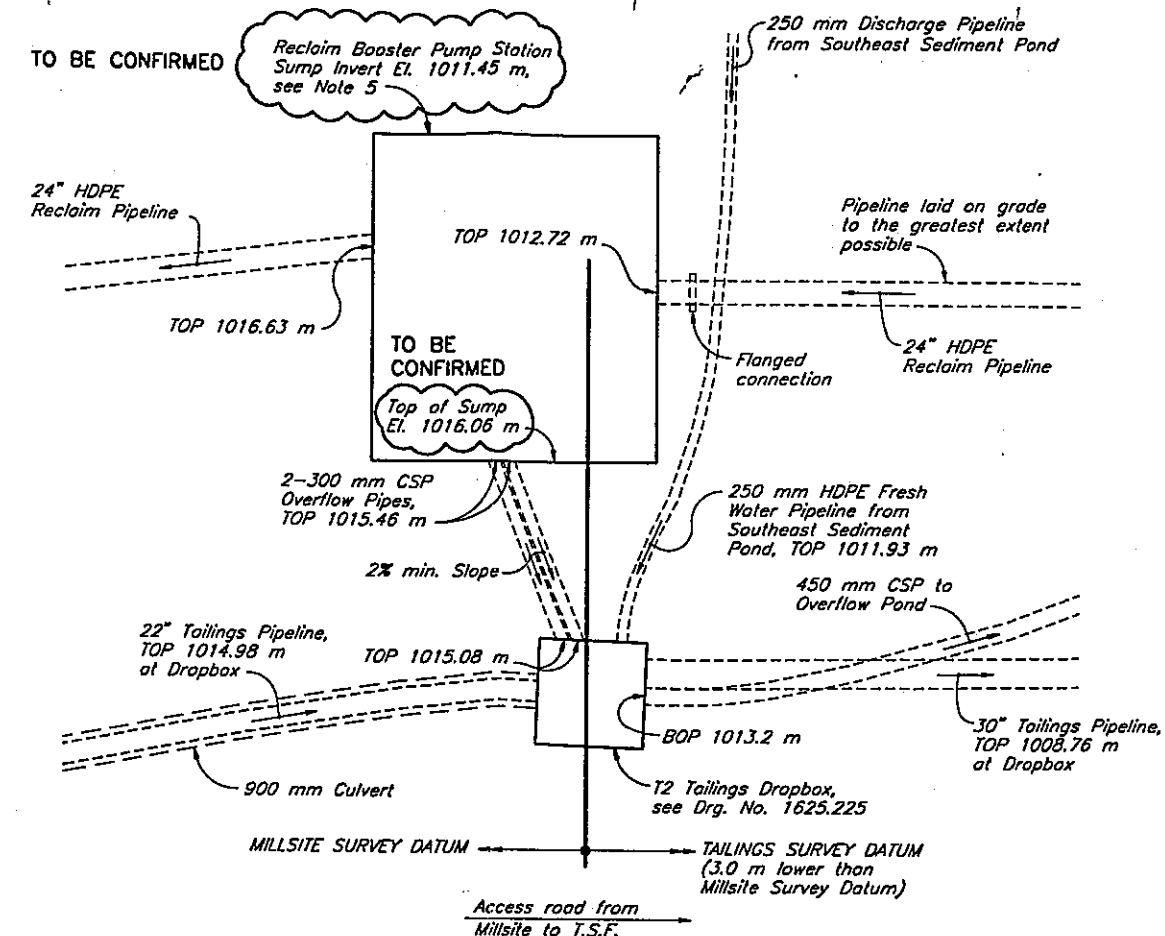
2 **NOTES**

1. The 500 m³ capacity of the Overflow Pond, is sufficient to contain the contents of the upstream tailings pipeline. Pond located by Mount Polley Mining Corporation.
2. Radius of natural bends in HDPE pipelines not to be less than 25 pipe diameters.
3. Tailings and Reclaim pipelines uniformly graded between pipe containment channel and structures without high or low points.
4. Details of pipelines into Reclaim Booster Pumpstation sump determined in conjunction with CSFM.
5. Invert of pipe containment channel is assumed to be 1 m below local road elevation.
6. Local riprap required where 450 mm CSP overflow culvert exits overflow pond.
7. Top of discharge culvert for overflow pond to be 1000 mm below top of overflow pond.
8. As-built information provided by Mount Polley Mining Corporation.
9. Topography not updated by 1997 Flyover.
10. Pipeline elevations from Tailings Storage Facility to T2 Dropbox and Booster Pumpstation are based on Tailings Survey Datum (3.0 m lower than Millsite Datum). Survey control break is shown at the T2 Dropbox and Booster Pumpstation.

1625.225	TSF - TAILINGS PIPEWORK DETAILS - DROP BOX No. 2
1625.223	TSF - RECLAIM PIPELINE DETAILS
1625.219	TSF - TAILINGS DISTRIBUTION & RECLAIM SYSTEM - SECTIONS & DETAILS
1625.218	TSF - TAILINGS DISTRIBUTION & RECLAIM SYSTEM - PLAN
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

2	AUG 14/97	AS-BUILT PIPELINES	LJB
1	MAY 30/97	REVISED LOCATION	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			



2 **DETAIL A - SCHEMATIC**
NTS

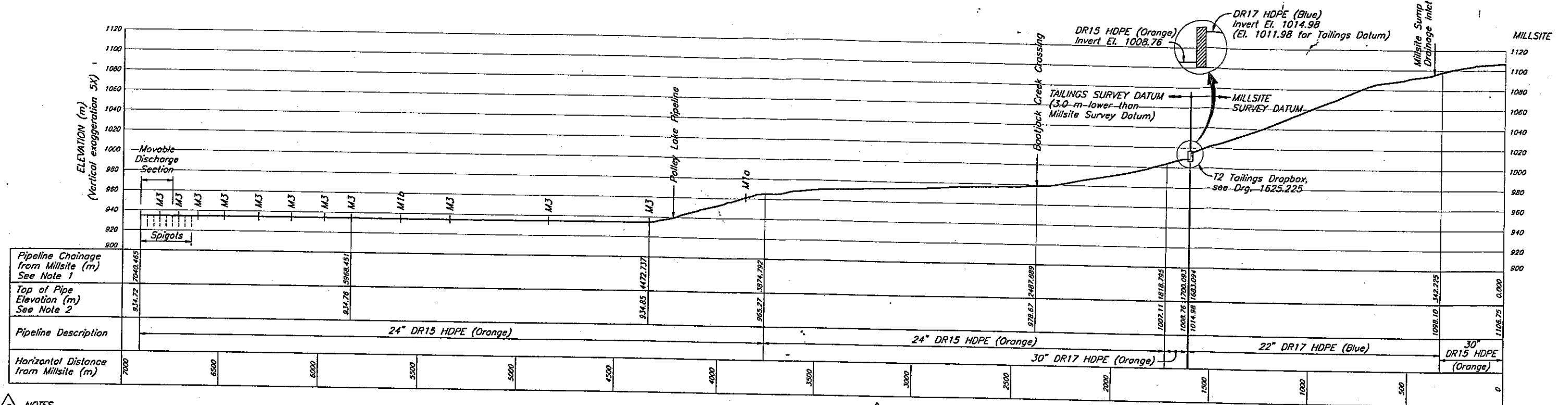
LEGEND

TOP Top of Pipe
BOP Bottom of Pipe



* "SIGNATURES AND PROFESSIONAL SEAL ON PREVIOUS REVISION"

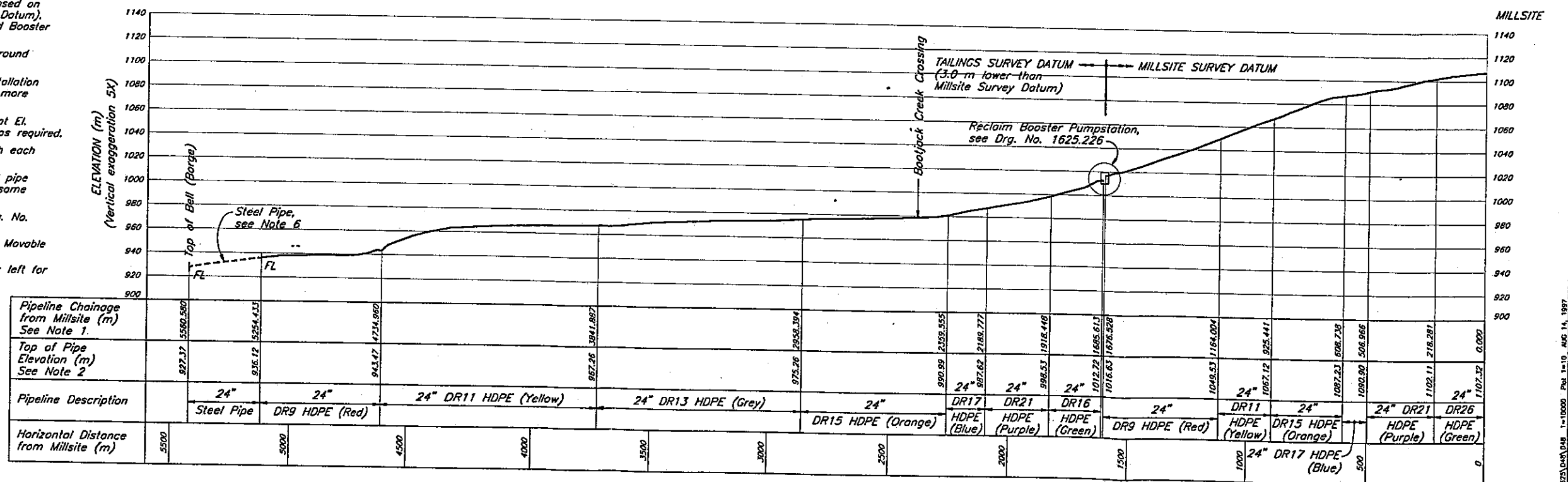
KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.		MOUNT POLLEY MINING CORPORATION	
*	DESIGNED	HPD/NM	MOUNT POLLEY PROJECT TAILINGS STORAGE FACILITY RECLAIM BOOSTER PUMP STATION AREA GENERAL ARRANGEMENT
	DRAWN	VY	
	CHECKED	*	
	APPROVED	*	
DATE JULY 15, 1996		SCALE AS SHOWN	DRG. NO. 1625.226
			REV. 2



2 NOTES

- Pipeline chainage is based on top of pipe (TOP) As-Built Survey.
- Pipeline elevations from Tailings Storage Facility to T2 Dropbox and Reclaim Booster Pumpstation are based on Tailings Survey Datum (3.0 m lower than Millsite Datum). Survey control break is shown at T2 Dropbox and Booster Pumpstation.
- Flanges in pipelines must be supported off the ground if pipelines are dragged into position.
- Any section of HDPE pipeline damaged during installation by a local reduction in wall thickness of 10% or more cut out and replaced.
- Reclaim pipeline installed only to original ground at El. 925 m. Additional ramps for barge to be added as required.
- All steel and HDPE DR9 pipeline to be moved with each barge relocation.
- Butt fusion joining of lower DR pipe to higher DR pipe requires end of lower DR pipe to be bevelled to same inside diameter as higher DR pipe.
- Tailings offtakes (Mark 1 to 4) are shown on Drg. No. 1625.224.
- Mark 2 and 4 offtakes not installed. Replaced by Movable Discharge Section.
- Mark 3 offtakes not installed. Flanged connections left for future use.

TAILINGS PIPELINE PROFILE 2



RECLAIM PIPELINE PROFILE 2

LEGEND

- FL Flange Joints
- M1 Mark 1 Offtake (2)
- M2 Mark 2 Offtake
- M3 Mark 3 Offtake (10)
- M4 Mark 4 Offtake
- DR9 HDPE Pipe Dimensional Ratio (typical)

1625.226	TSF - RECLAIM BOOSTER PUMP STATION AREA - GENERAL ARRANGEMENT
1625.225	TSF - TAILINGS PIPEWORK DETAILS - DROP BOX NO. 2
1625.224	TSF - TAILINGS DISTRIBUTION SYSTEM - DETAILS
1625.206	TSF - RECLAIM BARGE CHANNEL - EXCAVATION DETAILS

REV. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
1					
2					

REV. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
1					
2					

REV. NO.	DATE	DESCRIPTION	APPROVED
2	AUG 14/97	AS-BUILT PIPELINES	
1	MAY 30/97	REVISED DROPBOX/PUMPSTATION LOCATIONS	
0	JULY 15/96	ISSUED FOR CONSTRUCTION	

* SIGNATURES AND PROFESSIONAL SEAL ON PREVIOUS REVISION

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

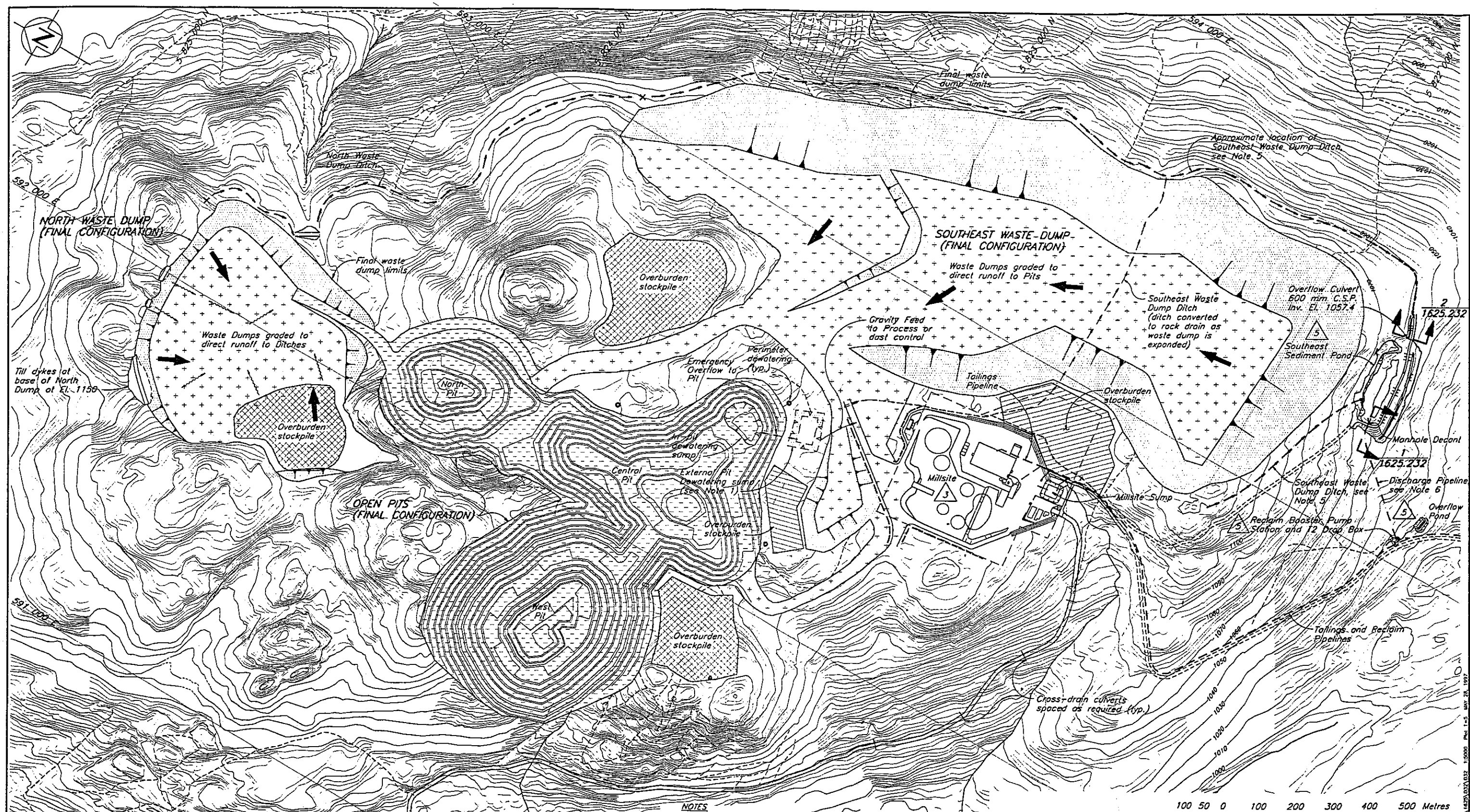
DESIGNED HPD
DRAWN NAR
CHECKED *
APPROVED *

MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

TAILINGS STORAGE FACILITY
TAILINGS AND RECLAIM
PIPEWORK PROFILES

DATE JULY 15, 1996 SCALE AS SHOWN DRG. NO. 1625.228 REV. 2



- NOTES**
1. External Pit Dewatering Sump to be installed as required.
 2. Open Pit and Waste Dump layouts digitized from information supplied by Mount Polley Mining Corporation.
 3. Location of Southeast Sediment Pond by Others.
 4. As-built information provided by Mount Polley Mining Corporation.
 5. As-built survey of Southeast Waste Ditch will be provided by Mount Polley Mining Corporation.
 6. As-built survey of Discharge Pipeline will be provided by Mount Polley Mining Corporation.

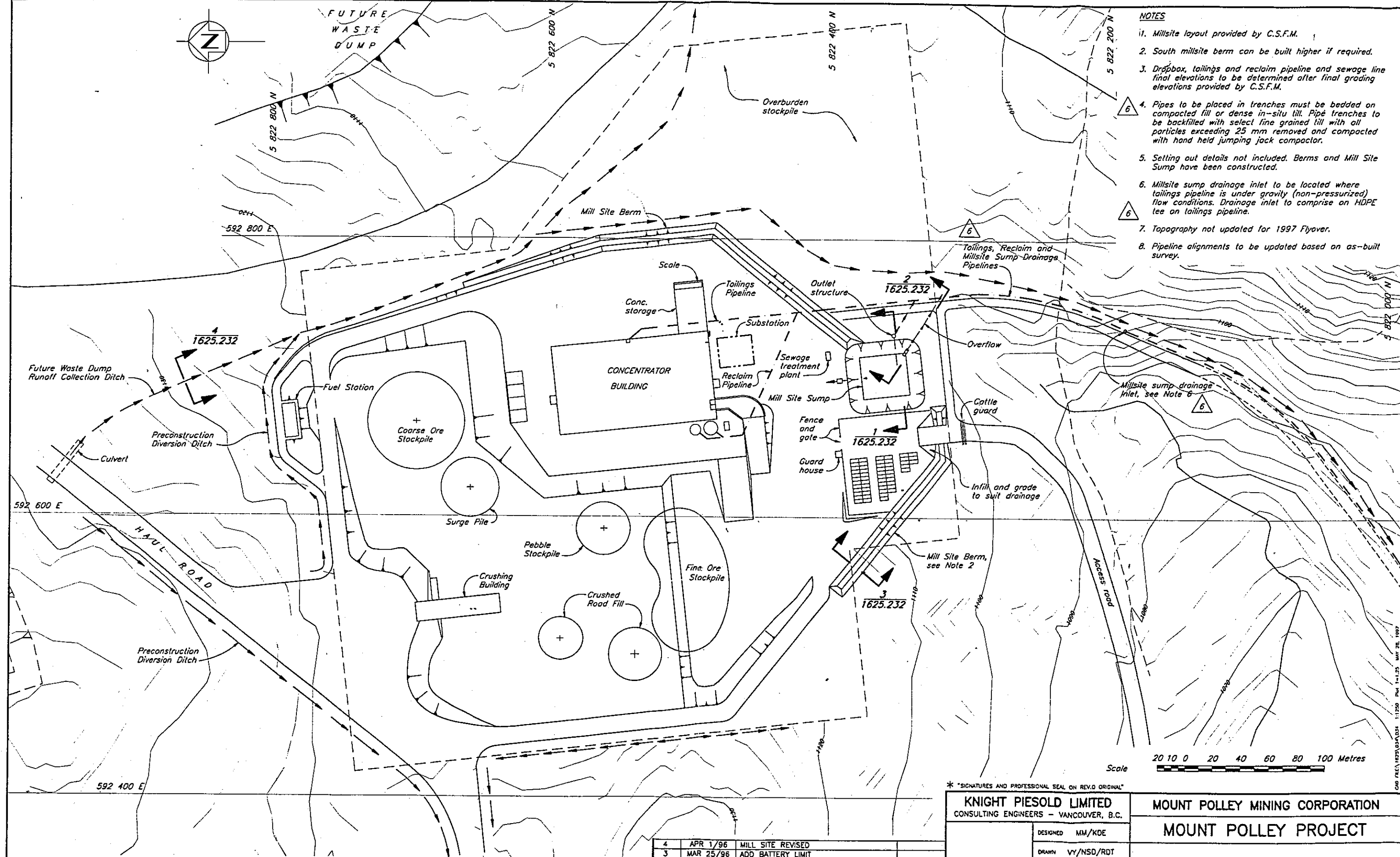
* SIGNATURES AND PROFESSIONAL SEAL ON REV'D ORIGINAL

KNIGHT PIESOLD LIMITED CONSULTING ENGINEERS - VANCOUVER, B.C.	
DESIGNED	KDE/MM
DRAWN	RDT/VY/NSD
CHECKED	*
APPROVED	*

MOUNT POLLEY MINING CORPORATION MOUNT POLLEY PROJECT	
DRAINAGE PLAN MINE SITE	

DRG. NO.	DESCRIPTION	REV.	DATE	DESCRIPTION	APPROVED
1625.232	DRAINAGE PLAN - SECTIONS AND DETAILS	5	MAY 8/97	UPDATED SOUTHEAST SEDIMENT POND	KDE
		4	JULY 15/96	RELOCATE BOOSTER PUMP STATION	
		3	APRIL 1/96	MILLSITE AND CONTROL POND REVISED	

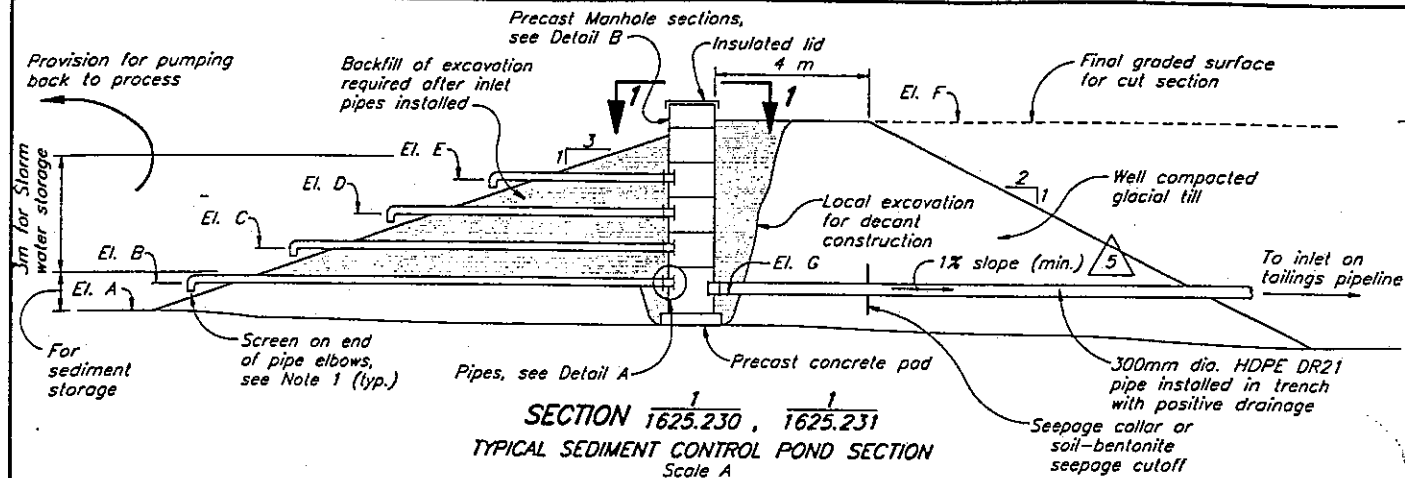
REV.	DATE	DESCRIPTION	APPROVED
2	MAR 20/96	UPDATE DRAINAGE, MILLSITE & SOUTH SEDIMENT CONTROL POND	
1	MAR 14/96	UPDATED OPEN PITS, WASTE DUMPS, SITE DRAINAGE	
0	AUG 24/95	ISSUED FOR CONSTRUCTION	



- NOTES**
1. Millsite layout provided by C.S.F.M.
 2. South millsite berm can be built higher if required.
 3. Dropbox, tailings and reclaim pipeline and sewage line final elevations to be determined after final grading elevations provided by C.S.F.M.
 4. Pipes to be placed in trenches must be bedded on compacted fill or dense in-situ till. Pipe trenches to be backfilled with select fine grained till with all particles exceeding 25 mm removed and compacted with hand held jumping jack compactor.
 5. Setting out details not included. Berms and Mill Site Sump have been constructed.
 6. Millsite sump drainage inlet to be located where tailings pipeline is under gravity (non-pressurized) flow conditions. Drainage inlet to comprise an HDPE tee on tailings pipeline.
 7. Topography not updated for 1997 Flyover.
 8. Pipeline alignments to be updated based on as-built survey.



1625.232 DRAINAGE PLAN - SECTIONS AND DETAILS				6 MAY 30/97 REVISED MILLSITE SUMP DRAINAGE INLET				2 MAR 20/96 UPDATE DRAINAGE AND MILLSITE				* CHECKED * APPROVED *		DRAINAGE PLAN MILLSITE					
5 JULY 15/96 OVERFLOW POND NO. 1 ADDED				1 MAR 14/96 RELOCATED OPEN PIT SUMP				0 AUG 24/95 ISSUED FOR CONSTRUCTION											
DRG. NO. DESCRIPTION				REV. DATE DESCRIPTION APPROVED				REV. DATE DESCRIPTION APPROVED											
REFERENCE DRAWINGS				REVISIONS				REVISIONS				DATE AUG. 24, 1995		SCALE AS SHOWN		DRG. NO. 1625.231		REV. 6	



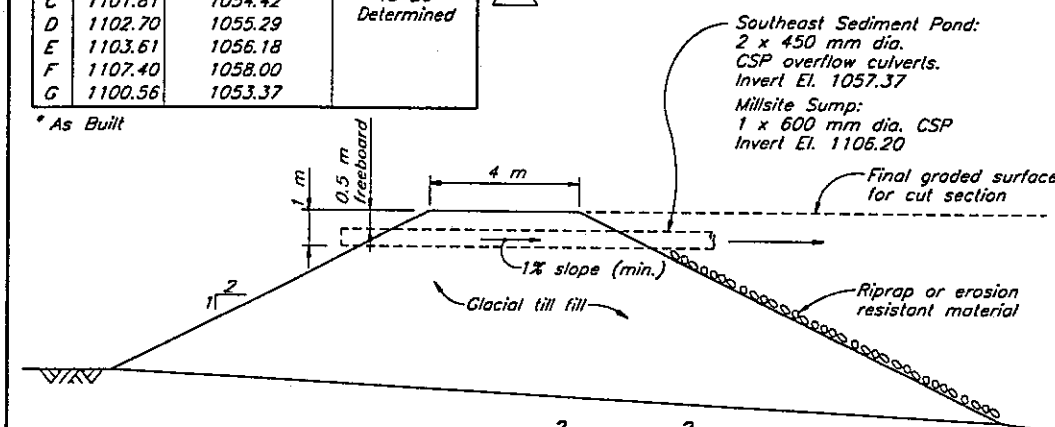
SECTION 1625.231
TYPICAL DITCH SECTION
Scale A

DITCH DIMENSIONS		
Ditch	W(m)	D(m)
All Mill Site Diversion Ditches	1.0	0.35
All Waste Dump Ditches	1.0	0.6

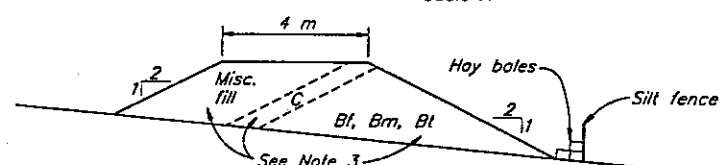
- 5 NOTES
1. Pipe elbows provided for oil skimming.
 2. Sediment control pond fill sections to be constructed using suitable glacial till materials from local excavations.
 3. Fill sections to be constructed in max. 0.5 m lifts and compacted prior to the placement of the next lift.
 4. Silt fence and hay bales provided for sediment control.
 5. Rockfill to comprise clean coarse gravel and cobbles.
 6. All pond excavations and fill sections to be completed in low permeability glacial till materials.

El.	Millsite Sump *	Southeast Sediment Pond *	Pit Dewatering Sump
A	1100.00	1052.20	To Be Determined
B	1100.91	1053.56	
C	1101.81	1054.42	
D	1102.70	1055.29	
E	1103.61	1056.18	
F	1107.40	1058.00	
G	1100.56	1053.37	

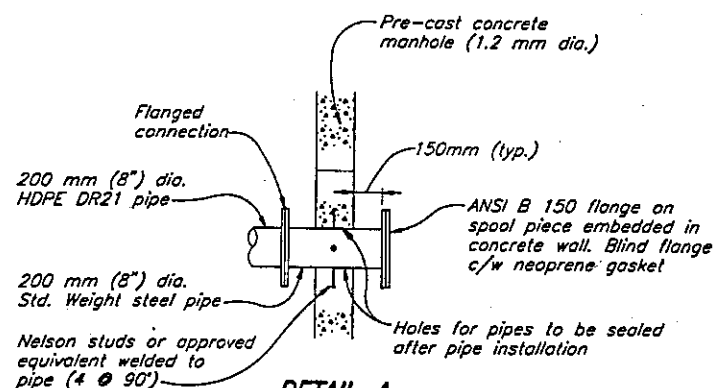
* As Built



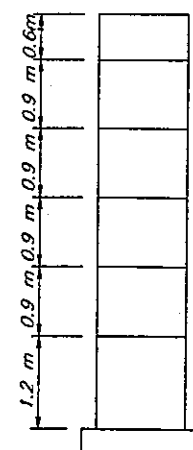
SECTION 1625.230, 1625.231
TYPICAL SEDIMENT CONTROL POND OVERFLOW CULVERT
Scale A



SECTION 1625.231
MILLSITE BERM SECTION
Scale A



DETAIL A
Scale C



DETAIL B
TYPICAL MANHOLE SECTIONS
FOR 5 m DEEP POND
NTS

1625.230	DRAINAGE PLAN - MINE SITE
1625.231	DRAINAGE PLAN - MILL SITE
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

5	MAY 8/97	ELEVATIONS MODIFIED	
4	JULY 15/96	DETAIL AND ELEVATIONS MODIFIED	
3	APR 1/96	UPDATE SEDIMENT CONTROL POND	
2	MAR 20/96	UPDATE SEDIMENT CONTROL POND	
1	MAR 14/96	UPDATE DITCHES AND NOTE 3 ADDED	
0	AUG 24/95	ISSUED FOR CONSTRUCTION	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

* SIGNATURES AND PROFESSIONAL SEAL ON REV'D ORIGINAL

KNIGHT PIESOLD LIMITED
CONSULTING ENGINEERS - VANCOUVER, B.C.

*	DESIGNED	KDE/MM
	DRAWN	RD/NSD
	CHECKED	*
	APPROVED	*

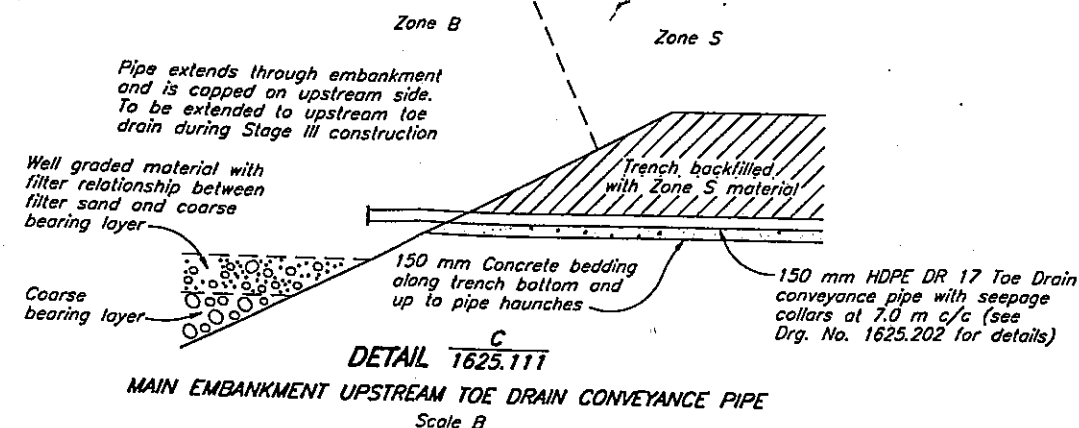
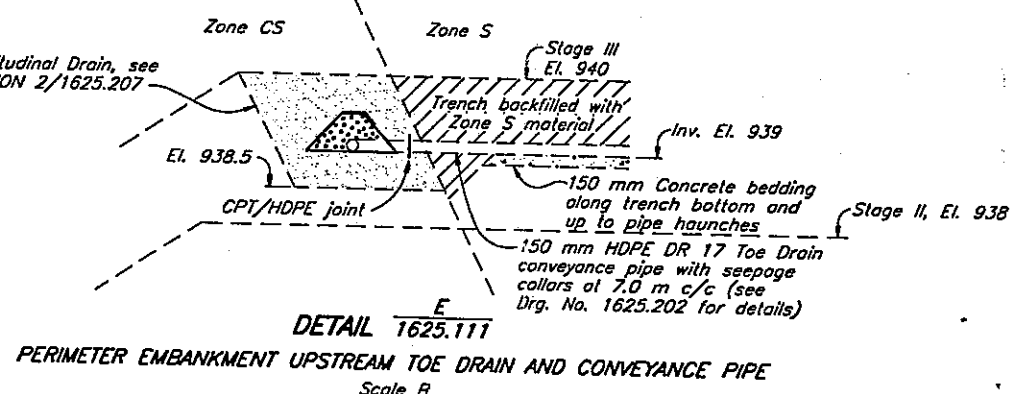
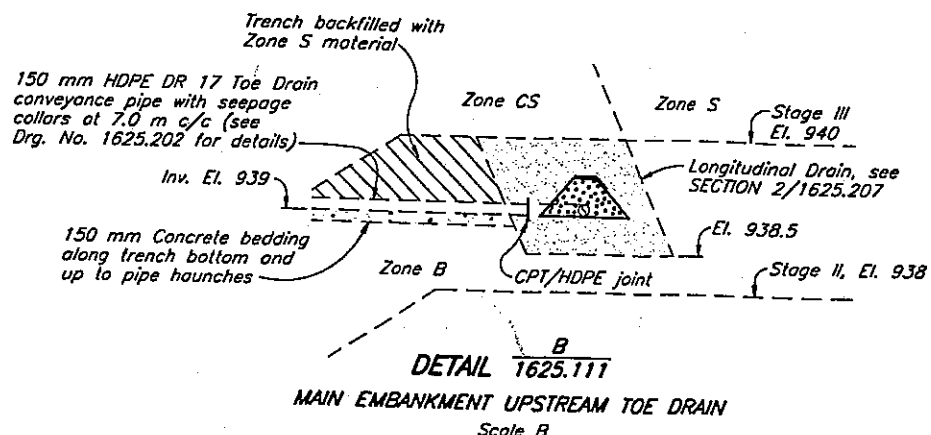
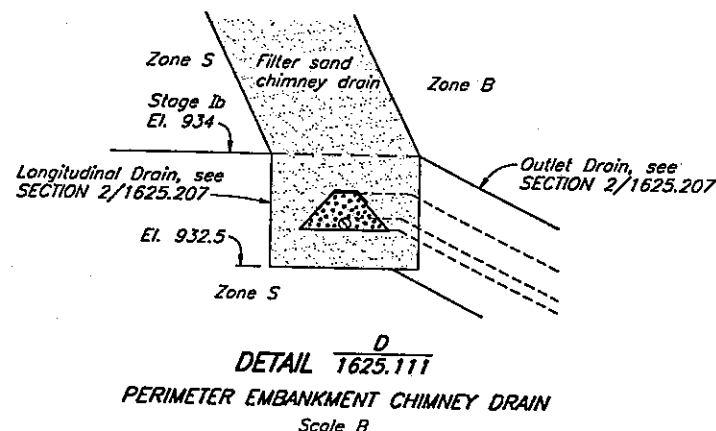
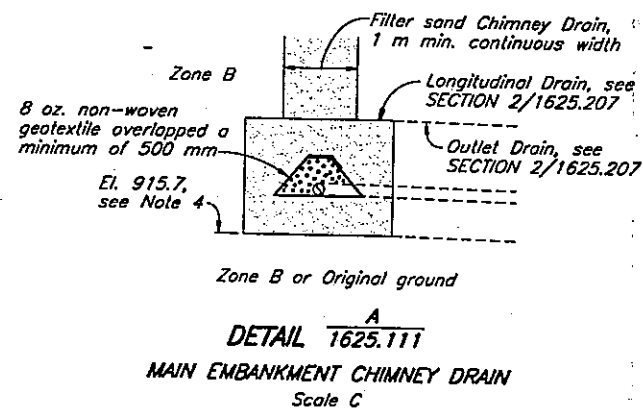
MOUNT POLLEY MINING CORPORATION

MOUNT POLLEY PROJECT

DRAINAGE PLAN
SECTIONS AND DETAILS

DATE	AUGUST 24, 1995	SCALE	AS SHOWN	DRG. NO.	1625.232	REV.	5
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CAN FILE 1625.232.033 1:100 P&E L-01 510.1 MAY 28, 1997



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 Drains	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	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

- 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.
- Future toe drains, shown for Stages V and VII will be added if required.
- Dashed lines imply preliminary design. Ongoing design and crest elevations will be modified as required based on filling records and monitoring information.
- Downstream 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.

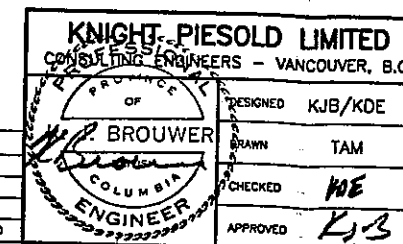
NOT FOR CONSTRUCTION

Scale 1 0 1 2 3 4 5 Metres

1625.202	TSF - FOUNDATION PREPARATION AND BASIN LINER
1625.111	TSF - TAILINGS EMBANKMENT - SECTIONS AND DETAILS - SHEET 1 OF 2
1625.207	TSF - TAILINGS DAM CHIMNEY DRAIN
1625.130	TSF - FINAL ARRANGEMENT
DRG. NO.	DESCRIPTION
REFERENCE DRAWINGS	

5	MAY 30/97	REVISED DRAIN DETAILS - DETAILS FROM SHEET 1 OF 2 (1625.111)	KJB
4	SEP 4/96	REVISED DRAINAGE DETAILS	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			

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 8/95	ISSUED FOR REVIEW	
REV.	DATE	DESCRIPTION	APPROVED
REVISIONS			



MOUNT POLLEY MINING CORPORATION	
MOUNT POLLEY PROJECT	
TAILINGS STORAGE FACILITY	
TAILINGS EMBANKMENT	
SECTIONS AND DETAILS	
SHEET 2 OF 2	
DATE MAY 27, 1997	SCALE AS SHOWN
DRG. NO. 1625.236	REV. 5

APPENDIX B

SUPPLEMENTARY INVESTIGATION REPORTS

B1 - R. E. GRAHAM FIÉLD REPORT

B2 - CONETEC FIELD REPORT





B1 - R. E. GRAHAM FIELD REPORT







R. E. GRAHAM ENGINEERING LTD.

302 - 1777 Third Avenue
Prince George, B.C., V2L 3G7
Phone (604) 564-4304
Fax (604) 564-9323
E-mail graham@mag-net.com

August 12, 1996

North American Construction Ltd.
2150 Steel Road
Prince George, B.C.
V2N 2H9

File No. J-1245

Attention: Mr. Randy Pepler, A.Sc.T.

Dear Sir:

RE: MT. POLLEY PROJECT
EMBANKMENT FOUNDATION PIEZOMETER INSTALLATIONS

On July 21 to 24, 1996, we supervised the installation of six vibrating wire piezometers in drill holes in native soil below the centre of the proposed tailings dam. Mr. Bill Porter of North American Construction Ltd. (NAC) helped coordinate the work. Mr. Peter Procter, E.I.T. of Knight Piesold Ltd. (KPL) was on site to specify requirements for soil testing and piezometer installations.

Test hole logs describing soil conditions and showing details of the piezometer installations are on Plates 1 to 7, attached. Coordinates and elevations, as surveyed by NAC, are provided on the logs. An explanation of the terms and symbols used on the logs is attached for your reference.

Judging by the adjacent ground, about 0.5 m of soil had been stripped from the sites prior to the installations. Our drilling subcontractor, Peace Drilling and Research of Taylor, B.C., drilled the holes using 150 mm diameter solid augers and 200 mm outside diameter hollow-stem augers. In addition to our original scope of work, we were directed by KPL to perform continuous Standard Penetration Tests to about 10 m depth, log soil conditions, obtain samples, and install additional bentonite seals. Samples were submitted to KPL for laboratory analyses. Two piezometers were set in each of the holes except at Plane B, where sloughing soil conditions required the upper piezometer (B2-PE2-02) to be set in an adjacent hole. Prior to, and following installation of the piezometers, we hooked the indicator cables to the readout box to check that the sensors were operating.




North American Construction Ltd.
Mt. Polley Project

August 12, 1996
File No. J-1245

Thank you for the opportunity to work on this project. Please call me or Dave McDougall, P.Eng. if you have any questions, require any additional information, or if we can be of further assistance.

Yours truly,
R.E. Graham Engineering Ltd.



Per: J.D. Clarke, E.I.T.
JDC/pm
Enclosures







R. E. GRAHAM ENGINEERING LTD.

302-1777 THIRD AVENUE

PRINCE GEORGE, B.C., V2L 3G7

TEST HOLE LOG

CLIENT NORTH AMERICAN CONSTRUCTION LTD.

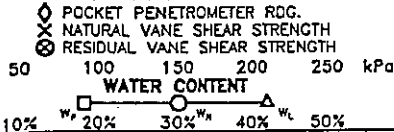
PROJECT

MT. POLLEY PROJECT

EMBANKMENT FOUNDATION PIEZOMETER INSTALLATION

LOGGED JDC FILE NO. J-1245 DATE OF INVEST. 96/07/21-24 DRILL SOLID/HOLLOW STEM AUGER HOLE NO. 96-A1

STRENGTH TEST RESULTS



DEPTH (m)

SYMBOL

LOCATION N.5818482.71/E.595598.14 PLANE A

SURFACE ELEVATION 912.67 m

SOIL DESCRIPTION

SAMPLES
SPT 'N'
RECOVERY (mm)

PAGE 1 of 2

COMMENTS
STANDPIPE OR
PIEZOMETER
INSTALLATION

DEPTH ELEV.

SILT (TILL), clayey, some sand, some fine to medium gravel, low plasticity matrix, brown with slight orange mottling, moist.

SILT, clayey, varved in places, occasional fine sand in lenses and varves, very stiff, low to intermediate plasticity, brown, moist.

- between 1.2 to 1.5 m, noted two ~100 mm thick sand layers, fine to medium grained, saturated.

- from 2.0 to 2.4 m, and from 2.75 to 3.0 m, sand layers, fine to medium grained, some silt, saturated.

- below 3.65 m, strongly varved, varves 10-20 mm thick, grey-brown.

SILT, trace of fine sand, sensitive, non-plastic to low plasticity from 5.8 to 6.4 m, non plastic below, grey, saturated.

- from 7.3 to 8.7 m depth, silt quickening in hole.

SAND (TILL), silty, gravelly, very dense, grey-brown, moist.

Continued on following sheet.

Seepage from 1.2 to 1.5 m.

pp = 300 kPa

Seepage from 2.0 to 2.4 m.

Seepage from 2.75 to 3.0 m.

Switched from solid to hollow stem auger @ 4.9 m.
pp = 225 - 325 kPa

Seepage from 5.8 to 9.75 m.

pp = 150 kPa

Sampler sank 430 mm under weight of rods.

Sampler sank under weight of rods.

Sampler sank under weight of rods.

Sampler sank under weight of rods.

Sampler sank under weight of rods.

Sampler sank under weight of rods.

PLATE NO. 1





R. E. GRAHAM ENGINEERING LTD.
302-1777 THIRD AVENUE
PRINCE GEORGE, B.C., V2L 3G7

TEST HOLE LOG

CLIENT NORTH AMERICAN CONSTRUCTION LTD.
PROJECT MT. POLLEY PROJECT
EMBANKMENT FOUNDATION PIEZOMETER INSTALLATION

LOGGED JDC FILE NO. J-1245 DATE OF INVEST. 96/07/21-24 DRILL SOLID/HOLLOW STEM AUGER HOLE NO. 96-A1

STRENGTH TEST RESULTS

- ◇ POCKET PENETROMETER RDG.
- × NATURAL VANE SHEAR STRENGTH
- ⊗ RESIDUAL VANE SHEAR STRENGTH

50 100 150 200 250 kPa

WATER CONTENT

10% 20% 30% 40% 50%

DEPTH (m)

SYMBOL

LOCATION N.5818482.71/E.595598.14 PLANE A

SURFACE ELEVATION 912.67 m

SOIL DESCRIPTION

SAMPLES

SPT 'N'
RECOVERY (mm)

PAGE 2 of 2

COMMENTS

STANDPIPE OR
PIEZOMETER
INSTALLATION

Continued from previous sheet.

SAND (TILL), silty, gravelly, very dense, grey-brown, moist.

125 mm Penetration, on rock.

- from 12.25 to 12.7 m, SILT, non-plastic, trace of fine sand.
- below 12.7 m, some silt, brown.

74

600

>100

350

>78

350

70

600

15.4 897.3

End of hole @ 15.4 m.

Seepage as noted.

Artesian conditions, likely from silt layer from 5.8 to 9.75 m depth. Hole quickening and sloughing in silt layer.

NOTES:

- 1) Ground surface cut down roughly 0.5 m at hole location.
- 2) Piezometers are vibrating wire type (SINCO Model 52611030), rated for 0-100 psi, connected to surface via direct burial, polyethylene jacket cable (SINCO Model 50612604).



Bentonite



Screened and washed coarse sand



Slough

PLATE NO. 2





R. E. GRAHAM ENGINEERING LTD.

302-1777 THIRD AVENUE
PRINCE GEORGE, B.C., V2L 3G7

TEST HOLE LOG

CLIENT NORTH AMERICAN CONSTRUCTION LTD.
PROJECT MT. POLLEY PROJECT
EMBANKMENT FOUNDATION PIEZOMETER INSTALLATION

LOGGED JDC FILE NO. J-1245 DATE OF INVEST. 96/07/21-24 DRILL SOLID AUGER HOLE NO. 96-B1a

STRENGTH TEST RESULTS

- ◇ POCKET PENETROMETER RQ.
- ✕ NATURAL VANE SHEAR STRENGTH
- ⊗ RESIDUAL VANE SHEAR STRENGTH

50 100 150 200 250 kPa
WATER CONTENT
10% 20% 30% 40% 50%

DEPTH (m)

SYMBOL

LOCATION N.5818628.27/E.595787.88 PLANE B

SURFACE ELEVATION 916.97 m

SOIL DESCRIPTION

SAMPLES

SPT 'N'
RECOVERY (mm)

PAGE 1 of 2

COMMENTS

STANDPIPE OR
PIEZOMETER
INSTALLATION

DEPTH ELEV.

SILT (TILL), clayey, some sand, some gravel, compact to dense, brown, moist.

- above 0.6 m, wet with slight orange mottling.
- from 0.6 m to 1.8 m, gravelly.

- from 2.4 to 3.0 m, slight laminated structure in places, clayey and sandy zones.

- below 3.0 m, sandy.

- @ 3.6 m, 40 mm thick varved layer.

- @ 4.8 m, 75 mm thick fine to medium grained, silty sand layer.

4.9 912.1
SILT, some fine sand to sandy, dense to very dense, non plastic to low plasticity, structureless, grey, damp to moist.

- from 6.1 to 6.7 m, clayey, weakly varved with occasional fine sand in varves, low plasticity.

7.3 909.7
SAND, fine to medium grained, silty, dense, grey, saturated.

8.2 908.8
SILT, some fine sand, very dense, non-plastic to low plasticity, slight varved structure, grey, moist.
- from 8.8 to 10.4 m, frequent wet, fine to medium grained, sandy layers and zones (<150 mm thick).

Seepage @ 4.8 m.

pp >450 kPa

500 mm Penetration

Seepage from 7.3 to 8.2 m.

Possible seepage from 8.8 to 10.4 m.

Continued on following sheet.

PLATE NO. 3



R. E. GRAHAM ENGINEERING LTD.

302-1777 THIRD AVENUE

PRINCE GEORGE, B.C., V2L 3G7

TEST HOLE LOG

CLIENT NORTH AMERICAN CONSTRUCTION LTD.

PROJECT

MT. POLLEY PROJECT

EMBANKMENT FOUNDATION PIEZOMETER INSTALLATION

LOGGED JDC FILE NO. J-1245 DATE OF INVEST. 96/07/21-24 DRILL SOLID AUGER HOLE NO. 96-B1a

STRENGTH TEST RESULTS

POCKET PENETROMETER RDC.
NATURAL VANE SHEAR STRENGTH
RESIDUAL VANE SHEAR STRENGTH

50 100 150 200 250 kPa
10% 20% 30% 40% 50%
WATER CONTENT

DEPTH (m)

SYMBOL

LOCATION N.5818628.27/E.595787.88 PLANE B

SURFACE ELEVATION 916.97 m

SOIL DESCRIPTION

SAMPLES

SPT 'N'
RECOVERY (mm)

PAGE 2 of 2

COMMENTS

STANDPIPE OR
PIEZOMETER
INSTALLATION

Continued from previous sheet.

SILT, some fine sand, very dense,
non-plastic to low plasticity,
slight varved structure, grey,
moist.

- from 11.0 to 11.9 m, clayey,
intermediate plasticity.

- from 11.9 to 12.4 m, occasional
(<20 mm thick) sand seams.

- from 12.5 to 13.0 m, silty clay,
intermediate plasticity.

- from 13.0 to 13.9 m, strongly
varved, occasional (<20 mm thick)
wet sand seams.
- below 13.4 m, grey-brown.

- from 14.0 to 14.9 m, silty clay,
intermediate plasticity.

- from 14.9 to 15.5 m, strongly
varved.

- below 15.5 m, wet, very stiff to
stiff with depth.

66
460

pp > 450 kPa

84
460

11.7
12.2

72
300

Possible
Seepage
from 13.0
to 13.9 m.
pp = 450 kPa

62
460

pp = 250 kPa
to 350 kPa

pp = 300 kPa

pp = 100 kPa

Bentonite

Screened and washed
coarse sand

Bentonite and Silt

Slough

End of hole @ 16.5 m.

Seepage as noted.

Hole sloughing in sand layer
from 7.3 to 8.2 m.

Hole filled with water to 3.0 m depth
when left open for 2 hr period.

NOTES:

- 1) Ground surface cut down roughly
0.5 m at hole location.
- 2) Piezometer is vibrating wire type
(SINCO Model 52611030), rated for
0-100 psi, connected to surface
via direct burial, polyethylene jacket
cable (SINCO Model 50612604).
- 3) Piezometer B2-PE2-02 installed in
adjacent hole 96-B1b.

PLATE NO. 4





R. E. GRAHAM ENGINEERING LTD.
302-1777 THIRD AVENUE
PRINCE GEORGE, B.C., V2L 3G7

TEST HOLE LOG

CLIENT NORTH AMERICAN CONSTRUCTION LTD.
PROJECT MT. POLLEY PROJECT
EMBANKMENT FOUNDATION PIEZOMETER INSTALLATION

LOGGED JDC

FILE NO. J-1245

DATE OF INVEST. 96/07/21-24

DRILL SOLID/HOLLOWSTEM AUGER

HOLE NO. 96-B1b

STRENGTH TEST RESULTS

POCKET PENETROMETER RDG.
NATURAL VANE SHEAR STRENGTH
RESIDUAL VANE SHEAR STRENGTH

50 100 150 200 250 kPa
WATER CONTENT
10% 20% 30% 40% 50%

DEPTH (m)

SYMBOL

LOCATION N.5818627.47/E.595790.66 PLANE B

SURFACE ELEVATION 916.99 m

SOIL DESCRIPTION

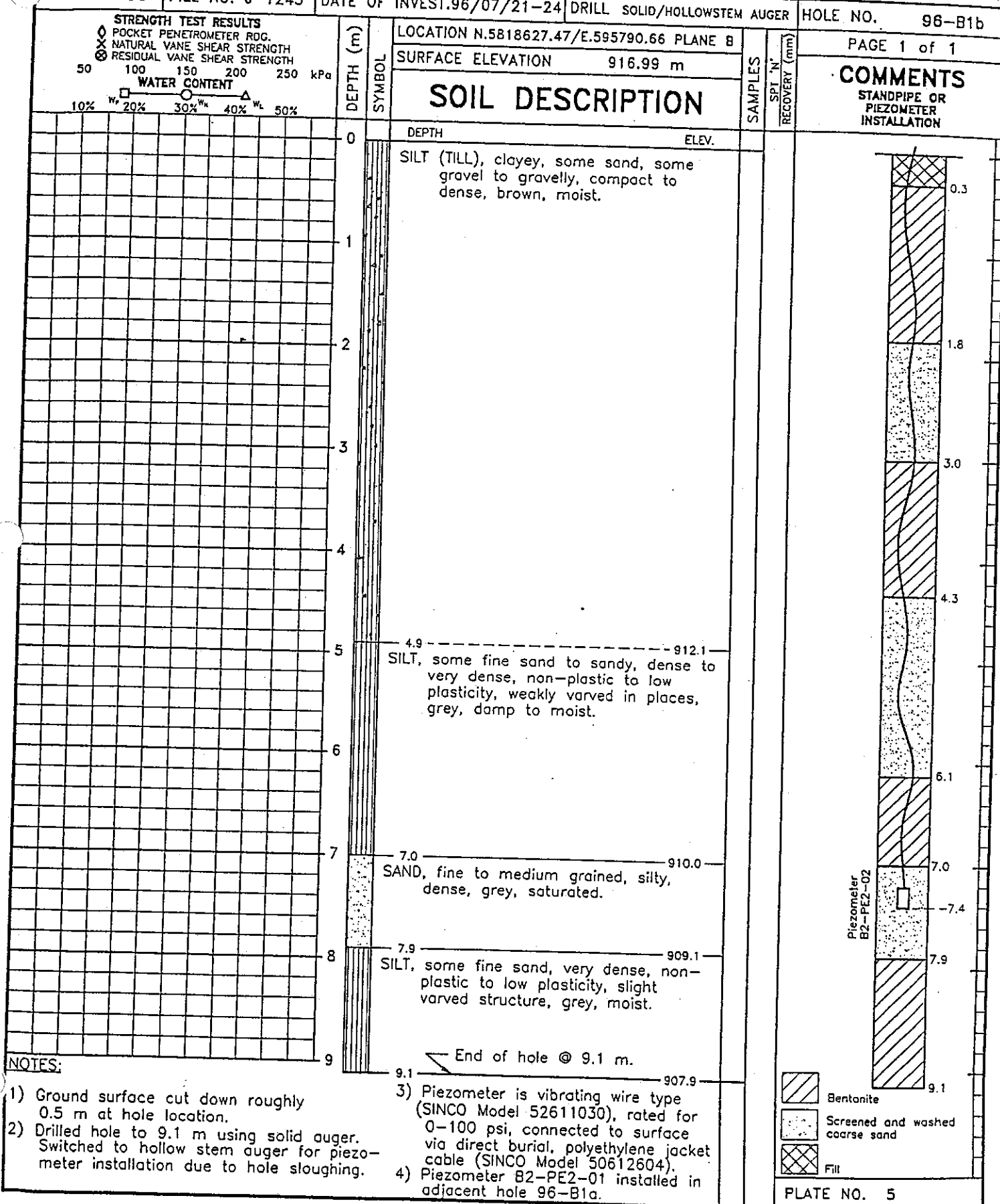
SAMPLES

SPT 'N'
RECOVERY (mm)

PAGE 1 of 1

COMMENTS

STANDPIPE OR
PIEZOMETER
INSTALLATION



NOTES:

- 1) Ground surface cut down roughly 0.5 m at hole location.
- 2) Drilled hole to 9.1 m using solid auger. Switched to hollow stem auger for piezometer installation due to hole sloughing.

- 3) Piezometer is vibrating wire type (SINCO Model 52611030), rated for 0-100 psi, connected to surface via direct burial, polyethylene jacket cable (SINCO Model 50612604).
- 4) Piezometer B2-PE2-01 installed in adjacent hole 96-B1a.

PLATE NO. 5





R. E. GRAHAM ENGINEERING LTD.
302-1777 THIRD AVENUE
PRINCE GEORGE, B.C., V2L 3G7

TEST HOLE LOG

CLIENT NORTH AMERICAN CONSTRUCTION LTD.
PROJECT MT. POLLEY PROJECT
EMBANKMENT FOUNDATION PIEZOMETER INSTALLATION

LOGGED JDC FILE NO: J-1245 DATE OF INVEST. 96/07/21-24 DRILL SOLID/HOLLOWSTEM AUGER HOLE NO. 96-C1

STRENGTH TEST RESULTS
◇ POCKET PENETROMETER RDG.
✕ NATURAL VANE SHEAR STRENGTH
⊗ RESIDUAL VANE SHEAR STRENGTH
50 100 150 200 250 kPa
WATER CONTENT
10% 20% 30% 40% 50%
w_p w_L

DEPTH (m)
SYMBOL

LOCATION N.5818392.41/E.595478.24 PLANE C

SURFACE ELEVATION 915.71 m

SOIL DESCRIPTION

SAMPLES
SPT 'N'
RECOVERY (mm)

PAGE 1 of 2

COMMENTS
STANDPIPE OR
PIEZOMETER
INSTALLATION

DEPTH ELEV.

SILT (TILL), clayey, some sand, some gravel, compact to dense, low plasticity, brown, moist.
- slight orange mottling above 0.6 m.

- below 2.4 m, grey-brown, then grey with depth.

- below 3.0 m, sandy.

- @ 4.6 m, 200 mm thick wet seam.
- @ 4.9 m, approx. 50 mm thick, fine to medium sand layer, brown, saturated.

CLAY, silty, occasional fine sand in varves, (varves ~10 mm thick), very stiff, intermediate plasticity, brown, moist.

- @ 5.6 m, 50 mm thick silt layer, trace of fine sand, non-plastic, wet.

SILT, some fine sand to fine sandy, non-plastic, brown, saturated.

- below 7.3 m, grey, sensitive.

SAND (TILL), gravelly, silty, very dense, grey, moist.

- below 9.6 m, SILT (TILL), sandy, some gravel.

100 mm Penetration, on rock.

Seepage @ 4.3 m.

pp > 350 kPa
Possible seepage @ 5.6 m.
pp = 450 kPa

Seepage from 6.4 to 8.4 m.

Switched from solid to hollow stem auger @ 7.3 m.

Seepage from 8.4 to 9.4 m.

230 mm Penetration

Continued on following sheet.

PLATE NO. 6





R. E. GRAHAM ENGINEERING LTD.
302-1777 THIRD AVENUE
PRINCE GEORGE, B.C., V2L 3G7

TEST HOLE LOG

CLIENT NORTH AMERICAN CONSTRUCTION LTD.
PROJECT MT. POLLEY PROJECT
EMBANKMENT FOUNDATION PIEZOMETER INSTALLATION

LOGGED JDC FILE NO. J-1245 DATE OF INVEST. 96/07/21-24 DRILL SOLID/HOLLOWSTEM AUGER HOLE NO. 96-C1

STRENGTH TEST RESULTS

POCKET PENETROMETER RDG.
NATURAL VANE SHEAR STRENGTH
RESIDUAL VANE SHEAR STRENGTH
50 100 150 200 250 kPa
WATER CONTENT
10% 20% 30% 40% 50%

DEPTH (m)

SYMBOL

LOCATION N.5818392.41/E.595478.24 PLANE C

SURFACE ELEVATION 915.71 m

SOIL DESCRIPTION

Continued from previous sheet.

SILT (TILL), sandy, some gravel, dense, grey, moist.

- from 12.0 to 12.5 m, SILT, non-plastic, grey, wet.

- below 12.5 m, SAND (TILL), gravelly, silty.

- @ 13.5 m, 50 mm thick, wet, fine to medium sand seam.

- below 14.9 m, mainly sand and gravel, slight purple colour, wet.

End of hole @ 15.4 m.

Seepage as noted.

Hole sloughing in silt layer from 6.4 to 8.4 m.

SAMPLES

SPT 'N' RECOVERY (mm)

PAGE 2 of 2

COMMENTS

STANDPIPE OR PIEZOMETER INSTALLATION

>75 360 mm Penetration
360

74 Possible seepage from 12.0 to 12.5 m.
460

59 Possible seepage @ 13.5 m.
460

92 Probable seepage below 14.9 m.
460

Bentonite

Screened and washed coarse sand

Slough

NOTES:

- 1) Ground surface cut down roughly 0.5 m at hole location.
- 2) Piezometers are vibrating wire type (SINCO Model 52611030), rated for 0-100 psi, connected to surface via direct burial, polyethylene jacket cable (SINCO Model 50612604).

PLATE NO. 7



EXPLANATION OF TERMS AND SYMBOLS USED ON TEST HOLE LOGS

SOIL DESCRIPTION

Soil is classified in accordance with the International Society of Soil Mechanics and Foundation Engineering (ISSMFE) system as described in the 1992 Canadian Foundation Engineering Manual (CFEM). Descriptions for each soil type encountered are divided by contact lines at appropriate depths. Each description has a corresponding graphic symbol which relates to soil type.

Major Soil Division:

The major soil division is the main fraction of soil and constitutes at least 35% by weight. Soil is classified as GRAVEL, SAND, CLAY, SILT, or ORGANICS according to the criteria on pg. 3.

Interpretation:

Where applicable, a bracketed term such as (FILL) or (TILL) is included to describe soil genesis.

Grain size and Shape:

Grain size descriptions for soils follow the criteria on pg. 3.

The shape of coarse and oversized particles is described as:

angular - sharp corners	rounded - smooth rounded surface
subangular - slightly rounded corners	platy - flat, plate shaped
subrounded - no angular corners	

Soil Composition:

The following terms are used to describe the percentage of soil components by weight based on laboratory sieve analyses or field estimates:

<u>Descriptive Term</u>	<u>Percentage Range</u>
"and" and sand, and gravel ... etc.	>35%
"—y" clayey, sandy ... etc.	20 - 35%
"some" some silt, some gravel ... etc.	10 - 20%
"trace" trace sand, trace silt ... etc.	1 - 10%

The amount of cobbles and boulders, in increasing proportion, is described as:

isolated —→ occasional —→ frequent —→ numerous

Compactness and Consistency:

The following terms are used to describe the compactness of cohesionless soils based on the Standard Penetration Test (SPT) or field estimates:

<u>Descriptive Term</u>	<u>SPT 'N' Index</u>
very loose	0 - 4
loose	4 - 10
compact	10 - 30
dense	30 - 50
very dense	over 50

The following terms are used to describe the consistency of fine-grained soils based on unconfined compressive strength as determined by field or laboratory tests, or estimates:

<u>Descriptive Term</u>	<u>Unconfined Compressive Strength (kPa)</u>
very soft	<25
soft	25 - 50
firm	50 - 100
stiff	100 - 200
very stiff	200 - 400
hard	>400

Structure:

Soil macrostructure and microstructure is described.

Plasticity:

Plasticity of fine-grained soils is estimated or determined from Atterberg Limit tests based on the plasticity chart on pg. 3.



EXPLANATION OF TERMS AND SYMBOLS USED ON TEST HOLE LOGS

SOIL DESCRIPTION (cont.)

Colour and Odour:

Colour and odour of soils is described, especially where it may indicate organic inclusions or give evidence of soil contamination.

Inclusions:

The quantity of inclusions is described using the same relative amount terms used for cobbles and boulders, noted above.

Water Content:

Soil moisture, in increasing amount, is subjectively described as:

dry —→ damp —→ moist —→ wet —→ saturated —→ excess water

SOIL SAMPLES

Graphic symbols indicate the depth and condition of soil samples:



Disturbed



Undisturbed

Undisturbed samples may be taken with tubes, from blocks, or by coring. All other types of samples are disturbed.

FIELD TESTS

Field test results commonly reported on test hole logs include:

Standard Penetration Test (SPT) (ASTM D1586):

The SPT results are reported as the 'N' index over the length of the recovered sample, at the appropriate depth. The 'N' value denotes the number of blows of a 63.5 kg hammer, freely dropping 760 mm, required to drive a 50.8 mm diameter split-spoon sampler 305 mm.

Dynamic Cone Penetration Test (DCPT):

Dynamic cone penetration test results are shown graphically. The number of blows required to drive a solid cone 305 mm is shown opposite the depth. The method of driving the cone is the same as for the SPT test described above.

Field Vane Test (FVT) (ASTM D2573-72):

Undrained shear strength of cohesive soils is measured using a 100 mm long by 50 mm diameter vane. Test results for peak and residual strengths are graphically reported at the appropriate depths using the following symbols:



Peak Shear Strength



Residual Shear Strength

Pocket Penetrometer and Torvane Tests:

Unconfined compressive strength and undrained shear strength measurements may be taken on samples or excavation walls using a pocket penetrometer or hand torvane. Pocket penetrometer results are shown graphically using \diamond symbols. Torvane results are reported using the same symbols used for the field vane test.

LABORATORY TESTS

The following symbols are used to denote laboratory test results:



Natural water content, W_N (ASTM D2216).



Atterberg Plastic Limit, W_p (ASTM D424).



Atterberg Liquid Limit, W_L (ASTM D423).

MA

Mechanical grain size (sieve) analysis or hydrometer test, or both (ASTM D422).

qu

Unconfined compressive strength test on an undisturbed sample (ASTM D2166).

SO₄

Test for concentration of water-soluble sulphates.


γ


Unit weight of soil or rock.

γ_d

Dry unit weight of soil or rock.

COMMENTS

Groundwater conditions are indicated using the following symbols:  groundwater table

 seepage

Comments often included are additional test results, drilling progress, monitoring equipment installation details, and other relevant information.



ISSMFE SOIL CLASSIFICATION SYSTEM

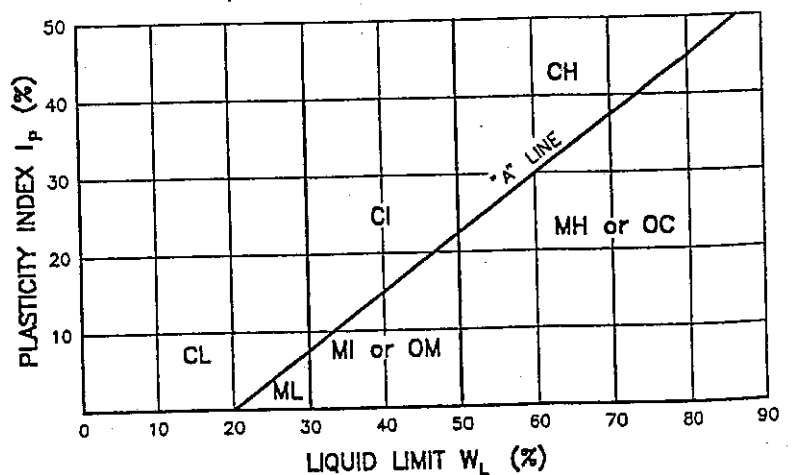
MAJOR DIVISION			GROUP SYMBOL	GRAPHIC SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA		
COARSE-GRAINED SOIL	GRAVEL 60.0 mm DIAMETER 2.0	CLEAN GRAVEL	GW		WELL-GRADED GRAVEL AND SANDY GRAVEL MIXTURES WITH LESS THAN 5% FINES.	$C_u = \frac{D_{60}}{D_{10}} > 6$, $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$		
			GP		POORLY-GRADED GRAVEL AND SANDY GRAVEL MIXTURES WITH LESS THAN 5% FINES.	NOT MEETING ABOVE REQUIREMENTS.		
		DIRTY GRAVEL	GM		SILTY GRAVEL AND SILT-SAND-GRAVEL MIXTURES WITH MORE THAN 15% FINES.	ATTERBERG LIMITS BELOW "A" LINE.		
			GC		CLAYEY GRAVEL AND CLAY-SAND-GRAVEL MIXTURES WITH MORE THAN 15% FINES.	ATTERBERG LIMITS ABOVE "A" LINE.		
	SAND 2.0 mm DIAMETER 0.06	CLEAN SAND	SW		WELL-GRADED SAND AND GRAVELLY SAND MIXTURES WITH LESS THAN 5% FINES.	$C_u = \frac{D_{60}}{D_{10}} > 6$, $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ to } 3$		
			SP		POORLY-GRADED SAND AND GRAVELLY SAND MIXTURES WITH LESS THAN 5% FINES.	NOT MEETING ABOVE REQUIREMENTS.		
		DIRTY SAND	SM		SILTY SAND AND SILT-GRAVEL-SAND MIXTURES WITH MORE THAN 15% FINES.	ATTERBERG LIMITS BELOW "A" LINE.		
			SC		CLAYEY SAND AND CLAY-GRAVEL-SAND MIXTURES WITH MORE THAN 15% FINES.	ATTERBERG LIMITS ABOVE "A" LINE.		
FINE-GRAINED SOIL	SILT BELOW "A" LINE ON PLASTICITY CHART. NEGLECTIBLE ORGANIC CONTENT.		ML		INORGANIC SILT, VERY FINE SAND, ROCK FLOUR, AND SANDY SILT OF LOW PLASTICITY.	SEE PLASTICITY CHART BELOW		
			MI		INORGANIC SILT OF INTERMEDIATE PLASTICITY.			
			MH		INORGANIC SILT AND MICACEOUS OR DIATOMACEOUS SOIL OF HIGH PLASTICITY.			
	CLAY ABOVE "A" LINE ON PLASTICITY CHART. NEGLECTIBLE ORGANIC CONTENT.		CL		INORGANIC CLAY OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAY, "LEAN" CLAY			
			CI		INORGANIC CLAY OF INTERMEDIATE PLASTICITY, SILTY CLAY.			
			CH		INORGANIC CLAY OF HIGH PLASTICITY, "FAT" CLAY.			
	ORGANIC SILT & CLAY BELOW "A" LINE ON PLASTICITY CHART		OM		ORGANIC SILT			
			OC		ORGANIC CLAY			
	HIGHLY ORGANIC SOIL			Pt			PEAT AND OTHER HIGHLY ORGANIC SOIL	HIGH ORGANIC CONTENT AND FIBROUS TEXTURE.

GRAIN SIZE

Coarse-grained soil and silt is identified on the basis of grain size diameter as follows:

SILT:	Fine	0.002 - 0.006 mm
	Medium	0.006 - 0.020 mm
	Coarse	0.020 - 0.060 mm
SAND:	Fine	0.06 - 0.20 mm
	Medium	0.20 - 0.60 mm
	Coarse	0.60 - 2.00 mm
GRAVEL:	Fine	2.0 - 6.0 mm
	Medium	6.0 - 20.0 mm
	Coarse	20.0 - 60.0 mm
COBBLES:		60.0 - 200 mm
BOULDERS:		> 200 mm

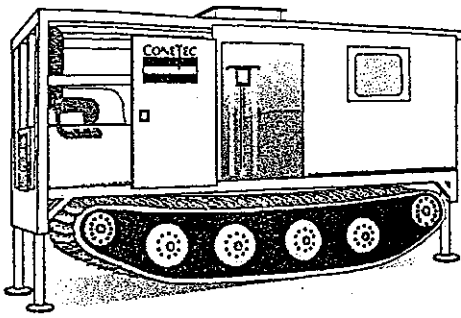
PLASTICITY CHART





B2 - CONETEC FIELD REPORT





Geotechnical and Environmental In Situ Testing Contractors

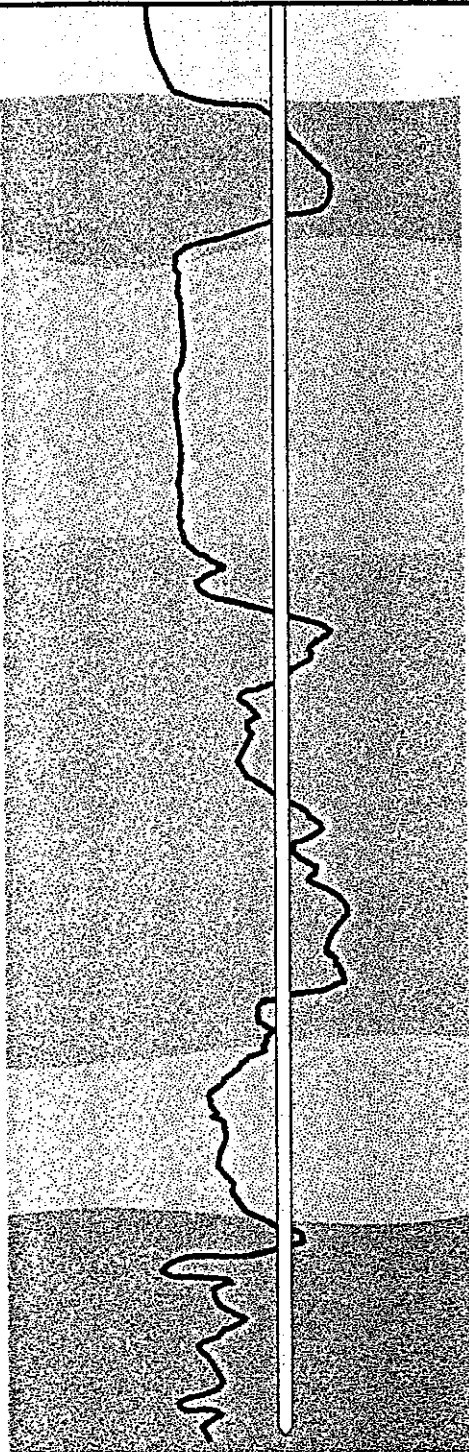
ConeTec Field Report

Cone Penetration Test Results
Mount Polley Tailings Dam

Prepared for:

Knight Piésold Ltd.,
Vancouver, BC

- July 31, 1996 -



PRESENTATION OF CONE PENETRATION TEST RESULTS
MOUNT POLLEY TAILINGS DAM INVESTIGATION

Prepared for:

KNIGHT PIÉSOLD LTD.
Vancouver, B.C.

Prepared by:

CONETEC INVESTIGATIONS LTD.

July 31, 1996

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1.0 INTRODUCTION

2.0 FIELD EQUIPMENT AND PROCEDURES

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3.0 CONE PENETRATION TEST DATA AND INTERPRETATION

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3.2 Pore Pressure Dissipation Data

3.3 Shear Wave Velocity Data

APPENDICES

Appendix A CPT Plots

Appendix B Tabular CPT Interpretations

Appendix C Summary of Pore Pressure Dissipation Times and Equilibrium Pore Pressures

Appendix D Pore Pressure Dissipation Plots

Appendix E Shear Wave Velocity Data

1.0 INTRODUCTION

This report presents the results of a cone penetration testing (CPT) program which included pore pressure dissipation and shear wave velocity measurements. The tests were conducted on the tailings dyke at Mount Polley Mine, between July 27, 1996 and July 28, 1996. A total of 10 CPTs were performed at the site. The CPTs were performed on the embankment crest and pushed into the mine waste adjacent to the embankment. The work was carried out under the direction and supervision of Knight Piésold.

2.0 FIELD EQUIPMENT AND PROCEDURES

2.1 Electric Cone Testing

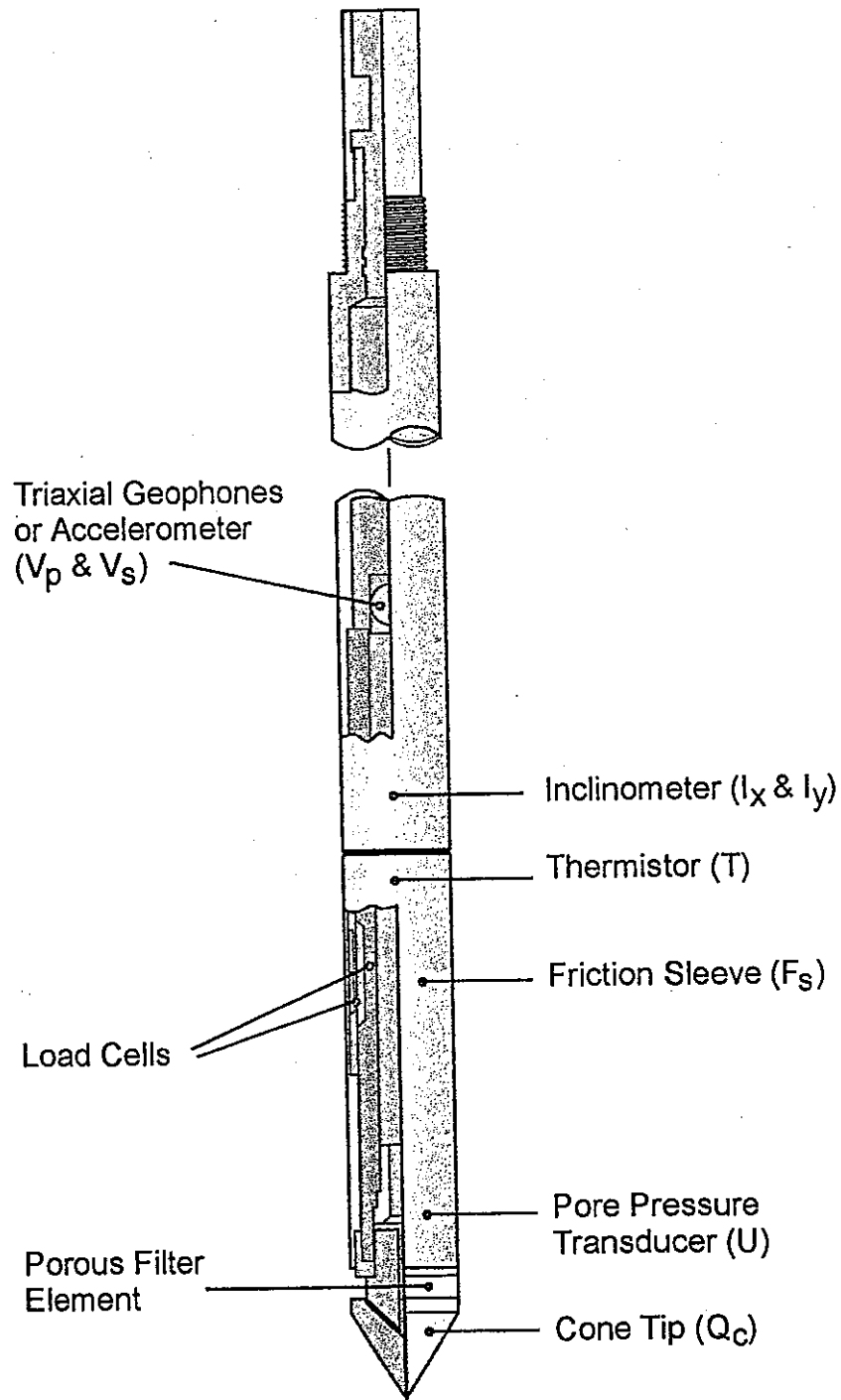
The cone penetration tests (CPT's) were carried out by *ConeTec Investigations Ltd.* of Vancouver, B.C. using an integrated electronic cone system. A 10 ton compression type cone as shown in figure 1 was used for all of the soundings. This cone has a tip area of 10 sq. cm. and friction sleeve area of 150 sq. cm. A piezometer element 6 mm thick is located immediately behind the cone tip. The compression cone is designed with an equal end area friction sleeve and a tip end area ratio of 0.85. The cone system used during the program was capable of recording the following parameters at 5 cm depth intervals:

- Tip Resistance (Q_c)
- Sleeve Friction (F_s)
- Dynamic Pore Pressure (U_t)

The above parameters were printed simultaneously on a printer and stored on digital media for future analysis and reference.

The porous plastic pore pressure element was located directly behind the cone tip. Each of the elements were saturated in glycerin under vacuum pressure prior to penetration. Pore pressure

Piezo Cone Penetrometer



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ConeTec Investigations Ltd. • 9113 Shaughnessy St. Vancouver B.C. Canada V6P 6R9 • Tel: (604) 327-4311 • Fax: (604) 327-4066

Figure 1

dissipations were recorded at 5 second intervals when appropriate during pauses in the penetration.

A complete set of baseline readings were taken prior to each sounding to determine temperature shifts and any zero load offsets. Establishing temperature shifts and load offsets enables corrections to be made to the cone data where necessary. These corrections are critical, especially where the load conditions are relatively low, and generally are the single largest source of error with respect to the accuracy of cone data.

2.2 Seismic Cone Testing

The equipment and procedures used in this investigation in general were as developed at UBC and reported by Rice, 1984, Laing, 1985 and Robertson et al., 1986. The procedure was incorporated within the cone penetration test (CPT) and conducted when the cone penetration test was stopped to add additional push rods. At the end of the first push and at one meter intervals afterwards shear wave velocity measurements were made. The CPT rods are one meter long, and therefore accurate depth intervals were ensured by always pushing the cone rods one meter and ending at the limit of the hydraulic ram system. Before taking wave velocity measurements the rods were decoupled from the drill rig.

Shear waves were generated by striking a steel beam which was held down by the rear stabilizers of the drill rig. A rear axle weight of ten tonnes provided excellent coupling of the beam to the ground surface. The steel beam was 2.3 meters long, 0.2 meters wide and 0.2 meters deep. The beam was equipped with steel end plates to permit striking the beam with a sledge hammer. The centre of the beam was offset horizontally from the cone rods a distance of 0.96 meters. This offset was accounted for in the velocity calculations.

A friction reducer was used to reduce the friction between the soils penetrated and the cone rods behind the cone. The particular reducer used is oversized compared to conventional reducers to facilitate the decoupling of the cone rods from the soils in an effort to produce a high quality

signal and produce a high signal to noise ratio.

The beam was struck lightly for shear wave generation using a 7.25 kg sledge hammer in a horizontal direction, parallel to the active axis of the transducer, first from one end and then the other. Each wave was inspected and the procedure was repeated if necessary. Occasionally, excessive vertical components of the striking force resulted in excessive generation of compressional waves and the procedure was repeated. A contact trigger between the beam and the hammer produced accurate triggering times and allowed for the accurate timing of S wave markers.

After each pair of wave traces was recorded, inspected and saved, the two traces were overlayed on a digital oscilloscope screen and the arrival and first crossover times were selected.

The shear waves were detected by a horizontally active geophone in the cone which was offset above the cone tip a distance of 0.2 meters. This offset is accounted for in all calculations. The geophone signal was amplified by 100 times prior to processing in the storage oscilloscope. The oscilloscope sampled at a frequency of 20 kHz (i.e., 20,000 samples per second).

The cone was pushed using a specially modified drill rig MARL 10, having a down pressure capacity of approximately 14 tons. The cone testing rig was supplied and operated by Mud Bay Drilling of Surrey, B.C.

3.0 CONE PENETRATION TEST DATA AND INTERPRETATION

3.1 CPT Data

The cone penetration test data are presented in graphical form in Appendix A. Penetration data is referenced to existing ground surface. Sections in the embankments that were augered through are labelled as drilled out on the CPT plots.

The following table summarizes the CPT test program:

Table 1 - Summary of CPT Test Programme

CPT Sounding	Test Date	Total Depth (m)	Drill Outs (m)	Total Dissipation Time (s)
CPT 96-1(1)	96/07/27	9.7		3010
CPT 96-2 (4)	96/07/27	11.8	7.30 to 7.80	1150
CPT 96-3 (2)	96/07/27	8.25		415
CPT 96-4 (3)	96/07/27	10.25		535
CPT 96-2 (4A)	96/07/28	15.85	0.0 to 7.6	2440
CPT 96-1 (5)	96/07/28	7.65		
CPT 96-2 (6)	96/07/28	9.6		355
CPT 96-3 (7)	96/07/28	10.85		80
CPT 96-4 (8)	96/07/28	11.50		1055
CPT 96-5 (9)	96/07/28	10.0		1105

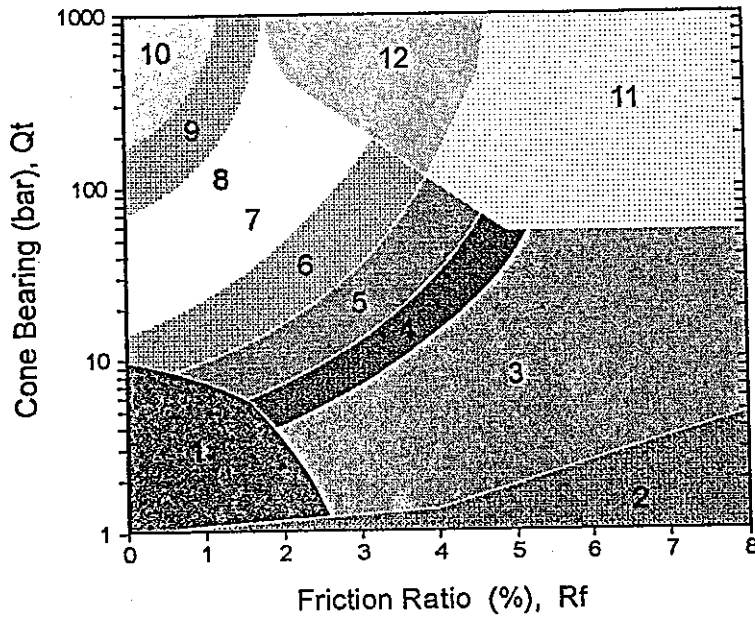
The stratigraphic interpretation is based on relationships between cone bearing Q_c , sleeve friction F_s , and penetration pore pressure U_t . The friction ratio R_f (sleeve friction divided by cone bearing) is a calculated parameter which is used to infer soil behaviour type. Generally, cohesive soils have high friction ratios, low cone bearing and generate large excess pore water pressures. Cohesionless soils have lower friction ratios, high cone bearing and generate little in the way of excess pore water pressures.

The interpretation of soils encountered on this project was carried out using correlations developed by Robertson et al., 1986 (upper chart in figure 2). It should be noted that it is not always possible to clearly identify a soil type based on Q_c , F_s and U_t . Occasionally soils will fall within different soil categories on the classification charts. In these situations, experience and judgment and an assessment of the pore pressure dissipation data should be used to infer the soil behaviour type. Computer tabulations of the interpreted soil types along with certain other geotechnical parameters for each cone hole is presented in Appendix B. It should be noted that the unit weights shown in the tabulated output are generated by the program based on the

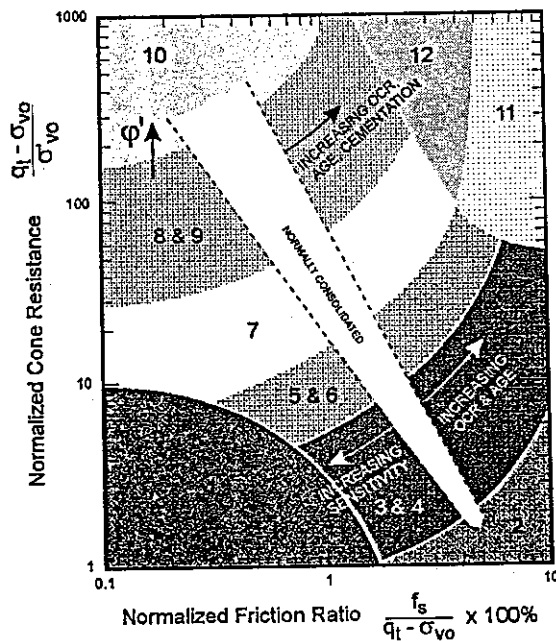
CPT Classification Chart

(after Robertson 1990)

Non-Normalized Classification Chart

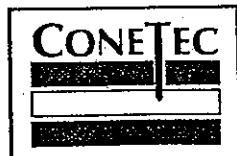


Normalized Classification Chart



Zone	Q_t / N	Soil Behaviour Type
1	2	sensitive fine grained
2	1	organic material
3	1	clay
4	1.5	silty clay to clay
5	2	clayey silt to silty clay
6	2.5	sandy silt to clayey silt
7	3	silty sand to sandy silt
8	4	sand to silty sand
9	5	sand
10	6	gravely sand to sand
11	1	very stiff fine grained *
12	2	sand to clayey sand *

* overconsolidated or cemented



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Figure 2

inferred soil type. The unit weights may not be accurate given the high metal content of the tailings that were tested.

3.2 Pore Pressure Dissipation Test Results

Pore pressure dissipations were automatically recorded during pauses in penetration. The pore pressure data was recorded at 5 second intervals. The pore pressure dissipation data for each CPT is included on the data disk. A summary of dissipation times and equilibrium pore pressures is presented in Appendix C. Plots of selected dissipations are presented in Appendix D. Generally, the water pressures in the dam were fairly low, most in the range of one to three metres of water pressure. The identification of the phreatic surface is difficult due to the fine grained nature of the soils plus the large downward gradient.

3.3 Shear Wave Velocity Test Results

The variation in shear wave velocity with depth calculated for each hole (SCPT-2 and SCPT-4A) are shown in Appendix E plotted at a depth midway between the one meter test intervals. The pertinent data for each of the seismic profiles is presented in Tables 1 and 4A in Appendix E. Based on the seismic cone test data presented, the shear wave velocities in the penetrated tailings vary between about 175 m/sec and 312 m/sec.

We trust that the information presented in this report is sufficient for your purposes. If you have any questions regarding the contents of this report, please do not hesitate to contact our office.

Sincerely,

David J. Woeller, M.Eng., P.Eng.

ref: a:\96-163.rpt

APPENDIX A

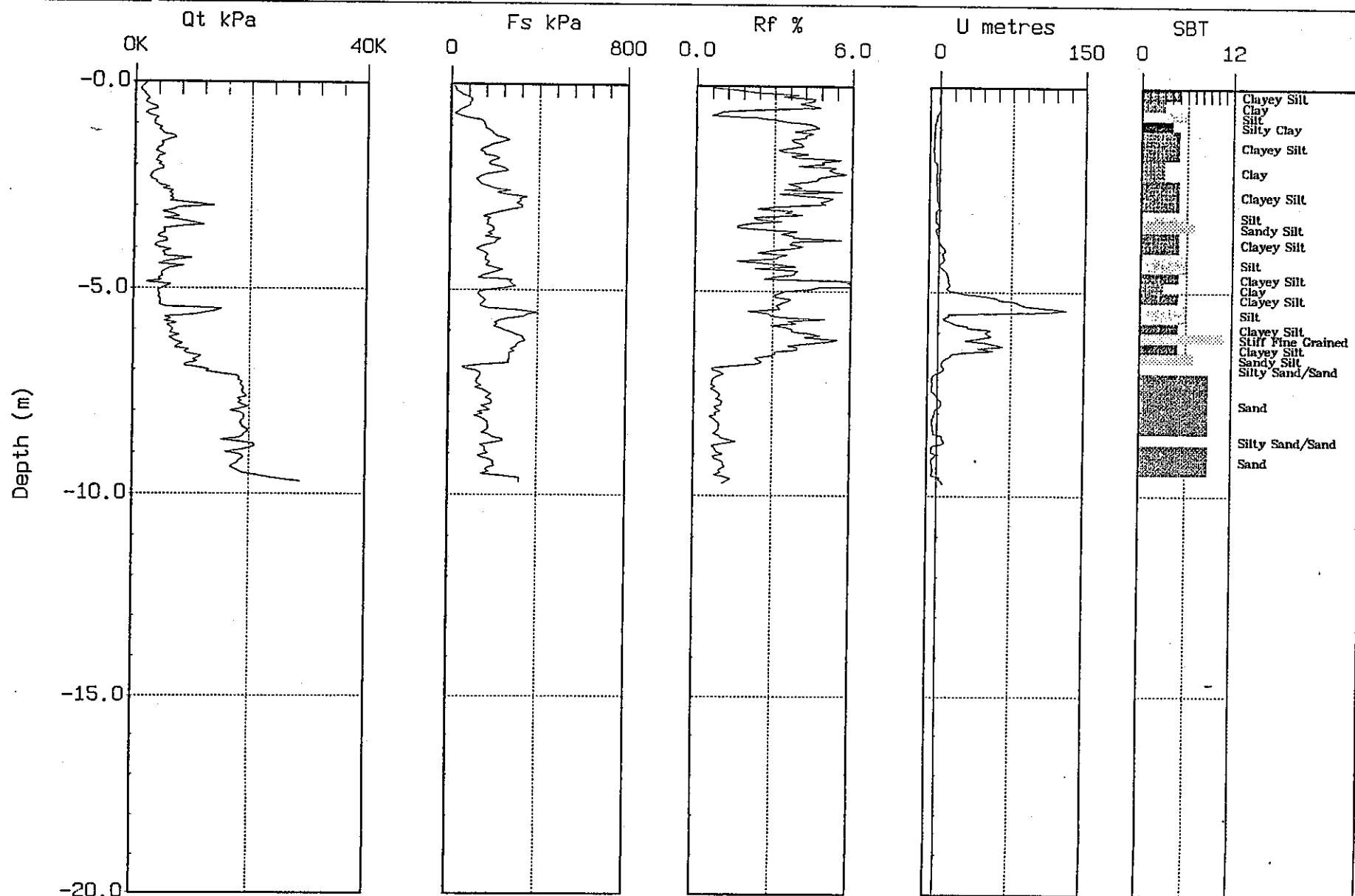
CPT PLOTS



KNIGHT PIESOLD

Site: CPT 96-1 (1) 20+00 C/L
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15



Max. Depth: 9.70 (m)

Depth Inc.: 0.05 (m)

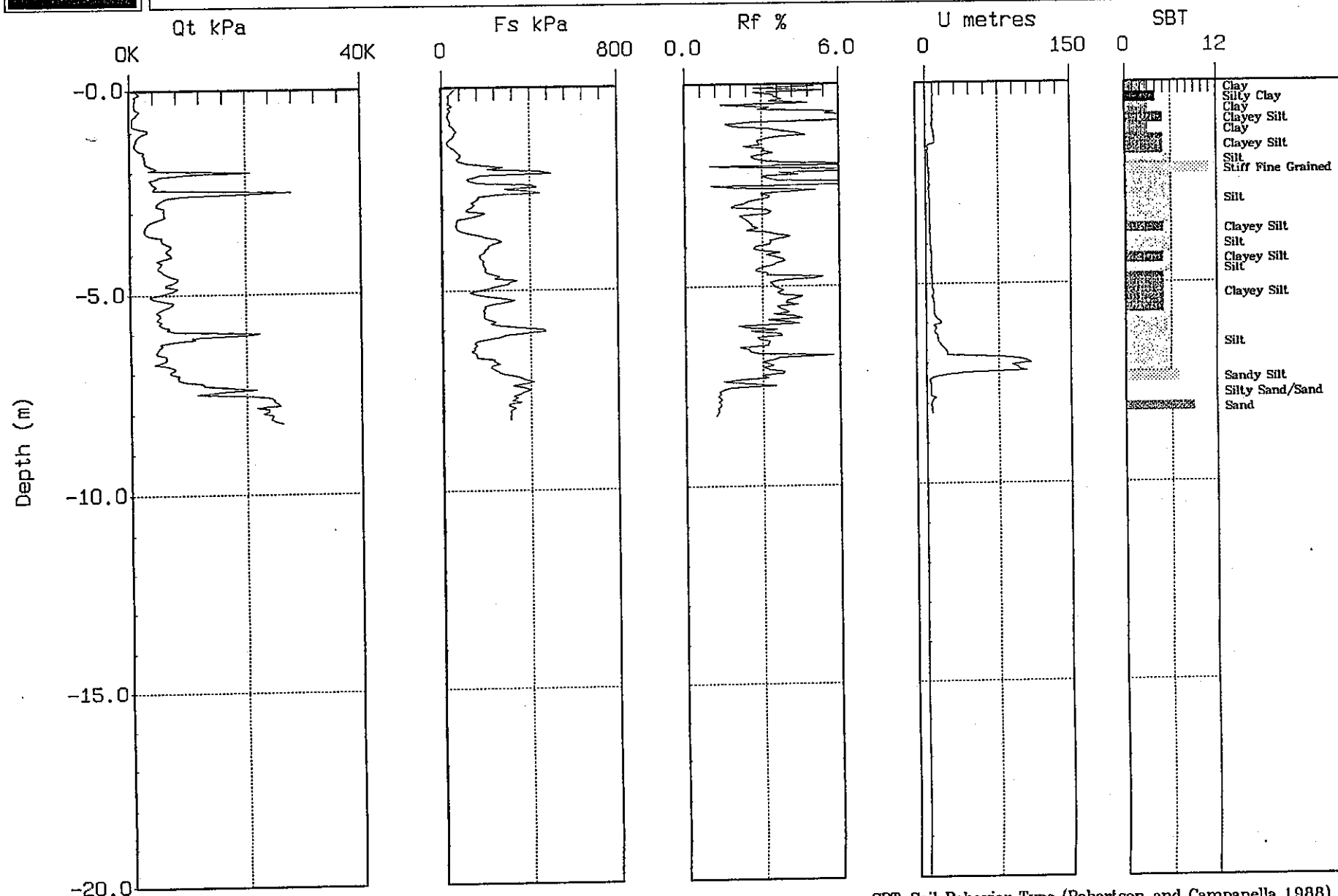
SBT: Soil Behavior Type (Robertson and Campanella 1988)



KNIGHT PIESOLD

Site: PRW 96-3 (2) 19+30 C/L
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 11:43



Max. Depth: 8.25 (m)

Depth Inc.: 0.05 (m)

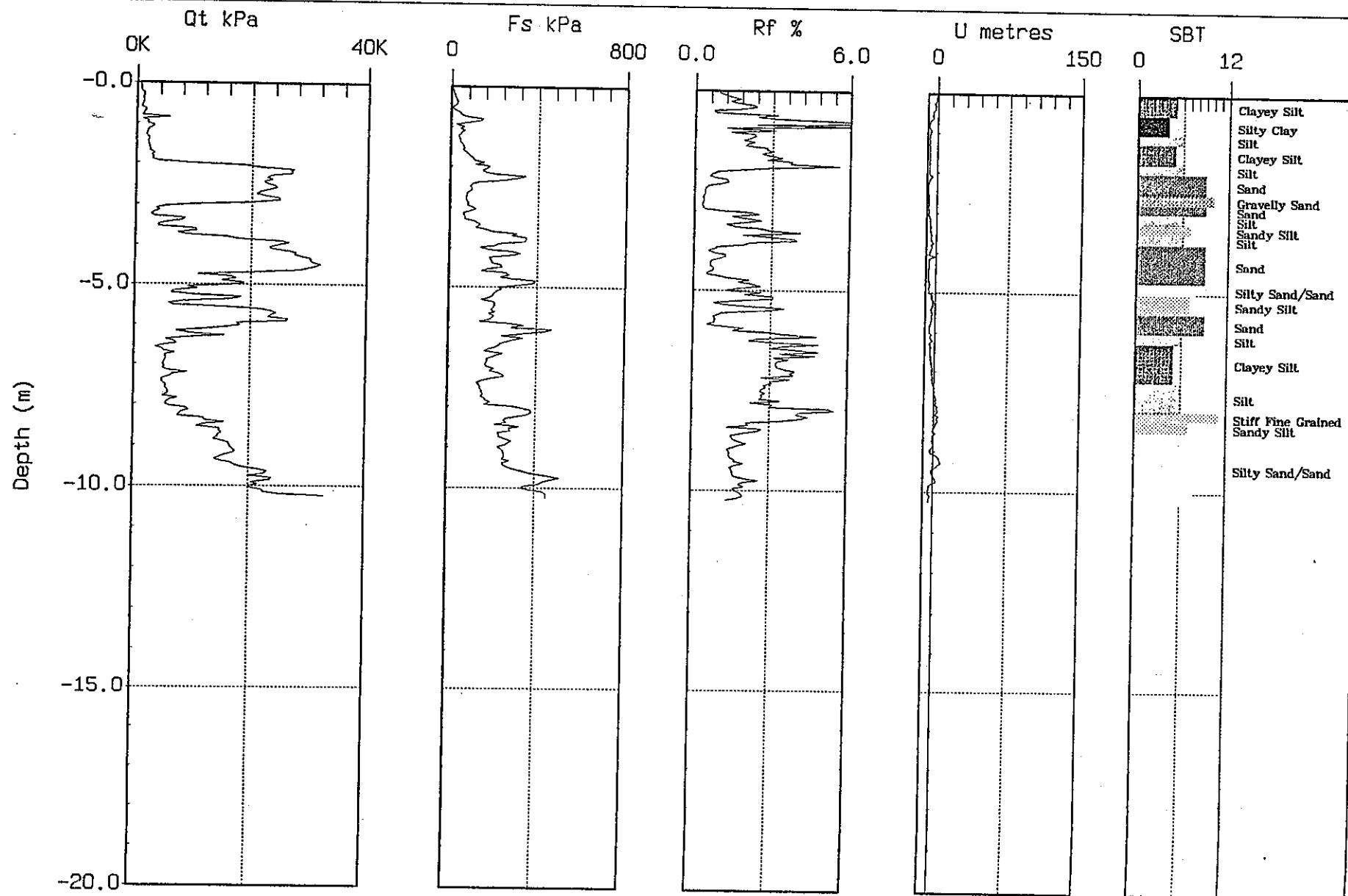
SBT: Soil Behavior Type (Robertson and Campanella 1988)



KNIGHT PIESOLD

Site: PAW 96-4 (3) 18+00 c/L
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 1351



Max. Depth: 10.25 (m)

Depth Inc.: 0.05 (m)

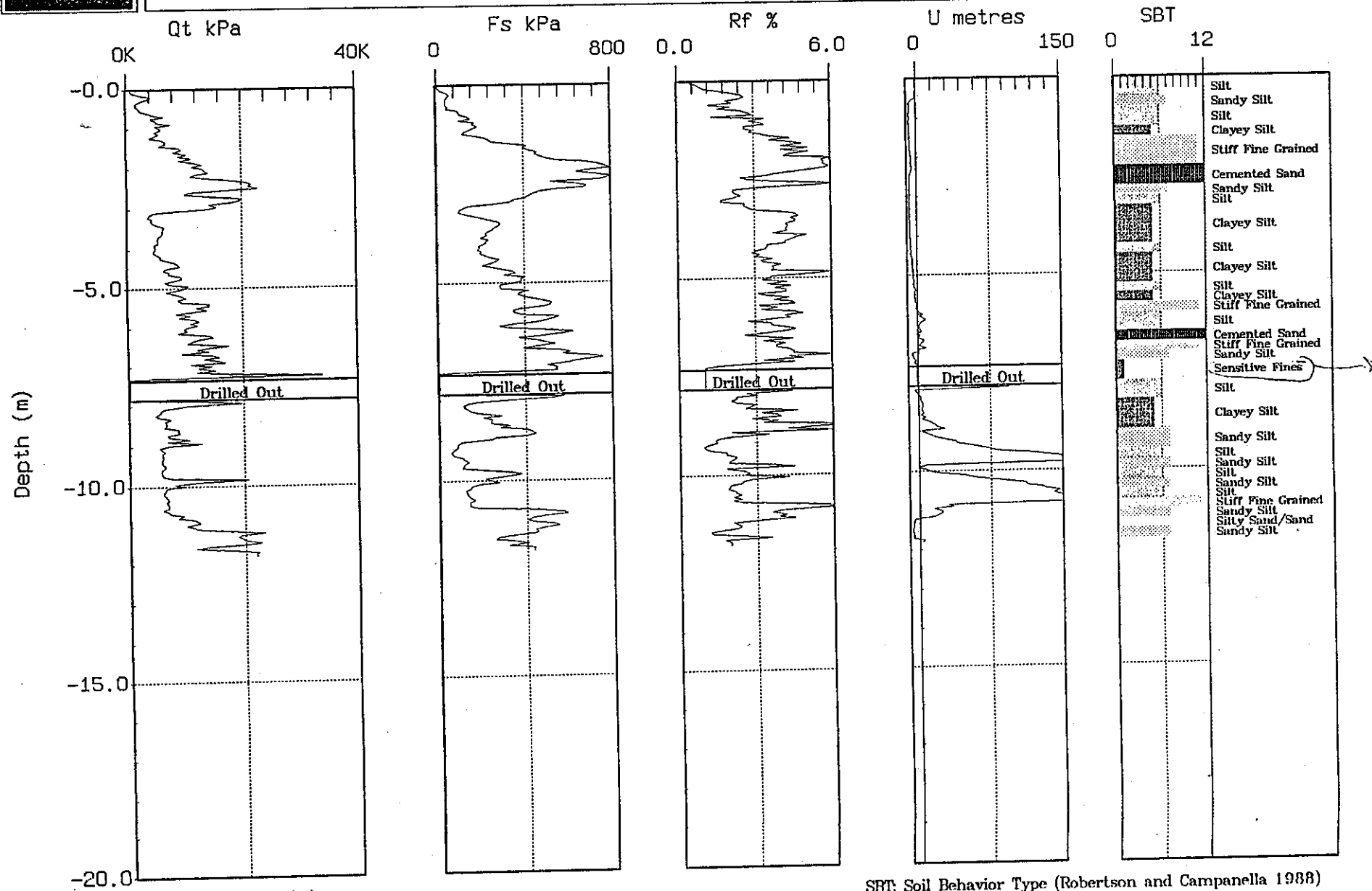
SBT: Soil Behavior Type (Robertson and Campanella 1988)



KNIGHT PIESOLD

Site: PRW 96-2 (4) 21400
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07/27/96 16:27



Max. Depth: 11.80 (m)

Depth Inc.: 0.05 (m)

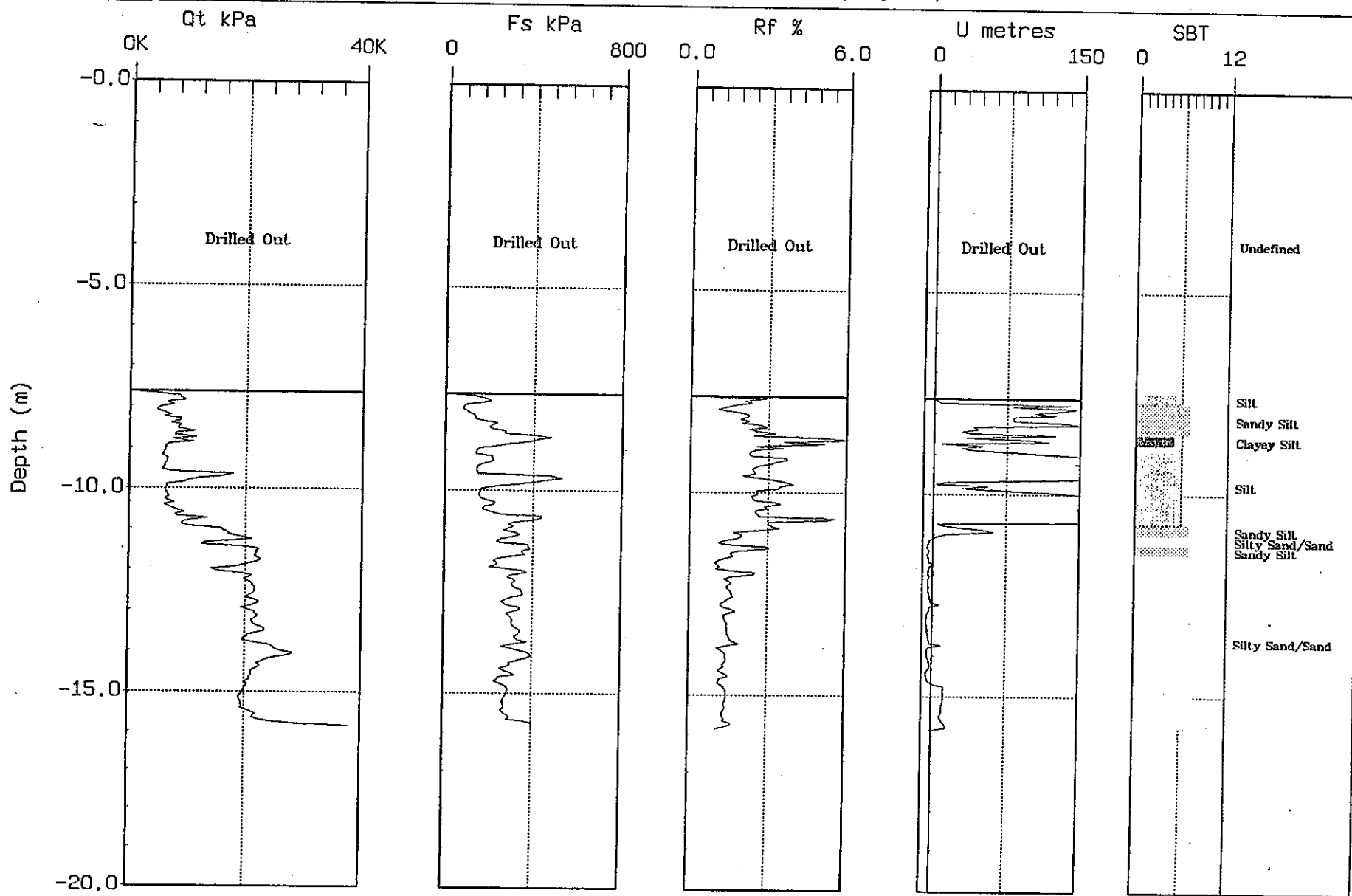


KNIGHT PIESOLD

Site: PRW 96-2 (4A)
Location: MT. POLLEY DAM

2100
Redrill

Cone: 10 TON A 023
Date: 07:28:96 08:43



Max. Depth: 15.85 (m)

Depth Inc.: 0.05 (m)

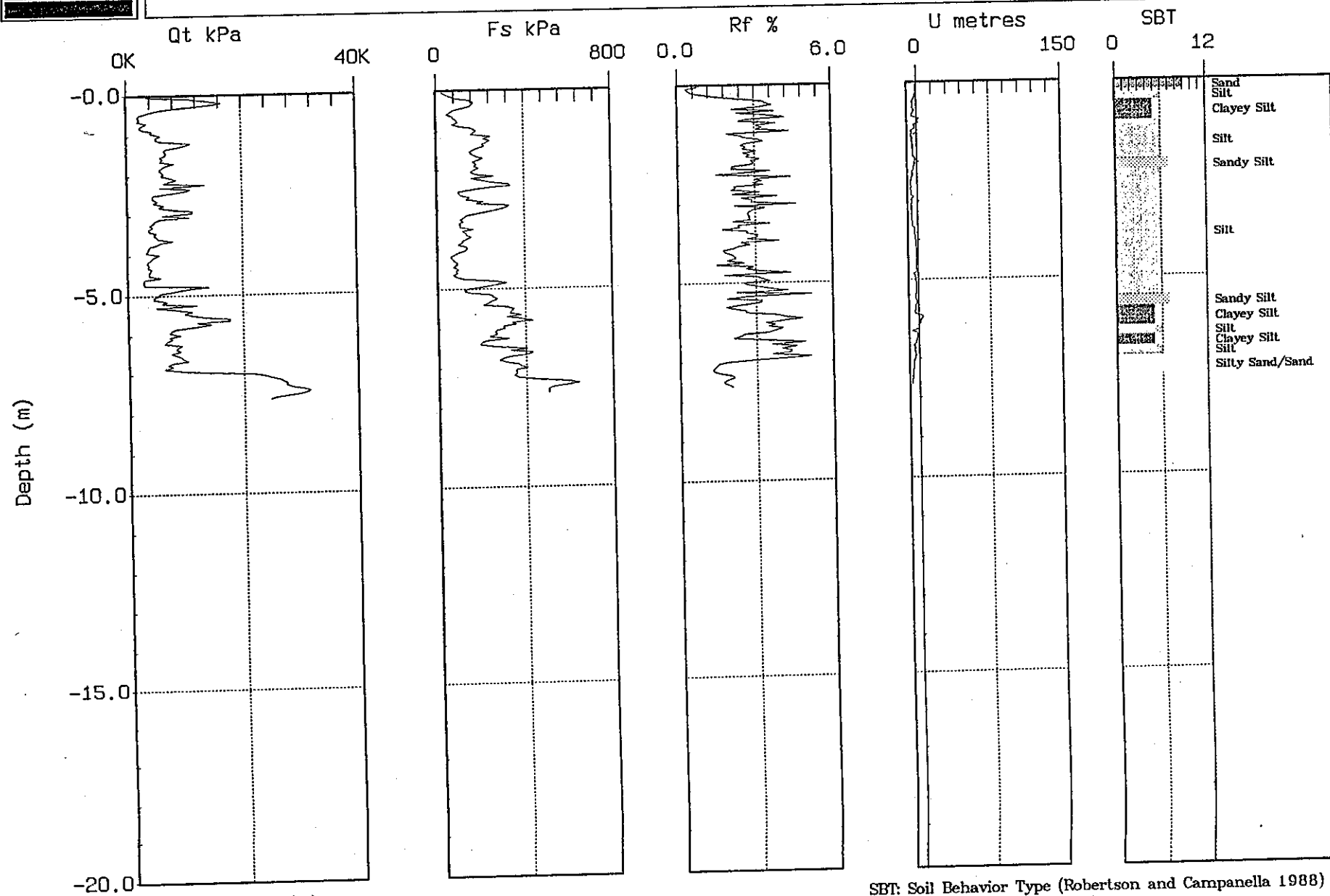
SBT: Soil Behavior Type (Robertson and Campanella 1988)



KNIGHT PIESOLD

Site: PRW 96-1 (5) 22+80 ϕ
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07/28/96 10:28



Max. Depth: 7.65 (m)

Depth Inc.: 0.05 (m)

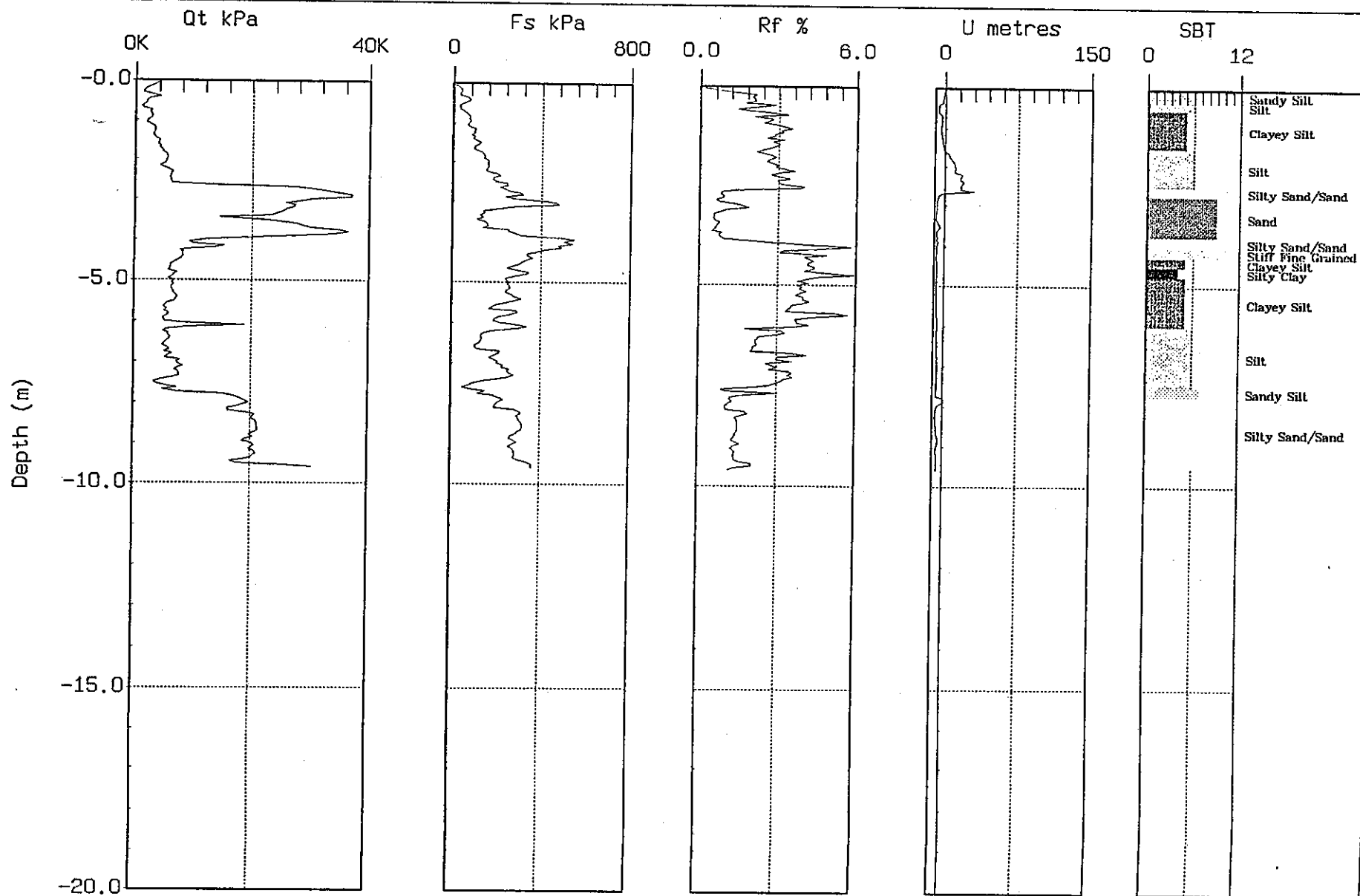
SBT: Soil Behavior Type (Robertson and Campanella 1988)



KNIGHT PIESOLD

Site: CPT 96-2 (6) 19450, 0/5 Toe
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 13:48



Max. Depth: 9.60 (m)

Depth Inc.: 0.05 (m)

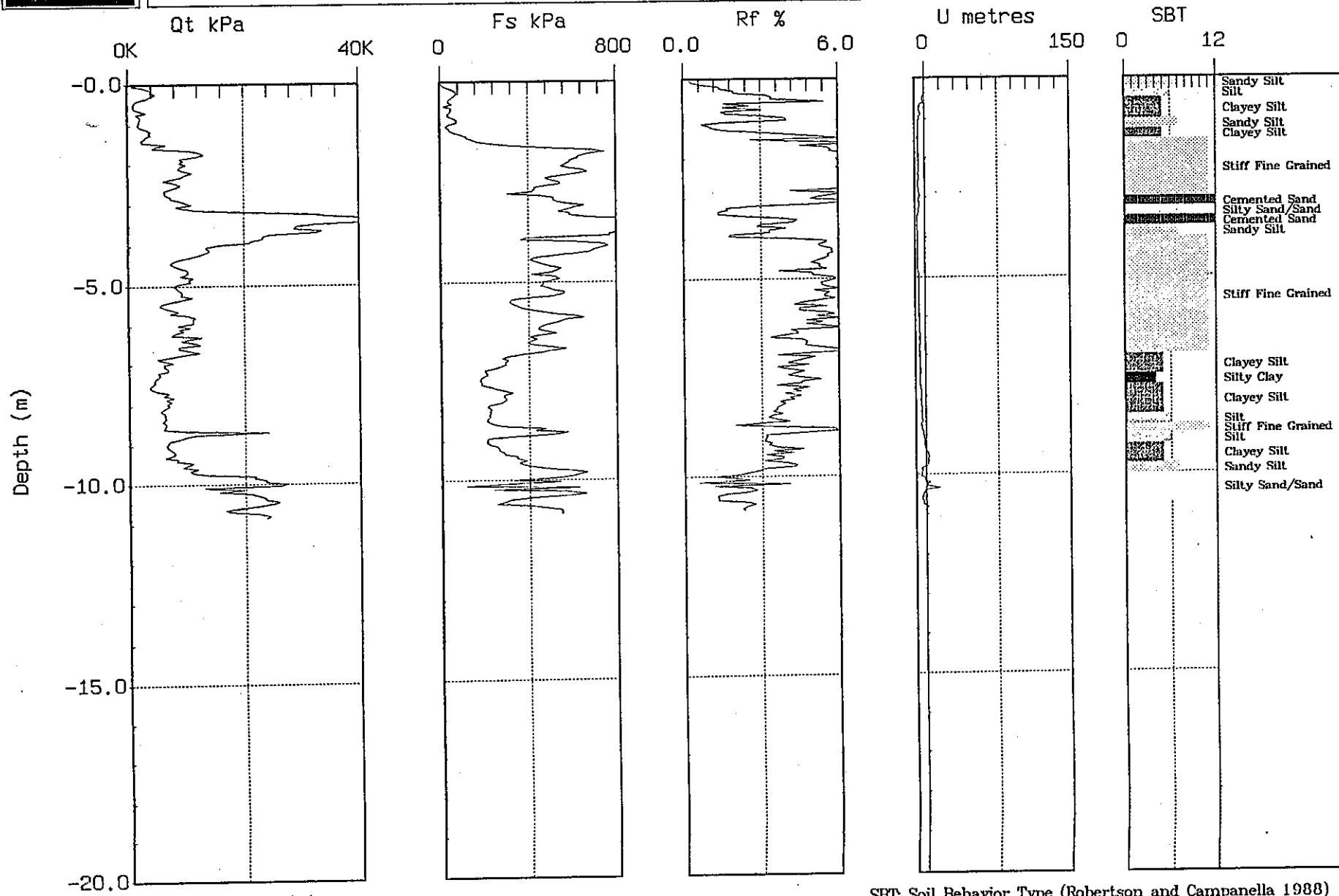
SBT: Soil Behavior Type (Robertson and Campanella 1988)



KNIGHT PIESOLD

Site: CPT 96-3 (7) 20450, U/S Toe
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07/28/96 15:08



Max. Depth: 10.85 (m)

Depth Inc.: 0.05 (m)

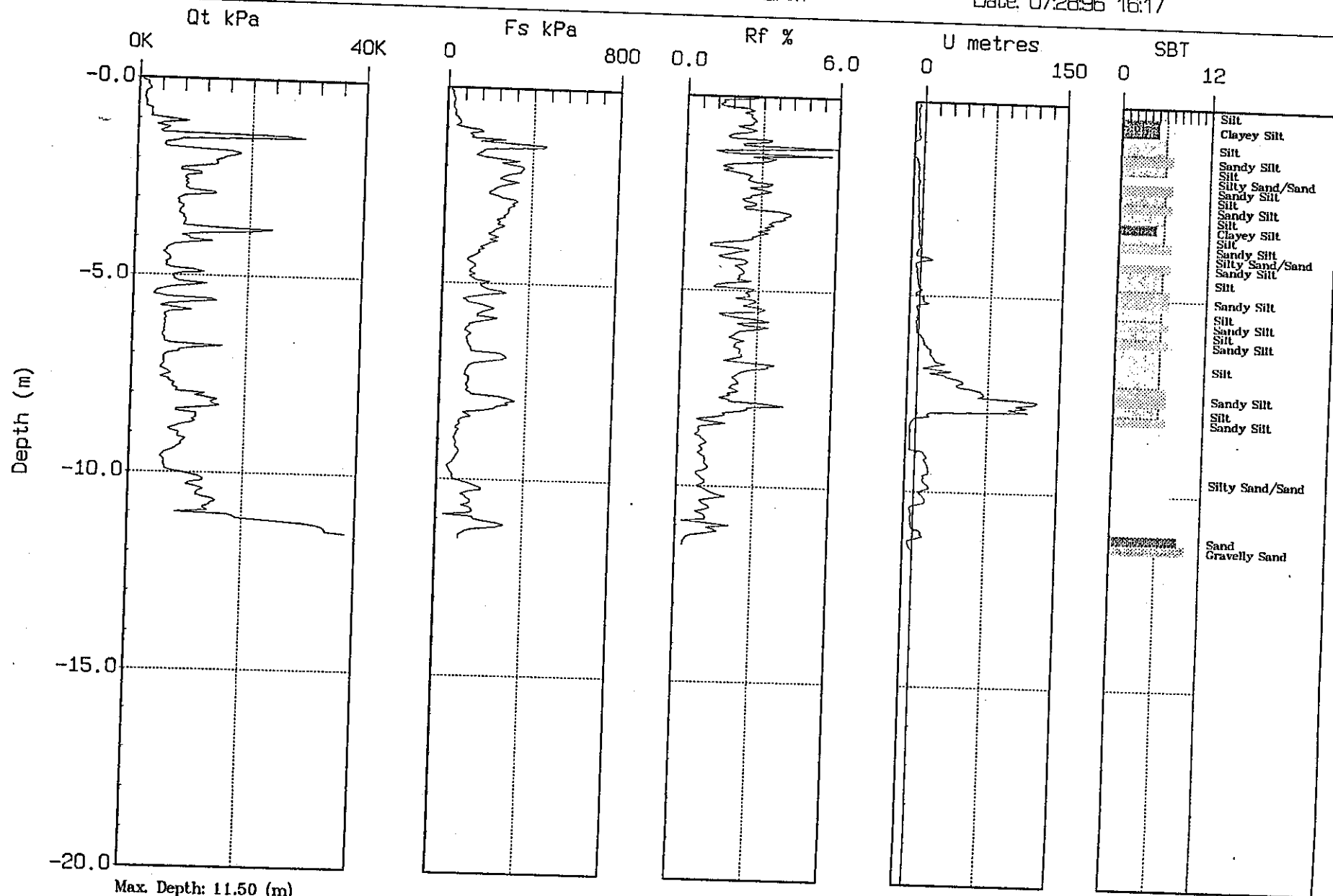
SBT: Soil Behavior Type (Robertson and Campanella 1988)



KNIGHT PIESOLD

Site: CPT 96-4 (8) 10450, D/S Toe
Location: MT. POLLEY DAM

Cone: 10 TON A 005
Date: 07:28:96 16:17



Max. Depth: 11.50 (m)

Depth Inc.: 0.05 (m)

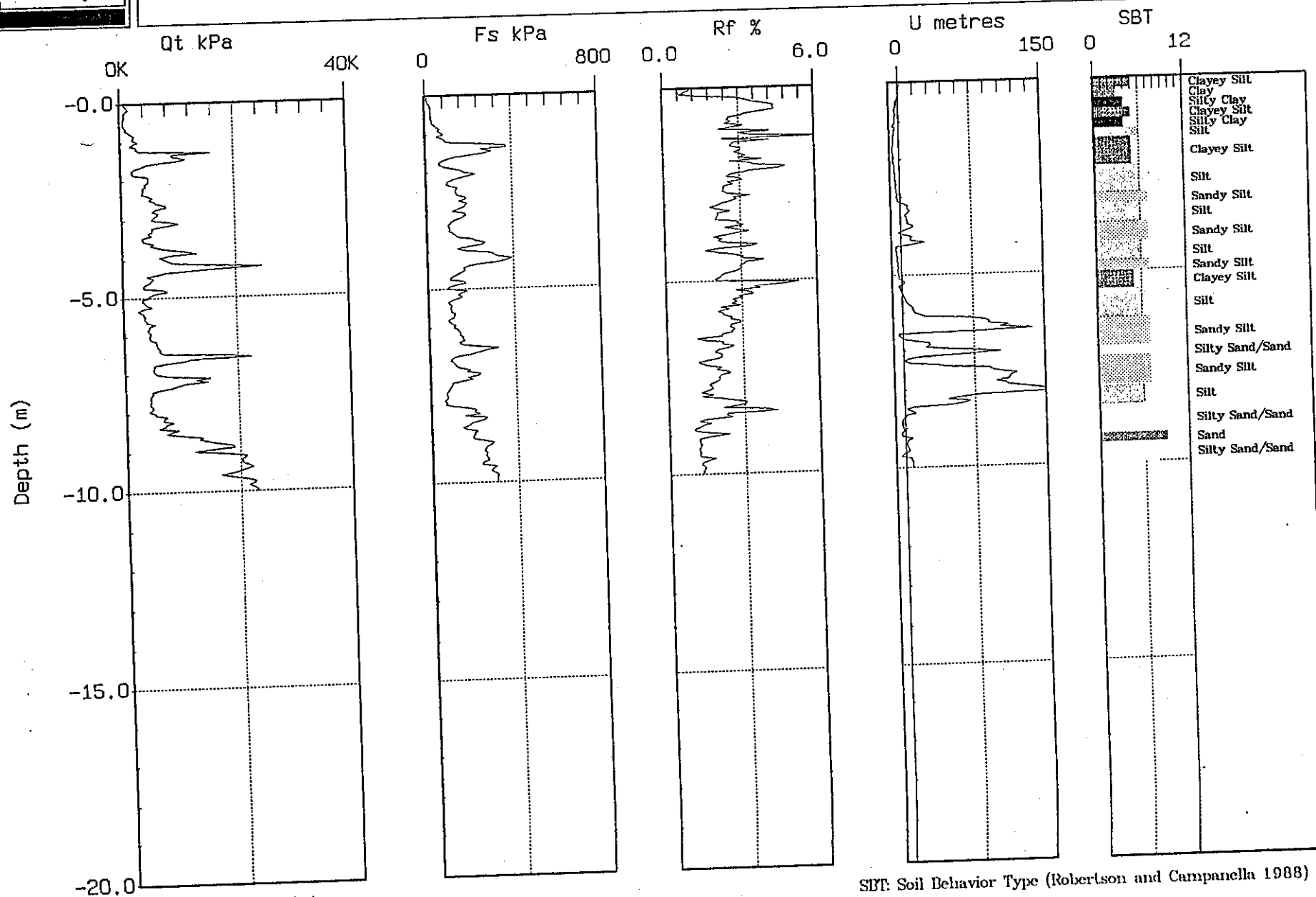
SBT: Soil Behavior Type (Robertson and Campanella 1988)



KNIGHT PIESOLD

Site: CPT 96-5 (9) 20+50 D/S T₂
Location: MT. POLLEY DAM

Cone: 10 TON A 005
Date: 07/28/96 17:20



Max. Depth: 10.00 (m)

Depth Inc.: 0.05 (m)

SBT: Soil Behavior Type (Robertson and Campanella 1988)

APPENDIX B

TABULAR CPT INTERPRETATIONS

ConeTec Investigations Ltd. - CPT Interpretation
 Client: KNIGHT PIESOLD
 Site: CPT 96-1 (1)
 Location: MT. POLLEY DAM
 Cone: 10 TON A 023
 Date: 07:27:96 08:15

20+00 4

Cor Table (m): 0.00 (ft): 0.00
 Su Nkt used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U Wt	TStress	EStress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	1310.55	28.20	2.15	5	18.00	2.25	1.02	1.23	2.00	6.6	13.1	104.66	5.0E-06
2	0.38	1931.77	84.80	4.39	3	17.50	6.69	3.01	3.68	2.00	19.3	38.6	154.01	5.0E-08
3	0.62	2797.64	36.80	1.32	6	18.00	11.12	4.99	6.13	2.00	11.2	22.4	222.92	5.0E-05
4	0.88	3266.65	131.80	4.03	4	18.00	15.62	7.04	8.58	2.00	21.8	43.6	260.08	5.0E-07
5	1.12	4360.36	181.80	4.17	5	18.00	20.12	9.09	11.04	2.00	21.8	43.6	347.22	5.0E-06
6	1.38	5731.42	219.00	3.82	5	18.00	24.62	11.14	13.49	2.00	28.7	57.3	456.54	5.0E-06
7	1.62	4270.71	156.00	3.65	5	18.00	29.12	13.18	15.94	2.00	21.4	42.7	339.33	5.0E-06
8	1.88	3970.95	194.60	4.90	3	17.50	33.56	15.17	18.39	2.00	39.7	79.4	314.99	5.0E-08
9	2.12	3836.34	200.60	5.23	3	17.50	37.94	17.09	20.85	2.00	38.4	76.7	303.87	5.0E-08
10	2.38	3397.24	137.20	4.04	5	18.00	42.38	19.08	23.30	2.00	17.0	34.0	268.39	5.0E-06
11	2.62	5953.32	253.60	4.26	5	18.00	46.88	21.12	25.75	2.00	29.8	59.5	472.52	5.0E-06
12	2.88	8599.27	315.80	3.67	5	18.00	51.38	23.17	28.20	2.00	43.0	86.0	683.83	5.0E-06
13	3.12	6632.89	205.60	3.10	6	18.00	55.88	25.22	30.66	1.95	26.5	51.7	526.16	5.0E-05
14	3.38	8587.49	178.20	2.08	7	18.50	60.44	27.33	33.11	1.87	28.6	53.6	0.00	5.0E-04
15	3.62	4731.28	188.80	3.99	5	18.00	65.00	29.44	35.56	1.80	23.7	42.7	373.30	5.0E-06
16	3.88	4510.20	164.20	3.64	5	18.00	69.50	31.49	38.01	1.74	22.6	39.3	355.26	5.0E-06
17	4.12	6235.88	160.40	2.57	6	18.00	74.00	33.53	40.47	1.69	24.9	42.2	492.95	5.0E-05
18	4.38	6216.44	188.40	3.03	6	18.00	78.50	35.58	42.92	1.64	24.9	40.8	491.04	5.0E-05
19	4.62	4787.51	189.60	3.96	5	18.00	83.00	37.63	45.37	1.60	23.9	38.2	376.36	5.0E-06
20	4.88	4617.74	250.00	5.41	3	17.50	87.44	39.61	47.82	1.55	46.2	71.8	362.42	5.0E-08
21	5.12	4292.24	143.00	3.33	5	18.00	91.88	41.60	50.28	1.52	21.5	32.6	336.03	5.0E-06
22	5.38	6799.53	184.00	2.71	6	18.00	96.38	43.65	52.73	1.48	27.2	40.3	536.25	5.0E-05
23	5.62	9579.77	316.40	3.30	6	18.00	100.88	45.69	55.18	1.45	38.3	55.5	758.31	5.0E-05
24	5.88	6267.72	220.60	3.52	5	18.00	105.38	47.74	57.63	1.42	31.3	44.4	492.99	5.0E-06
25	6.12	6663.82	318.80	4.78	11	20.50	110.19	50.10	60.09	1.38	19.0	26.3	0.00	0.0E+00
26	6.38	7990.02	298.00	3.73	5	18.00	115.00	52.46	62.54	1.35	40.0	54.0	630.00	5.0E-06
27	6.62	10171.47	269.60	2.65	7	18.50	119.56	54.57	64.99	1.32	33.9	44.9	0.00	5.0E-04
28	6.88	10581.24	131.80	1.25	8	19.00	124.25	56.81	67.44	1.30	26.5	34.4	0.00	5.0E-03
29	7.12	16417.00	133.40	0.81	9	19.50	129.06	59.17	69.90	1.27	32.8	41.8	0.00	5.0E-02
30	7.38	18703.74	142.00	0.76	9	19.50	133.94	61.59	72.35	1.25	37.4	46.7	0.00	5.0E-02
31	7.62	18854.78	183.00	0.97	9	19.50	138.81	64.01	74.80	1.22	37.7	46.1	0.00	5.0E-02
	7.88	18348.18	164.00	0.89	9	19.50	143.69	66.43	77.25	1.20	36.7	44.1	0.00	5.0E-02
	8.12	18809.59	150.40	0.80	9	19.50	148.56	68.86	79.71	1.18	37.6	44.4	0.00	5.0E-02
34	8.38	19093.07	169.80	0.89	9	19.50	153.44	71.28	82.16	1.16	38.2	44.3	0.00	5.0E-02
35	8.62	17899.68	212.80	1.19	8	19.00	158.25	73.64	84.61	1.14	44.7	51.0	0.00	5.0E-03
36	8.88	19196.81	163.00	0.85	9	19.50	163.06	76.00	87.06	1.12	38.4	43.1	0.00	5.0E-02
37	9.12	18446.33	175.20	0.95	9	19.50	167.94	78.42	89.52	1.11	36.9	40.8	0.00	5.0E-02
38	9.38	17661.97	177.20	1.00	9	19.50	172.81	80.84	91.97	1.09	35.3	38.4	0.00	5.0E-02

ConeTec Investigations Ltd. - CPT Interpretation
 Client: KNIGHT PIESOLD
 Site: PRW 96-3 (2)
 Location: MT. POLLEY DAM
 Cone: 10 TON A 023
 Date: 07:27:96 11:43

19730 4

Table (m): 0.00 (ft): 0.00
 Bu. nkt Used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U Wt	TStress	EStress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	1124.42	41.20	3.66	3	17.50	2.19	0.96	1.23	2.00	11.2	22.5	89.78	5.0E-08
2	0.38	1047.96	32.00	3.05	4	18.00	6.62	2.95	3.68	2.00	7.0	14.0	83.31	5.0E-07
3	0.62	718.90	30.40	4.23	3	17.50	11.06	4.93	6.13	2.00	7.2	14.4	56.63	5.0E-08
4	0.88	1635.24	42.20	2.58	5	18.00	15.50	6.92	8.58	2.00	8.2	16.4	129.58	5.0E-06
5	1.12	1339.31	51.00	3.81	3	17.50	19.94	8.90	11.04	2.00	13.4	26.8	105.55	5.0E-08
6	1.38	1268.60	34.00	2.68	5	18.00	24.38	10.89	13.49	2.00	6.3	12.7	99.54	5.0E-06
7	1.62	2455.60	74.00	3.01	5	18.00	28.88	12.93	15.94	2.00	12.3	24.6	194.14	5.0E-06
8	1.88	7031.80	170.40	2.42	6	18.00	33.38	14.98	18.39	2.00	28.1	56.3	559.87	5.0E-05
9	2.12	5514.11	272.20	4.94	11	20.50	38.19	17.34	20.85	2.00	15.8	31.5	0.00	0.0E+00
10	2.38	8893.63	282.60	3.18	6	18.00	43.00	19.70	23.30	2.00	35.6	71.1	708.05	5.0E-05
11	2.62	9009.70	282.80	3.14	6	18.00	47.50	21.75	25.75	2.00	36.0	72.1	716.98	5.0E-05
12	2.88	5318.14	133.20	2.50	6	18.00	52.00	23.80	28.20	2.00	21.3	42.5	421.29	5.0E-05
13	3.12	4819.53	131.80	2.73	6	18.00	56.50	25.84	30.66	1.93	19.3	37.1	381.04	5.0E-05
14	3.38	2590.14	63.40	2.45	6	18.00	61.00	27.89	33.11	1.85	10.4	19.2	202.33	5.0E-05
15	3.62	5148.77	168.60	3.27	5	18.00	65.50	29.94	35.56	1.79	25.7	46.0	406.66	5.0E-06
16	3.88	6693.62	220.80	3.30	6	18.00	70.00	31.99	38.01	1.73	26.8	46.3	529.89	5.0E-05
17	4.12	5621.60	176.60	3.14	6	18.00	74.50	34.03	40.47	1.68	22.5	37.7	443.77	5.0E-05
18	4.38	5392.79	188.40	3.49	5	18.00	79.00	36.08	42.92	1.63	27.0	43.9	425.10	5.0E-06
19	4.62	7445.91	251.80	3.38	6	18.00	83.50	38.13	45.37	1.58	29.8	47.2	588.99	5.0E-05
20	4.88	6589.77	247.00	3.75	5	18.00	88.00	40.18	47.82	1.54	32.9	50.9	520.14	5.0E-06
21	5.12	5528.09	216.00	3.91	5	18.00	92.50	42.22	50.28	1.51	27.6	41.6	434.85	5.0E-06
22	5.38	5317.00	214.80	4.04	5	18.00	97.00	44.27	52.73	1.47	26.6	39.1	417.60	5.0E-06
23	5.62	4966.18	191.00	3.85	5	18.00	101.50	46.32	55.18	1.44	24.8	35.7	389.17	5.0E-06
24	5.88	9664.47	301.40	3.12	6	18.00	106.00	48.37	57.63	1.41	38.7	54.4	764.68	5.0E-05
25	6.12	10637.00	315.00	2.96	6	18.00	110.50	50.41	60.09	1.38	42.5	58.6	842.12	5.0E-05
26	6.38	4778.53	146.20	3.06	6	18.00	115.00	52.46	62.54	1.35	19.1	25.8	373.08	5.0E-05
27	6.62	5511.57	163.40	2.96	6	18.00	119.50	54.51	64.99	1.33	22.0	29.2	431.37	5.0E-05
28	6.88	6982.35	232.40	3.33	6	18.00	124.00	56.56	67.44	1.30	27.9	36.3	548.67	5.0E-05
29	7.12	9214.82	309.40	3.36	6	18.00	128.50	58.60	69.90	1.28	36.9	47.1	726.91	5.0E-05
30	7.38	15726.07	374.20	2.38	7	18.50	133.06	60.71	72.35	1.26	52.4	65.8	0.00	5.0E-04
31	7.62	24083.95	338.60	1.41	8	19.00	137.75	62.95	74.80	1.23	60.2	74.3	0.00	5.0E-03
	7.88	23700.06	318.60	1.34	8	19.00	142.50	65.25	77.25	1.21	59.3	71.8	0.00	5.0E-03
	8.12	24987.66	305.60	1.22	9	19.50	147.31	67.61	79.71	1.19	50.0	59.5	0.00	5.0E-02

ConeTec Investigations Ltd. - CPT Interpretation
 Client: KNIGHT PIESOLD
 Site: PRW 96-4 (3)
 Location: MT. POLLEY DAM
 Cone: 10 TON A 023
 Date: 07:27:96 13:51

18100 4

Table (m): 1.75 (ft): 5.74
 Su Nkt used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U Wt	TStress	ESTress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	752.38	10.00	1.33	5	18.00	2.25	2.25	0.00	2.00	3.8	7.5	60.01	5.0E-06
2	0.38	1086.87	19.00	1.75	5	18.00	6.75	6.75	0.00	2.00	5.4	10.9	86.41	5.0E-06
3	0.62	1170.65	35.80	3.06	4	18.00	11.25	11.25	0.00	2.00	7.8	15.6	92.75	5.0E-07
4	0.88	2238.00	86.00	3.84	4	18.00	15.75	15.75	0.00	2.00	14.9	29.8	177.78	5.0E-07
5	1.12	2240.13	44.00	1.96	6	18.00	20.25	20.25	0.00	2.00	9.0	17.9	177.59	5.0E-05
6	1.38	1921.05	45.20	2.35	5	18.00	24.75	24.75	0.00	1.97	9.6	18.9	151.70	5.0E-06
7	1.62	2371.95	69.80	2.94	5	18.00	29.25	29.25	0.00	1.81	11.9	21.5	187.42	5.0E-06
8	1.88	4272.75	128.40	3.01	6	18.00	33.75	32.52	1.23	1.72	17.1	29.3	339.12	5.0E-05
9	2.12	24284.02	204.00	0.84	9	19.50	38.44	34.76	3.68	1.66	48.6	80.6	0.00	5.0E-02
10	2.38	22803.97	169.20	0.74	9	19.50	43.31	37.18	6.13	1.61	45.6	73.2	0.00	5.0E-02
11	2.62	22755.32	82.80	0.36	10	20.00	48.25	39.67	8.58	1.55	37.9	58.9	0.00	5.0E+00
12	2.88	20393.23	80.20	0.39	9	19.50	53.19	42.15	11.04	1.51	40.8	61.5	0.00	5.0E-02
13	3.12	3648.38	76.80	2.11	6	18.00	57.88	44.39	13.49	1.47	14.6	21.4	287.24	5.0E-05
14	3.38	5726.08	109.40	1.91	7	18.50	62.44	46.50	15.94	1.44	19.1	27.4	0.00	5.0E-04
15	3.62	8123.18	256.80	3.16	6	18.00	67.00	48.61	18.39	1.40	32.5	45.6	644.49	5.0E-05
16	3.88	22003.86	250.40	1.14	9	19.50	71.69	50.84	20.85	1.37	44.0	60.4	0.00	5.0E-02
17	4.12	25626.96	248.80	0.97	9	19.50	76.56	53.26	23.30	1.34	51.3	68.7	0.00	5.0E-02
18	4.38	30330.53	207.60	0.68	9	19.50	81.44	55.69	25.75	1.31	60.7	79.6	0.00	5.0E-02
19	4.62	23951.85	215.20	0.90	9	19.50	86.31	58.11	28.20	1.28	47.9	61.5	0.00	5.0E-02
20	4.88	17053.27	320.80	1.88	8	19.00	91.12	60.47	30.66	1.26	42.6	53.7	0.00	5.0E-03
21	5.12	8637.88	205.00	2.37	7	18.50	95.81	62.70	33.11	1.24	28.8	35.6	0.00	5.0E-04
22	5.38	11146.26	191.80	1.72	7	18.50	100.44	64.88	35.56	1.22	37.2	45.1	0.00	5.0E-04
23	5.62	22028.03	195.40	0.89	9	19.50	105.19	67.17	38.01	1.19	44.1	52.6	0.00	5.0E-02
24	5.88	22278.29	241.00	1.08	9	19.50	110.06	69.60	40.47	1.17	44.6	52.3	0.00	5.0E-02
25	6.12	12052.97	365.60	3.03	6	18.00	114.75	71.83	42.92	1.15	48.2	55.7	955.06	5.0E-05
26	6.38	6759.84	245.00	3.62	5	18.00	119.25	73.88	45.37	1.14	33.8	38.5	531.25	5.0E-06
27	6.62	5180.53	199.80	3.86	5	18.00	123.75	75.93	47.82	1.12	25.9	29.1	404.54	5.0E-06
28	6.88	5187.37	171.60	3.31	5	18.00	128.25	77.97	50.28	1.11	25.9	28.7	404.73	5.0E-06
29	7.12	6351.05	223.40	3.52	5	18.00	132.75	80.02	52.73	1.09	31.8	34.7	497.46	5.0E-06
30	7.38	5199.19	149.60	2.88	6	18.00	137.25	82.07	55.18	1.08	20.8	22.5	404.96	5.0E-05
31	7.62	5621.04	150.80	2.68	6	18.00	141.75	84.12	57.63	1.07	22.5	24.0	438.34	5.0E-05
	7.88	5899.14	196.40	3.33	6	18.00	146.25	86.16	60.09	1.05	23.6	24.9	460.23	5.0E-05
	8.12	8130.81	356.60	4.39	11	20.50	151.06	88.52	62.54	1.04	23.2	24.2	0.00	0.0E+00
34	8.38	11923.84	264.80	2.22	7	18.50	155.94	90.95	64.99	1.03	39.7	40.8	0.00	5.0E-04
35	8.62	14088.78	252.00	1.79	8	19.00	160.62	93.18	67.44	1.01	35.2	35.7	0.00	5.0E-03
36	8.88	15319.83	264.20	1.72	8	19.00	165.38	95.48	69.90	1.00	38.3	38.4	0.00	5.0E-03
37	9.12	16920.23	253.60	1.50	8	19.00	170.12	97.78	72.35	0.99	42.3	41.9	0.00	5.0E-03
38	9.38	15741.24	263.00	1.67	8	19.00	174.88	100.07	74.80	0.98	39.4	38.5	0.00	5.0E-03
39	9.62	21212.79	400.20	1.89	8	19.00	179.62	102.37	77.25	0.97	53.0	51.3	0.00	5.0E-03
40	9.88	21907.27	401.60	1.83	8	19.00	184.38	104.67	79.71	0.96	54.8	52.4	0.00	5.0E-03
41	10.12	24731.10	432.00	1.75	8	19.00	189.12	106.97	82.16	0.95	61.8	58.5	0.00	5.0E-03

ConeTec Investigations Ltd. - CPT Interpretation
 Client: KNIGHT PIESOLD
 Site: PRW 96-2 (4)
 Location: MT. POLLEY DAM
 Cone: 10 TON A 023
 Date: 07:27:96 16:27

21400 4

Table (m): 0.00 (ft): 0.00
 Sckt used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U Wt	TStress	ESTress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	2489.82	28.20	1.13	6	18.00	2.25	1.02	1.23	2.00	10.0	19.9	199.01	5.0E-05
2	0.38	1979.33	45.00	2.27	6	18.00	6.75	3.07	3.68	2.00	7.9	15.8	157.81	5.0E-05
3	0.62	4303.89	80.40	1.87	7	18.50	11.31	5.18	6.13	2.00	14.3	28.7	0.00	5.0E-04
4	0.88	5826.88	148.00	2.54	6	18.00	15.88	7.29	8.58	2.00	23.3	46.6	464.88	5.0E-05
5	1.12	5043.68	149.80	2.97	6	18.00	20.38	9.34	11.04	2.00	20.2	40.3	401.86	5.0E-05
6	1.38	6890.27	242.60	3.52	5	18.00	24.88	11.39	13.49	2.00	34.5	68.9	549.23	5.0E-06
7	1.62	9616.74	428.00	4.45	11	20.50	29.69	13.75	15.94	2.00	27.5	55.0	0.00	0.0E+00
8	1.88	11674.06	590.00	5.05	11	20.50	34.81	16.42	18.39	2.00	33.4	66.7	0.00	0.0E+00
9	2.12	12861.01	726.00	5.64	11	20.50	39.94	19.09	20.85	2.00	36.7	73.5	0.00	0.0E+00
10	2.38	20914.98	697.60	3.34	12	19.00	44.88	21.58	23.30	2.00	104.6	209.1	0.00	0.0E+00
11	2.62	14319.71	561.00	3.92	12	19.00	49.62	23.87	25.75	2.00	71.6	143.2	0.00	0.0E+00
12	2.88	16307.56	351.20	2.15	7	18.50	54.31	26.11	28.20	1.92	54.4	104.1	0.00	5.0E-04
13	3.12	4958.75	117.40	2.37	6	18.00	58.88	28.22	30.66	1.84	19.8	36.5	391.99	5.0E-05
14	3.38	5279.07	236.40	4.48	5	18.00	63.38	30.27	33.11	1.78	26.4	47.0	417.26	5.0E-06
15	3.62	5750.57	248.60	4.32	5	18.00	67.88	32.31	35.56	1.72	28.8	49.5	454.62	5.0E-06
16	3.88	4993.30	219.80	4.40	5	18.00	72.38	34.36	38.01	1.67	25.0	41.7	393.67	5.0E-06
17	4.12	5189.90	193.20	3.72	5	18.00	76.88	36.41	40.47	1.62	25.9	42.1	409.04	5.0E-06
18	4.38	7986.63	251.20	3.15	6	18.00	81.38	38.46	42.92	1.58	31.9	50.4	632.42	5.0E-05
19	4.62	7927.82	288.80	3.64	5	18.00	85.88	40.50	45.37	1.54	39.6	61.0	627.36	5.0E-06
20	4.88	8550.85	365.40	4.27	5	18.00	90.38	42.55	47.82	1.50	42.8	64.1	676.84	5.0E-06
21	5.12	8669.96	332.60	3.84	5	18.00	94.88	44.60	50.28	1.47	43.3	63.5	686.01	5.0E-06
22	5.38	11677.58	443.20	3.80	6	18.00	99.38	46.65	52.73	1.43	46.7	66.9	926.26	5.0E-05
23	5.62	10557.94	414.20	3.92	5	18.00	103.88	48.69	55.18	1.40	52.8	74.0	836.33	5.0E-06
24	5.88	11457.12	484.60	4.23	11	20.50	108.69	51.05	57.63	1.37	32.7	44.8	0.00	0.0E+00
25	6.12	11538.37	416.40	3.61	6	18.00	113.50	53.41	60.09	1.34	46.2	61.8	913.99	5.0E-05
26	6.38	13159.21	472.60	3.59	6	18.00	118.00	55.46	62.54	1.31	52.6	69.2	1043.30	5.0E-05
27	6.62	13169.97	511.00	3.88	12	19.00	122.62	57.63	64.99	1.29	65.8	84.9	0.00	0.0E+00
28	6.88	14263.35	672.40	4.71	11	20.50	127.56	60.12	67.44	1.26	40.8	51.4	0.00	0.0E+00
29	7.12	18233.88	545.60	2.99	7	18.50	132.44	62.54	69.90	1.24	60.8	75.2	0.00	5.0E-04
30	7.38	198.53	2.00	1.01	1	12.50	136.31	63.96	72.35	1.22	1.0	1.2	4.98	1.0E-07
31	7.62	198.53	2.00	1.01	1	12.50	139.44	64.64	74.80	1.22	1.0	1.2	4.73	1.0E-07
32	7.88	8821.45	285.60	3.24	6	18.00	143.25	66.00	77.25	1.20	35.3	42.5	694.26	5.0E-05
33	8.12	5870.77	134.60	2.29	6	18.00	147.75	68.04	79.71	1.19	23.5	27.9	457.84	5.0E-05
34	8.38	6277.97	213.00	3.39	5	18.00	152.25	70.09	82.16	1.17	31.4	36.7	490.06	5.0E-06
35	8.62	7649.20	297.60	3.89	5	18.00	156.75	72.14	84.61	1.15	38.2	44.1	599.40	5.0E-06
36	8.88	8679.92	353.40	4.07	5	18.00	161.25	74.19	87.06	1.14	43.4	49.3	681.49	5.0E-06
37	9.12	5619.57	83.20	1.48	7	18.50	165.81	76.30	89.52	1.12	18.7	21.0	0.00	5.0E-04
38	9.38	5707.20	77.80	1.36	7	18.50	170.44	78.47	91.97	1.10	19.0	21.0	0.00	5.0E-04
39	9.62	5677.40	135.00	2.38	6	18.00	175.00	80.58	94.42	1.09	22.7	24.8	440.19	5.0E-05
40	9.88	11321.03	287.60	2.54	7	18.50	179.56	82.69	96.87	1.08	37.7	40.6	0.00	5.0E-04
41	10.12	6076.15	170.60	2.81	6	18.00	184.12	84.80	99.33	1.06	24.3	25.8	471.36	5.0E-05
42	10.38	6500.81	136.40	2.10	7	18.50	188.69	86.91	101.78	1.05	21.7	22.7	0.00	5.0E-04
43	10.62	7043.41	205.80	2.92	6	18.00	193.25	89.02	104.23	1.04	28.2	29.2	548.01	5.0E-05
44	10.88	10602.73	494.00	4.66	11	20.50	198.06	91.38	106.68	1.02	30.3	31.0	0.00	0.0E+00
45	11.12	16470.34	483.60	2.94	7	18.50	202.94	93.80	109.14	1.01	54.9	55.5	0.00	5.0E-04
46	11.38	20282.48	351.40	1.73	8	19.00	207.62	96.04	111.59	1.00	50.7	50.6	0.00	5.0E-03
47	11.62	17529.17	385.20	2.20	7	18.50	212.31	98.27	114.04	0.99	58.4	57.7	0.00	5.0E-04

ConeTec Investigations Ltd. - CPT Interpretation

Client: KNIGHT PIESOLD
 Site: PRW 96-2 (4A)
 Location: MT. POLLEY DAM
 Cone: 10 TON A 023
 Date: 07:28:96 08:43

21+00 4

Redrill

Table (m): 0.00 (ft): 0.00
 Su Nkt used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U Wt	TStress	EStress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	10.00	0.00	0.00	0	19.50	2.44	1.21	1.23	2.00	0.1	0.2	0.00	0.0E+00
2	0.38	10.00	0.00	0.00	0	19.50	7.31	3.63	3.68	2.00	0.1	0.2	0.00	0.0E+00
3	0.62	10.00	0.00	0.00	0	19.50	12.19	6.06	6.13	2.00	0.1	0.2	0.00	0.0E+00
4	0.88	10.00	0.00	0.00	0	19.50	17.06	8.48	8.58	2.00	0.1	0.2	0.00	0.0E+00
5	1.12	10.00	0.00	0.00	0	19.50	21.94	10.90	11.04	2.00	0.1	0.2	0.00	0.0E+00
6	1.38	10.00	0.00	0.00	0	19.50	26.81	13.32	13.49	2.00	0.1	0.2	0.00	0.0E+00
7	1.62	10.00	0.00	0.00	0	19.50	31.69	15.75	15.94	2.00	0.1	0.2	0.00	0.0E+00
8	1.88	10.00	0.00	0.00	0	19.50	36.56	18.17	18.39	2.00	0.1	0.2	0.00	0.0E+00
9	2.12	10.00	0.00	0.00	0	19.50	41.44	20.59	20.85	2.00	0.1	0.2	0.00	0.0E+00
10	2.38	10.00	0.00	0.00	0	19.50	46.31	23.01	23.30	2.00	0.1	0.2	0.00	0.0E+00
11	2.62	10.00	0.00	0.00	0	19.50	51.19	25.44	25.75	1.94	0.1	0.2	0.00	0.0E+00
12	2.88	10.00	0.00	0.00	0	19.50	56.06	27.86	28.20	1.85	0.1	0.2	0.00	0.0E+00
13	3.12	10.00	0.00	0.00	0	19.50	60.94	30.28	30.66	1.78	0.1	0.2	0.00	0.0E+00
14	3.38	10.00	0.00	0.00	0	19.50	65.81	32.70	33.11	1.71	0.1	0.2	0.00	0.0E+00
15	3.62	10.00	0.00	0.00	0	19.50	70.69	35.13	35.56	1.65	0.1	0.2	0.00	0.0E+00
16	3.88	10.00	0.00	0.00	0	19.50	75.56	37.55	38.01	1.60	0.1	0.2	0.00	0.0E+00
17	4.12	10.00	0.00	0.00	0	19.50	80.44	39.97	40.47	1.55	0.1	0.2	0.00	0.0E+00
18	4.38	10.00	0.00	0.00	0	19.50	85.31	42.39	42.92	1.50	0.1	0.2	0.00	0.0E+00
19	4.62	10.00	0.00	0.00	0	19.50	90.19	44.82	45.37	1.46	0.1	0.1	0.00	0.0E+00
20	4.88	10.00	0.00	0.00	0	19.50	95.06	47.24	47.82	1.42	0.1	0.1	0.00	0.0E+00
21	5.12	10.00	0.00	0.00	0	19.50	99.94	49.66	50.28	1.39	0.1	0.1	0.00	0.0E+00
22	5.38	10.00	0.00	0.00	0	19.50	104.81	52.08	52.73	1.36	0.1	0.1	0.00	0.0E+00
23	5.62	10.00	0.00	0.00	0	19.50	109.69	54.51	55.18	1.33	0.1	0.1	0.00	0.0E+00
24	5.88	10.00	0.00	0.00	0	19.50	114.56	56.93	57.63	1.30	0.1	0.1	0.00	0.0E+00
25	6.12	10.00	0.00	0.00	0	19.50	119.44	59.35	60.09	1.27	0.1	0.1	0.00	0.0E+00
26	6.38	10.00	0.00	0.00	0	19.50	124.31	61.77	62.54	1.25	0.1	0.1	0.00	0.0E+00
27	6.62	10.00	0.00	0.00	0	19.50	129.19	64.20	64.99	1.22	0.1	0.1	0.00	0.0E+00
28	6.88	10.00	0.00	0.00	0	19.50	134.06	66.62	67.44	1.20	0.1	0.1	0.00	0.0E+00
29	7.12	10.00	0.00	0.00	0	19.50	138.94	69.04	69.90	1.18	0.1	0.1	0.00	0.0E+00
30	7.38	10.00	0.00	0.00	0	19.50	143.81	71.46	72.35	1.16	0.1	0.1	0.00	0.0E+00
31	7.62	2554.19	59.60	2.33	6	18.00	148.50	73.70	74.80	1.14	10.2	11.6	192.46	5.0E-05
	7.88	7509.14	123.00	1.64	7	18.50	153.06	75.81	77.25	1.12	25.0	28.1	0.00	5.0E-04
	8.12	5613.22	118.20	2.11	7	18.50	157.69	77.98	79.71	1.11	18.7	20.7	0.00	5.0E-04
34	8.38	8301.00	204.20	2.46	7	18.50	162.31	80.15	82.16	1.09	27.7	30.2	0.00	5.0E-04
35	8.62	9266.89	367.60	3.97	5	18.00	166.88	82.26	84.61	1.08	46.3	50.0	728.00	5.0E-06
36	8.88	7465.28	239.40	3.21	6	18.00	171.38	84.31	87.06	1.07	29.9	31.8	583.51	5.0E-05
37	9.12	5977.13	182.60	3.05	6	18.00	175.88	86.36	89.52	1.05	23.9	25.2	464.10	5.0E-05
38	9.38	6100.89	160.40	2.63	6	18.00	180.38	88.41	91.97	1.04	24.4	25.4	473.64	5.0E-05
39	9.62	11840.43	350.20	2.96	6	18.00	184.88	90.45	94.42	1.03	47.4	48.7	932.44	5.0E-05
40	9.88	7665.37	252.40	3.29	6	18.00	189.38	92.50	96.87	1.02	30.7	31.2	598.08	5.0E-05
41	10.12	6338.70	165.20	2.61	6	18.00	193.88	94.55	99.33	1.01	25.4	25.5	491.59	5.0E-05
42	10.38	6774.77	194.00	2.86	6	18.00	198.38	96.60	101.78	1.00	27.1	27.0	526.11	5.0E-05
43	10.62	9483.44	349.60	3.69	6	18.00	202.88	98.64	104.23	0.99	37.9	37.4	742.45	5.0E-05
44	10.88	10910.60	292.00	2.68	7	18.50	207.44	100.75	106.68	0.98	36.4	35.5	0.00	5.0E-04
45	11.12	18099.96	292.40	1.62	8	19.00	212.12	102.99	109.14	0.96	45.2	43.6	0.00	5.0E-03
46	11.38	17105.63	347.40	2.03	7	18.50	216.81	105.22	111.59	0.95	57.0	54.4	0.00	5.0E-04
47	11.62	21928.24	290.00	1.32	8	19.00	221.50	107.46	114.04	0.94	54.8	51.8	0.00	5.0E-03
48	11.88	18886.70	262.00	1.39	8	19.00	226.25	109.76	116.49	0.93	47.2	44.1	0.00	5.0E-03
49	12.12	19129.71	315.60	1.65	8	19.00	231.00	112.05	118.95	0.92	47.8	44.2	0.00	5.0E-03
50	12.38	21249.07	323.80	1.52	8	19.00	235.75	114.35	121.40	0.92	53.1	48.6	0.00	5.0E-03
51	12.62	20972.90	309.40	1.48	8	19.00	240.50	116.65	123.85	0.91	52.4	47.5	0.00	5.0E-03
52	12.88	21011.12	307.80	1.46	8	19.00	245.25	118.95	126.30	0.90	52.5	47.1	0.00	5.0E-03
53	13.12	21631.48	297.40	1.37	8	19.00	250.00	121.24	128.76	0.89	54.1	48.1	0.00	5.0E-03
54	13.38	22406.21	326.60	1.46	8	19.00	254.75	123.54	131.21	0.88	56.0	49.3	0.00	5.0E-03
55	13.62	20394.74	337.00	1.65	8	19.00	259.50	125.84	133.66	0.87	51.0	44.5	0.00	5.0E-03
56	13.88	24320.19	313.00	1.29	8	19.00	264.25	128.14	136.11	0.86	60.8	52.6	0.00	5.0E-03
57	14.12	25718.23	357.20	1.39	8	19.00	269.00	130.43	138.57	0.86	64.3	55.1	0.00	5.0E-03
58	14.38	21931.04	281.20	1.28	8	19.00	273.75	132.73	141.02	0.85	54.8	46.6	0.00	5.0E-03
59	14.62	20694.76	258.00	1.25	8	19.00	278.50	135.03	143.47	0.84	51.7	43.6	0.00	5.0E-03
60	14.88	20029.00	284.80	1.42	8	19.00	283.25	137.33	145.92	0.84	50.1	41.8	0.00	5.0E-03
61	15.12	19246.34	272.20	1.41	8	19.00	288.00	139.62	148.38	0.83	48.1	39.9	0.00	5.0E-03
62	15.38	19898.37	268.40	1.35	8	19.00	292.75	141.92	150.83	0.82	49.7	40.9	0.00	5.0E-03
63	15.62	22273.60	326.20	1.46	8	19.00	297.50	144.22	153.28	0.81	55.7	45.4	0.00	5.0E-03

ConeTec Investigations Ltd. - CPT Interpretation

Client: KNIGHT PIESOLD

Site: PRW 96-1 (5)

Location: MT. POLLEY DAM

Cone: 10 TON A 023

Date: 07:28:96 10:28

22+80 4

Table (m): 0.00 (ft): 0.00

SU nkt used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U	Wt	TStress	EStress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	11951.69	72.40	0.61	9	19.50		2.44	1.21	1.23	2.00	23.9	47.8	0.00	5.0E-02
2	0.38	5533.44	135.40	2.45	6	18.00		7.12	3.45	3.68	2.00	22.1	44.3	442.11	5.0E-05
3	0.62	2433.28	69.80	2.87	5	18.00		11.62	5.49	6.13	2.00	12.2	24.3	193.73	5.0E-06
4	0.88	3867.24	122.20	3.16	5	18.00		16.12	7.54	8.58	2.00	19.3	38.7	308.09	5.0E-06
5	1.12	7420.22	205.40	2.77	6	18.00		20.62	9.59	11.04	2.00	29.7	59.4	591.97	5.0E-05
6	1.38	7092.17	200.20	2.82	6	18.00		25.12	11.64	13.49	2.00	28.4	56.7	565.36	5.0E-05
7	1.62	6540.42	177.00	2.71	6	18.00		29.62	13.68	15.94	2.00	26.2	52.3	520.86	5.0E-05
8	1.88	6038.54	174.80	2.89	6	18.00		34.12	15.73	18.39	2.00	24.2	48.3	480.35	5.0E-05
9	2.12	8552.01	189.00	2.21	7	18.50		38.69	17.84	20.85	2.00	28.5	57.0	0.00	5.0E-04
10	2.38	7803.56	258.00	3.31	6	18.00		43.25	19.95	23.30	2.00	31.2	62.4	620.82	5.0E-05
11	2.62	4976.94	116.20	2.33	6	18.00		47.75	22.00	25.75	2.00	19.9	39.8	394.34	5.0E-05
12	2.88	8240.75	262.20	3.18	6	18.00		52.25	24.05	28.20	2.00	33.0	65.8	655.08	5.0E-05
13	3.12	5825.66	156.60	2.69	6	18.00		56.75	26.09	30.66	1.92	23.3	44.6	461.51	5.0E-05
14	3.38	4227.59	118.00	2.79	6	18.00		61.25	28.14	33.11	1.84	16.9	31.2	333.31	5.0E-05
15	3.62	5763.61	132.40	2.30	6	18.00		65.75	30.19	35.56	1.78	23.1	41.1	455.83	5.0E-05
16	3.88	3937.28	116.80	2.97	6	18.00		70.25	32.24	38.01	1.72	15.7	27.1	309.36	5.0E-05
17	4.12	3860.89	84.40	2.19	6	18.00		74.75	34.28	40.47	1.67	15.4	25.8	302.89	5.0E-05
18	4.38	3793.95	82.40	2.17	6	18.00		79.25	36.33	42.92	1.62	15.2	24.6	297.18	5.0E-05
19	4.62	3386.36	90.40	2.67	6	18.00		83.75	38.38	45.37	1.58	13.5	21.4	264.21	5.0E-05
20	4.88	8647.71	231.00	2.67	6	18.00		88.25	40.43	47.82	1.54	34.6	53.2	684.76	5.0E-05
21	5.12	6723.94	204.60	3.04	6	18.00		92.75	42.47	50.28	1.50	26.9	40.4	530.50	5.0E-05
22	5.38	9048.37	269.20	2.98	6	18.00		97.25	44.52	52.73	1.47	36.2	53.1	716.09	5.0E-05
23	5.62	15058.41	345.40	2.29	7	18.50		101.81	46.63	55.18	1.43	50.2	71.9	0.00	5.0E-04
24	5.88	8564.16	344.20	4.02	5	18.00		106.38	48.74	57.63	1.40	42.8	60.0	676.62	5.0E-06
25	6.12	7321.29	269.60	3.68	5	18.00		110.88	50.79	60.09	1.37	36.6	50.3	576.83	5.0E-06
26	6.38	8272.92	254.40	3.08	6	18.00		115.38	52.84	62.54	1.35	33.1	44.6	652.60	5.0E-05
27	6.62	8603.04	357.80	4.16	5	18.00		119.88	54.88	64.99	1.32	43.0	56.8	678.65	5.0E-06
28	6.88	11301.36	347.00	3.07	6	18.00		124.38	56.93	67.44	1.30	45.2	58.6	894.16	5.0E-05
29	7.12	25891.01	353.80	1.37	8	19.00		129.00	59.10	69.90	1.27	64.7	82.4	0.00	5.0E-03
30	7.38	29759.61	557.80	1.87	8	19.00		133.75	61.40	72.35	1.25	74.4	92.9	0.00	5.0E-03

19+50 v/s toe

ConeTec Investigations Ltd. - CPT Interpretation
Client: KNIGHT PIESOLD
Site: CPT 96-2 (6)
Location: MT. POLLEY DAM
Cone: 10 TON A 023
Date: 07:28:96 13:48

er Table (m): 0.00 (ft): 0.00
su Nkt used: 12.50

su Nkt used: 12.50																
Layer	Depth	Qt	Fs	Rf	SBT	U	Wt	TStress	EStress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)	
1	0.12	2554.30	25.80	1.01	7	18.50	2.31	1.09	1.23	2.00	8.5	17.0	0.00	5.0E-04		
2	0.38	2585.48	55.40	2.14	6	18.00	6.88	3.20	3.68	2.00	10.3	20.7	206.29	5.0E-05		
3	0.62	1658.62	36.20	2.18	5	18.00	11.38	5.24	6.13	2.00	8.3	16.6	131.78	5.0E-06		
4	0.88	2537.35	70.20	2.77	5	18.00	15.88	7.29	8.58	2.00	12.7	25.4	201.72	5.0E-06		
5	1.12	2772.81	84.60	3.05	5	18.00	20.38	9.34	11.04	2.00	13.9	27.7	220.19	5.0E-06		
6	1.38	3398.94	98.80	2.91	5	18.00	24.88	11.39	13.49	2.00	17.0	34.0	269.92	5.0E-06		
7	1.62	4205.90	106.80	2.54	6	18.00	29.38	13.43	15.94	2.00	16.8	33.6	334.12	5.0E-05		
8	1.88	5264.96	145.40	2.76	6	18.00	33.88	15.48	18.39	2.00	21.1	42.1	418.49	5.0E-05		
9	2.12	5018.57	154.00	3.07	6	18.00	38.38	17.53	20.85	2.00	20.1	40.1	398.42	5.0E-05		
10	2.38	6140.30	192.80	3.14	6	18.00	42.88	19.58	23.30	2.00	24.6	49.1	487.79	5.0E-05		
11	2.62	17298.53	237.00	1.37	8	19.00	47.50	21.75	25.75	2.00	43.2	86.5	0.00	5.0E-03		
12	2.88	34518.41	308.60	0.89	9	19.50	52.31	24.11	28.20	1.99	69.0	137.6	0.00	5.0E-02		
13	3.12	26889.72	312.40	1.16	9	19.50	57.19	26.53	30.66	1.90	53.8	102.2	0.00	5.0E-02		
14	3.38	21606.39	130.40	0.60	9	19.50	62.06	28.95	33.11	1.82	43.2	78.6	0.00	5.0E-02		
15	3.62	29328.63	190.80	0.65	9	19.50	66.94	31.38	35.56	1.75	58.7	102.5	0.00	5.0E-02		
16	3.88	25634.70	424.80	1.66	8	19.00	71.75	33.74	38.01	1.69	64.1	108.0	0.00	5.0E-03		
17	4.12	11217.15	460.80	4.11	11	20.50	76.69	36.22	40.47	1.63	32.0	52.1	0.00	0.0E+00		
18	4.38	7993.18	335.00	4.19	5	18.00	81.50	38.58	42.92	1.58	40.0	63.0	632.93	5.0E-06		
19	4.62	6192.68	292.00	4.72	4	18.00	86.00	40.63	45.37	1.54	41.3	63.4	488.53	5.0E-07		
20	4.88	6565.03	269.40	4.10	5	18.00	90.50	42.68	47.82	1.50	32.8	49.2	517.96	5.0E-06		
21	5.12	6434.01	249.60	3.88	5	18.00	95.00	44.72	50.28	1.46	32.2	47.1	507.12	5.0E-06		
22	5.38	6989.60	275.80	3.95	5	18.00	99.50	46.77	52.73	1.43	34.9	50.0	551.21	5.0E-06		
23	5.62	5300.37	223.60	4.22	5	18.00	104.00	48.82	55.18	1.40	26.5	37.1	415.71	5.0E-06		
24	5.88	5377.40	212.20	3.95	5	18.00	108.50	50.87	57.63	1.37	26.9	36.9	421.51	5.0E-06		
25	6.12	9421.03	250.80	2.66	6	18.00	113.00	52.91	60.09	1.35	37.7	50.7	744.64	5.0E-05		
26	6.38	5837.81	130.20	2.23	6	18.00	117.50	54.96	62.54	1.32	23.4	30.8	457.62	5.0E-05		
27	6.62	5375.17	149.40	2.78	6	18.00	122.00	57.01	64.99	1.30	21.5	27.9	420.25	5.0E-05		
28	6.88	6509.17	191.60	2.94	6	18.00	126.50	59.06	67.44	1.27	26.0	33.2	510.61	5.0E-05		
29	7.12	7551.41	243.00	3.22	6	18.00	131.00	61.10	69.90	1.25	30.2	37.8	593.63	5.0E-05		
30	7.38	5927.42	191.60	3.23	6	18.00	135.50	63.15	72.35	1.23	23.7	29.2	463.35	5.0E-05		
31	7.62	5754.07	93.80	1.63	7	18.50	140.06	65.26	74.80	1.21	19.2	23.2	0.00	5.0E-04		
	7.88	17728.99	206.80	1.17	8	19.00	144.75	67.50	77.25	1.19	44.3	52.8	0.00	5.0E-03		
	8.12	17472.23	257.00	1.47	8	19.00	149.50	69.79	79.71	1.17	43.7	51.2	0.00	5.0E-03		
	8.38	20576.17	305.00	1.48	8	19.00	154.25	72.09	82.16	1.15	51.4	59.3	0.00	5.0E-03		
34	8.62	20983.74	308.20	1.47	8	19.00	159.00	74.39	84.61	1.13	52.5	59.5	0.00	5.0E-03		
35	8.82	19589.39	276.40	1.41	8	19.00	163.75	76.69	87.06	1.12	49.0	54.7	0.00	5.0E-03		
36	9.12	20419.21	276.80	1.36	8	19.00	168.50	78.98	89.52	1.10	51.0	56.2	0.00	5.0E-03		
37	9.38	18794.06	312.60	1.66	8	19.00	173.25	81.28	91.97	1.09	47.0	51.0	0.00	5.0E-03		

ConeTec Investigations Ltd. - CPT Interpretation

Client: KNIGHT PIESOLD
 Site: CPT 96-3 (7)
 Location: MT. POLLEY DAM
 Cone: 10 TON A 023
 Date: 07:28:96 15:08

20150 u/s toe

Core Table (m): 0.25 (ft): 0.82
 Su Nkt used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U Wt	TStress	EStress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	3278.85	32.80	1.00	7	18.50	2.31	2.31	0.00	2.00	10.9	21.9	0.00	5.0E-04
2	0.38	2168.61	52.60	2.43	6	18.00	6.88	5.65	1.23	2.00	8.7	17.3	172.94	5.0E-05
3	0.62	1706.08	42.40	2.49	5	18.00	11.38	7.70	3.68	2.00	8.5	17.1	135.58	5.0E-06
4	0.88	1966.77	54.20	2.76	5	18.00	15.88	9.74	6.13	2.00	9.8	19.7	156.07	5.0E-06
5	1.12	3334.83	40.40	1.21	7	18.50	20.44	11.85	8.58	2.00	11.1	22.2	0.00	5.0E-04
6	1.38	3462.91	128.80	3.72	5	18.00	25.00	13.96	11.04	2.00	17.3	34.6	275.03	5.0E-06
7	1.62	9049.95	494.00	5.46	11	20.50	29.81	16.32	13.49	2.00	25.9	51.7	0.00	0.0E+00
8	1.88	9855.25	622.80	6.32	11	20.50	34.94	19.00	15.94	2.00	28.2	56.3	0.00	0.0E+00
9	2.12	9638.12	606.20	6.29	11	20.50	40.06	21.67	18.39	2.00	27.5	55.1	0.00	0.0E+00
10	2.38	7939.74	529.80	6.67	11	20.50	45.19	24.34	20.85	1.98	22.7	45.0	0.00	0.0E+00
11	2.62	6919.19	457.00	6.60	11	20.50	50.31	27.01	23.30	1.88	19.8	37.2	0.00	0.0E+00
12	2.88	8819.36	462.80	5.25	11	20.50	55.44	29.69	25.75	1.80	25.2	45.3	0.00	0.0E+00
13	3.12	16909.29	591.00	3.50	12	19.00	60.38	32.17	28.20	1.73	84.5	145.9	0.00	0.0E+00
14	3.38	40957.82	795.00	1.94	8	19.00	65.12	34.47	30.66	1.67	102.4	170.7	0.00	5.0E-03
15	3.62	29676.91	1080.80	3.64	12	19.00	69.88	36.77	33.11	1.61	148.4	239.5	0.00	0.0E+00
16	3.88	20847.34	580.80	2.79	7	18.50	74.56	39.00	35.56	1.57	69.5	108.9	0.00	5.0E-04
17	4.12	13243.68	722.80	5.46	11	20.50	79.44	41.42	38.01	1.52	37.8	57.5	0.00	0.0E+00
18	4.38	8419.58	474.60	5.64	11	20.50	84.56	44.10	40.47	1.47	24.1	35.5	0.00	0.0E+00
19	4.62	9666.03	506.60	5.24	11	20.50	89.69	46.77	42.92	1.43	27.6	39.5	0.00	0.0E+00
20	4.88	9777.71	487.80	4.99	11	20.50	94.81	49.44	45.37	1.39	27.9	38.9	0.00	0.0E+00
21	5.12	8865.86	498.80	5.63	11	20.50	99.94	52.11	47.82	1.36	25.3	34.3	0.00	0.0E+00
22	5.38	7696.41	420.20	5.46	11	20.50	105.06	54.79	50.28	1.32	22.0	29.1	0.00	0.0E+00
23	5.62	7928.42	377.60	4.76	11	20.50	110.19	57.46	52.73	1.29	22.7	29.2	0.00	0.0E+00
24	5.88	10656.51	576.80	5.41	11	20.50	115.31	60.13	55.18	1.26	30.4	38.4	0.00	0.0E+00
25	6.12	8821.33	470.20	5.33	11	20.50	120.44	62.80	57.63	1.23	25.2	31.1	0.00	0.0E+00
26	6.38	11217.29	446.40	3.98	11	20.50	125.56	65.48	60.09	1.21	32.0	38.8	0.00	0.0E+00
27	6.62	9895.79	475.40	4.80	11	20.50	130.69	68.15	62.54	1.19	28.3	33.5	0.00	0.0E+00
28	6.88	6450.34	339.00	5.26	11	20.50	135.81	70.82	64.99	1.16	18.4	21.4	0.00	0.0E+00
29	7.12	5975.12	257.00	4.30	5	18.00	140.62	73.18	67.44	1.14	29.9	34.2	466.76	5.0E-06
30	7.38	4423.93	191.00	4.32	5	18.00	145.12	75.23	69.90	1.13	22.1	25.0	342.30	5.0E-06
31	7.62	4999.82	223.20	4.46	4	18.00	149.62	77.28	72.35	1.11	33.3	37.1	388.02	5.0E-07
32	7.88	6908.56	293.40	4.25	5	18.00	154.12	79.32	74.80	1.10	34.5	38.0	540.35	5.0E-06
33	8.12	5920.23	227.40	3.84	5	18.00	158.62	81.37	77.25	1.08	29.6	32.1	460.93	5.0E-06
34	8.38	6152.36	214.40	3.48	5	18.00	163.12	83.42	79.71	1.07	30.8	33.0	479.14	5.0E-06
35	8.62	11578.52	332.80	2.87	6	18.00	167.62	85.47	82.16	1.06	46.3	49.0	912.87	5.0E-05
36	8.88	7647.60	361.60	4.73	11	20.50	172.44	87.83	84.61	1.04	21.9	22.8	0.00	0.0E+00
37	9.12	7245.38	238.80	3.30	6	18.00	177.25	90.19	87.06	1.03	29.0	29.9	565.45	5.0E-05
38	9.38	8677.55	328.00	3.78	5	18.00	181.75	92.23	89.52	1.02	43.4	44.2	679.66	5.0E-06
39	9.62	11250.18	437.80	3.89	5	18.00	186.25	94.28	91.97	1.01	56.3	56.7	885.11	5.0E-06
40	9.88	23541.62	544.20	2.31	7	18.50	190.81	96.39	94.42	1.00	78.5	78.2	0.00	5.0E-04
41	10.12	19005.78	366.20	1.93	8	19.00	195.50	98.63	96.87	0.99	47.5	46.8	0.00	5.0E-03
42	10.38	23971.17	505.40	2.11	8	19.00	200.25	100.92	99.33	0.97	59.9	58.4	0.00	5.0E-03
43	10.62	19587.39	393.60	2.01	8	19.00	205.00	103.22	101.78	0.96	49.0	47.2	0.00	5.0E-03

ConeTec Investigations Ltd. - CPT Interpretation
 Client: KNIGHT PIESOLD
 Site: CPT 96-4 (8)
 Location: MT. POLLEY DAM
 Cone: 10 TON A 005
 Date: 07:28:96 16:17

19150 D/s toe

ter Table (m): 0.00 (ft): 0.00
 su Nkt used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U Wt	TStress	ESTress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	1489.64	22.20	1.49	6	18.00	2.25	1.02	1.23	2.00	6.0	11.9	118.99	5.0E-05
2	0.38	1140.63	28.00	2.45	5	18.00	6.75	3.07	3.68	2.00	5.7	11.4	90.71	5.0E-06
3	0.62	1519.61	37.00	2.43	5	18.00	11.25	5.12	6.13	2.00	7.6	15.2	120.67	5.0E-06
4	0.88	2941.49	61.00	2.07	6	18.00	15.75	7.17	8.58	2.00	11.8	23.5	234.06	5.0E-05
5	1.12	5447.08	131.20	2.41	6	18.00	20.25	9.21	11.04	2.00	21.8	43.6	434.15	5.0E-05
6	1.38	14293.81	327.40	2.29	7	18.50	24.81	11.32	13.49	2.00	47.6	95.3	0.00	5.0E-04
7	1.62	6345.66	164.00	2.58	6	18.00	29.38	13.43	15.94	2.00	25.4	50.8	505.30	5.0E-05
8	1.88	16438.79	296.40	1.80	8	19.00	34.00	15.61	18.39	2.00	41.1	82.2	0.00	5.0E-03
9	2.12	12106.73	322.80	2.67	7	18.50	38.69	17.84	20.85	2.00	40.4	80.7	0.00	5.0E-04
10	2.38	9422.01	282.80	3.00	6	18.00	43.25	19.95	23.30	2.00	37.7	75.4	750.30	5.0E-05
11	2.62	8770.52	221.60	2.53	7	18.50	47.81	22.06	25.75	2.00	29.2	58.5	0.00	5.0E-04
12	2.88	10576.06	308.40	2.92	6	18.00	52.38	24.17	28.20	1.99	42.3	84.2	841.89	5.0E-05
13	3.12	7701.14	289.00	3.75	5	18.00	56.88	26.22	30.66	1.91	38.5	73.6	611.54	5.0E-06
14	3.38	7908.17	257.80	3.26	6	18.00	61.38	28.27	33.11	1.84	31.6	58.2	627.74	5.0E-05
15	3.62	9511.50	228.00	2.40	7	18.50	65.94	30.38	35.56	1.78	31.7	56.3	0.00	5.0E-04
16	3.88	14686.47	224.00	1.53	8	19.00	70.62	32.61	38.01	1.71	36.7	62.9	0.00	5.0E-03
17	4.12	9118.98	166.60	1.83	7	18.50	75.31	34.85	40.47	1.66	30.4	50.4	0.00	5.0E-04
18	4.38	5518.55	125.80	2.28	6	18.00	79.88	36.96	42.92	1.61	22.1	35.5	435.09	5.0E-05
19	4.62	5799.24	135.20	2.33	6	18.00	84.38	39.00	45.37	1.57	23.2	36.4	457.19	5.0E-05
20	4.88	8651.35	161.00	1.86	7	18.50	88.94	41.11	47.82	1.53	28.8	44.0	0.00	5.0E-04
21	5.12	9005.23	226.20	2.51	7	18.50	93.56	43.29	50.28	1.49	30.0	44.7	0.00	5.0E-04
22	5.38	4629.19	131.80	2.85	6	18.00	98.12	45.40	52.73	1.45	18.5	26.9	362.49	5.0E-05
23	5.62	10147.48	206.20	2.03	7	18.50	102.69	47.51	55.18	1.42	33.8	48.0	0.00	5.0E-04
24	5.88	6866.04	193.20	2.81	6	18.00	107.25	49.62	57.63	1.39	27.5	38.2	540.70	5.0E-05
25	6.12	5607.55	118.80	2.12	7	18.50	111.81	51.73	60.09	1.36	18.7	25.4	0.00	5.0E-04
26	6.38	5440.44	122.20	2.25	6	18.00	116.38	53.84	62.54	1.33	21.8	29.0	425.93	5.0E-05
27	6.62	5757.40	132.40	2.30	6	18.00	120.88	55.88	64.99	1.31	23.0	30.2	450.92	5.0E-05
28	6.88	9883.47	273.60	2.77	6	18.00	125.38	57.93	67.44	1.29	39.5	50.8	780.65	5.0E-05
29	7.12	5544.45	129.40	2.33	6	18.00	129.88	59.98	69.90	1.26	22.2	28.0	433.17	5.0E-05
30	7.38	5757.49	123.20	2.14	7	18.50	134.44	62.09	72.35	1.24	19.2	23.8	0.00	5.0E-04
31	7.62	6297.84	123.00	1.95	7	18.50	139.06	64.26	74.80	1.22	21.0	25.6	0.00	5.0E-04
32	7.88	8657.99	244.00	2.82	6	18.00	143.62	66.37	77.25	1.20	34.6	41.6	681.15	5.0E-05
33	8.12	13558.92	266.60	1.97	7	18.50	148.19	68.48	79.71	1.18	45.2	53.5	0.00	5.0E-04
34	8.38	11141.01	115.80	1.04	8	19.00	152.88	70.72	82.16	1.16	27.9	32.4	0.00	5.0E-03
35	8.62	11115.29	87.20	0.78	8	19.00	157.62	73.01	84.61	1.15	27.8	31.8	0.00	5.0E-03
36	8.88	7788.25	76.00	0.98	8	19.00	162.38	75.31	87.06	1.13	19.5	22.0	0.00	5.0E-03
37	9.12	8897.54	82.40	0.93	8	19.00	167.12	77.61	89.52	1.11	22.2	24.7	0.00	5.0E-03
38	9.38	7601.65	83.00	1.09	8	19.00	171.88	79.91	91.97	1.09	19.0	20.8	0.00	5.0E-03
39	9.62	5803.99	53.00	0.91	8	19.00	176.62	82.20	94.42	1.08	14.5	15.7	0.00	5.0E-03
40	9.88	6980.76	66.40	0.95	8	19.00	181.38	84.50	96.87	1.06	17.5	18.6	0.00	5.0E-03
41	10.12	11896.91	167.40	1.41	8	19.00	186.12	86.80	99.33	1.05	29.7	31.2	0.00	5.0E-03
42	10.38	11820.44	133.20	1.13	8	19.00	190.88	89.10	101.78	1.04	29.6	30.6	0.00	5.0E-03
43	10.62	13920.64	144.00	1.03	8	19.00	195.62	91.39	104.23	1.02	34.8	35.6	0.00	5.0E-03
44	10.88	12496.92	136.20	1.09	8	19.00	200.38	93.69	106.68	1.01	31.2	31.6	0.00	5.0E-03
45	11.12	22209.29	248.80	1.12	9	19.50	205.19	96.05	109.14	1.00	44.4	44.4	0.00	5.0E-02
46	11.38	34996.00	114.00	0.33	10	20.00	210.12	98.54	111.59	0.99	58.3	57.5	0.00	5.0E+00

ConeTec Investigations Ltd. - CPT Interpretation

Client: KNIGHT PIESOLD

Site: CPT 96-5 (9)

Location: MT. POLLEY DAM

Cone: 10 TON A 005

Date: 07:28:96 17:20

20150 D/S toe

Table (m): 0.00 (ft): 0.00

Su Nkt used: 12.50

Layer	Depth	Qt	Fs	Rf	SBT	U Wt	TStress	ESTress	HPres	Cn	N60	N160	Su (kPa)	k(cm/s)
1	0.12	1018.61	12.80	1.26	5	18.00	2.25	1.02	1.23	2.00	5.1	10.2	81.31	5.0E-06
2	0.38	648.52	25.20	3.89	3	17.50	6.69	3.01	3.68	2.00	6.5	13.0	51.35	5.0E-08
3	0.62	919.58	30.00	3.26	4	18.00	11.12	4.99	6.13	2.00	6.1	12.3	72.68	5.0E-07
4	0.88	2398.97	65.00	2.71	5	18.00	15.62	7.04	8.58	2.00	12.0	24.0	190.67	5.0E-06
5	1.12	2608.19	110.40	4.23	4	18.00	20.12	9.09	11.04	2.00	17.4	34.8	207.05	5.0E-07
6	1.38	11168.50	316.80	2.84	6	18.00	24.62	11.14	13.49	2.00	44.7	89.3	891.51	5.0E-05
7	1.62	3822.25	115.80	3.03	5	18.00	29.12	13.18	15.94	2.00	19.1	38.2	303.45	5.0E-06
8	1.88	3669.27	120.20	3.28	5	18.00	33.62	15.23	18.39	2.00	18.3	36.7	290.85	5.0E-06
9	2.12	4111.14	154.80	3.77	5	18.00	38.12	17.28	20.85	2.00	20.6	41.1	325.84	5.0E-06
10	2.38	4413.42	121.80	2.76	6	18.00	42.62	19.33	23.30	2.00	17.7	35.3	349.66	5.0E-05
11	2.62	6640.82	157.60	2.37	6	18.00	47.12	21.37	25.75	2.00	26.6	53.1	527.50	5.0E-05
12	2.88	5762.16	159.40	2.77	6	18.00	51.62	23.42	28.20	2.00	23.0	46.1	456.84	5.0E-05
13	3.12	7388.25	153.60	2.08	7	18.50	56.19	25.53	30.66	1.94	24.6	47.7	0.00	5.0E-04
14	3.38	4405.62	102.60	2.33	6	18.00	60.75	27.64	33.11	1.86	17.6	32.8	347.59	5.0E-05
15	3.62	5649.82	163.60	2.90	6	18.00	65.25	29.69	35.56	1.80	22.6	40.6	446.77	5.0E-05
16	3.88	9208.24	202.20	2.20	7	18.50	69.81	31.80	38.01	1.74	30.7	53.3	0.00	5.0E-04
17	4.12	14828.99	336.40	2.27	7	18.50	74.44	33.97	40.47	1.68	49.4	83.0	0.00	5.0E-04
18	4.38	6998.16	213.80	3.06	6	18.00	79.00	36.08	42.92	1.63	28.0	45.6	553.53	5.0E-05
19	4.62	4225.43	124.60	2.95	6	18.00	83.50	38.13	45.37	1.58	16.9	26.8	331.35	5.0E-05
20	4.88	5894.66	127.80	2.17	7	18.50	88.06	40.24	47.82	1.54	19.6	30.3	0.00	5.0E-04
21	5.12	3951.36	153.20	3.88	5	18.00	92.62	42.35	50.28	1.50	19.8	29.7	308.70	5.0E-06
22	5.38	3287.90	99.80	3.04	5	18.00	97.12	44.40	52.73	1.47	16.4	24.1	255.26	5.0E-06
23	5.62	4359.59	111.20	2.55	6	18.00	101.62	46.44	55.18	1.44	17.4	25.0	340.64	5.0E-05
24	5.88	4438.42	103.40	2.33	6	18.00	106.12	48.49	57.63	1.41	17.8	25.0	346.58	5.0E-05
25	6.12	5236.42	141.00	2.69	6	18.00	110.62	50.54	60.09	1.38	20.9	28.8	410.06	5.0E-05
26	6.38	8829.14	165.20	1.87	7	18.50	115.19	52.65	62.54	1.35	29.4	39.7	0.00	5.0E-04
27	6.62	11331.10	222.40	1.96	7	18.50	119.81	54.82	64.99	1.32	37.8	49.9	0.00	5.0E-04
28	6.88	5223.85	107.00	2.05	7	18.50	124.44	56.99	67.44	1.30	17.4	22.6	0.00	5.0E-04
29	7.12	12072.20	187.40	1.55	8	19.00	129.12	59.23	69.90	1.27	30.2	38.4	0.00	5.0E-03
30	7.38	6512.86	141.00	2.16	7	18.50	133.81	61.46	72.35	1.25	21.7	27.1	0.00	5.0E-04
31	7.62	4366.52	80.00	1.83	7	18.50	138.44	63.64	74.80	1.23	14.6	17.9	0.00	5.0E-04
32	7.88	4577.85	69.80	1.52	7	18.50	143.06	65.81	77.25	1.21	15.3	18.4	0.00	5.0E-04
33	8.12	6739.68	183.00	2.72	6	18.00	147.62	67.92	79.71	1.19	27.0	32.0	527.36	5.0E-05
34	8.38	7307.73	209.80	2.87	6	18.00	152.12	69.97	82.16	1.17	29.2	34.2	572.45	5.0E-05
35	8.62	11593.67	178.20	1.54	8	19.00	156.75	72.14	84.61	1.15	29.0	33.4	0.00	5.0E-03
36	8.88	16164.79	220.80	1.37	8	19.00	161.50	74.44	87.06	1.13	40.4	45.8	0.00	5.0E-03
37	9.12	20040.56	253.40	1.26	8	19.00	166.25	76.73	89.52	1.12	50.1	56.0	0.00	5.0E-03
38	9.38	21070.97	249.40	1.18	9	19.50	171.06	79.09	91.97	1.10	42.1	46.4	0.00	5.0E-02
39	9.62	19505.44	272.40	1.40	8	19.00	175.88	81.45	94.42	1.08	48.8	52.9	0.00	5.0E-03
40	9.88	22503.41	300.00	1.33	8	19.00	180.62	83.75	96.87	1.07	56.3	60.2	0.00	5.0E-03

APPENDIX C

SUMMARY OF PORE PRESSURE DISSIPATION TIMES AND EQUILIBRIUM PORE PRESSURES

**Mount Polly Tailings Dam - Likely, BC
Dissipation Times and Equilibrium Pore Pressures**

Knight Piésold Ltd.

Mount Polly Tailings Dam - Likely, BC
Dissipation Times and Equilibrium Pore Pressures

Sounding	Depth (m)	Duration (s)	Equilibrium Pore Pressure (m)
CPT 96-1(1)	4.8	945	
	5.8	275	
	6.7	200	8.6
	7.5	375	8.3
	7.7	140	9.1
	8.1	245	9.0
	8.6	200	10.0
	9.05	395	10.6
	9.5	235	11.0
Total Dissipation Time (s)		3010	

Sounding	Depth (m)	Duration (s)	Equilibrium Pore Pressure (m)
CPT 96-2 (4)	7.25	930	7.4
	11.75	220	11.0
CPT 92-2(4A)	8.75	255	
	9.75	135	
	10.75	205	12.5
	11.75	195	11.25
	12.75	155	12.5
	14.75	210	14.25
	15.85	135	16.00
CPT96-2(6)	7.75	355	7.8
Total Dissipation Time (s)		2795	

Knight Piésold Ltd.

Sounding	Depth (m)	Duration (s)	Equilibrium Pore Pressure (m)
CPT 96-3(2)	8.25	415	9.0
Total Dissipation Time (s)		415	

Sounding	Depth (m)	Duration (s)	Equilibrium Pore Pressure (m)
CPT 96-4 (3)	10.25	535	8.0
Total Dissipation Time (s)		535	

Sounding	Depth (m)	Duration (s)	Equilibrium Pore Pressure (m)
CPT 96-3 (7)	10.55	80	10.3
CPT 96-4 (8)	6.95	470	
	8.95	425	9.3
	9.95	160	10.5
Total Dissipation Time (s)		1135	

ConeTec Investigations Ltd.

Knight Piésold Ltd.

Sounding	Depth (m)	Duration (s)	Equilibrium Pore Pressure (m)
CPT 96-5 (9)	5.10	595	6.0
	8.40	235	
	10.00	275	11.35
Total Dissipation Time (s)		1105	

ConeTec Investigations Ltd.

APPENDIX D

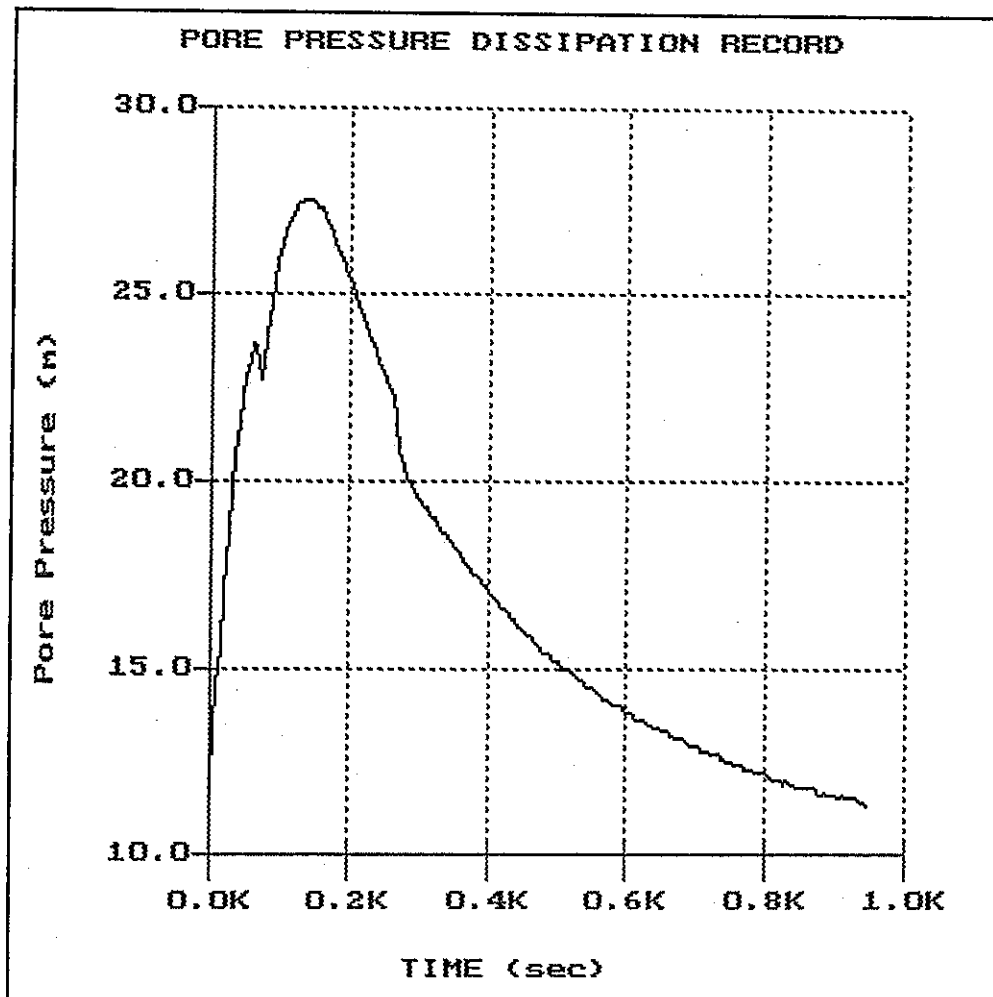
PORE PRESSURE DISSIPATION PLOTS

Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15

File: 163CP01.PPD
Depth (m): 4.80
(ft): 15.75
Duration: 945.0s

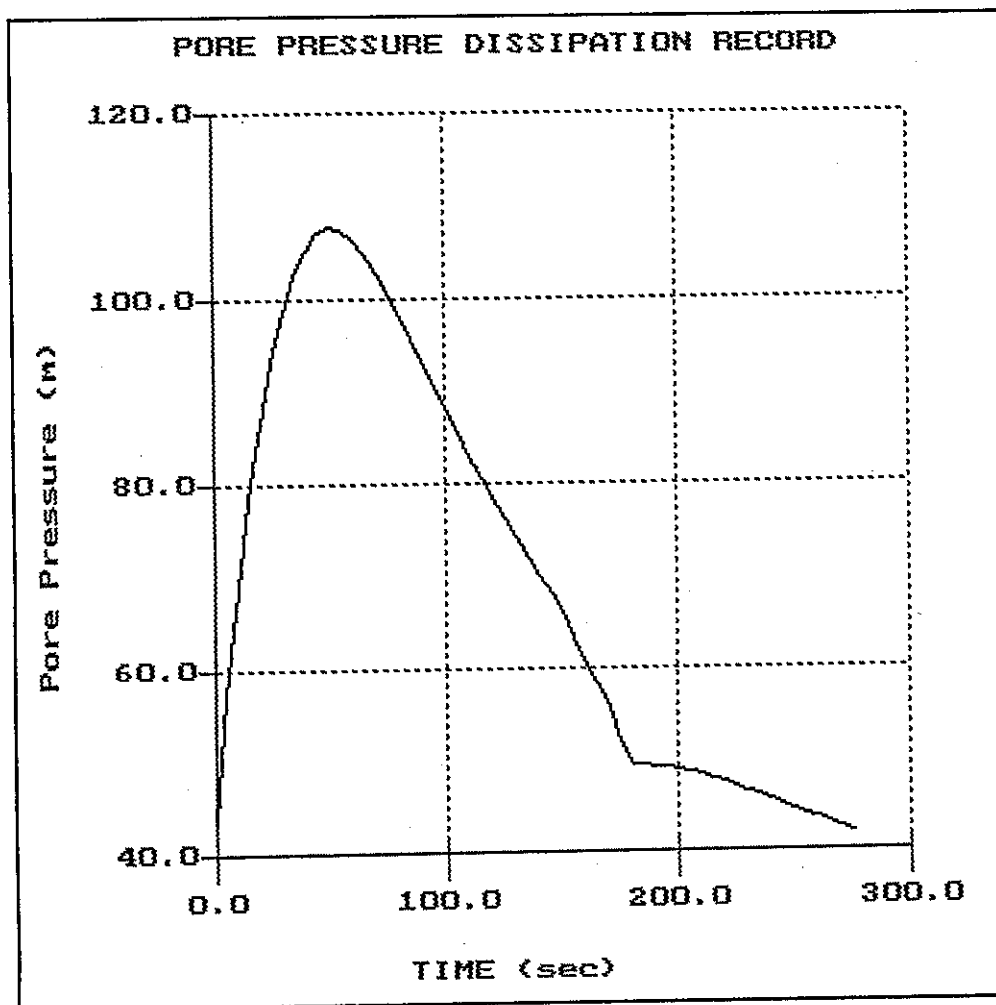


Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15

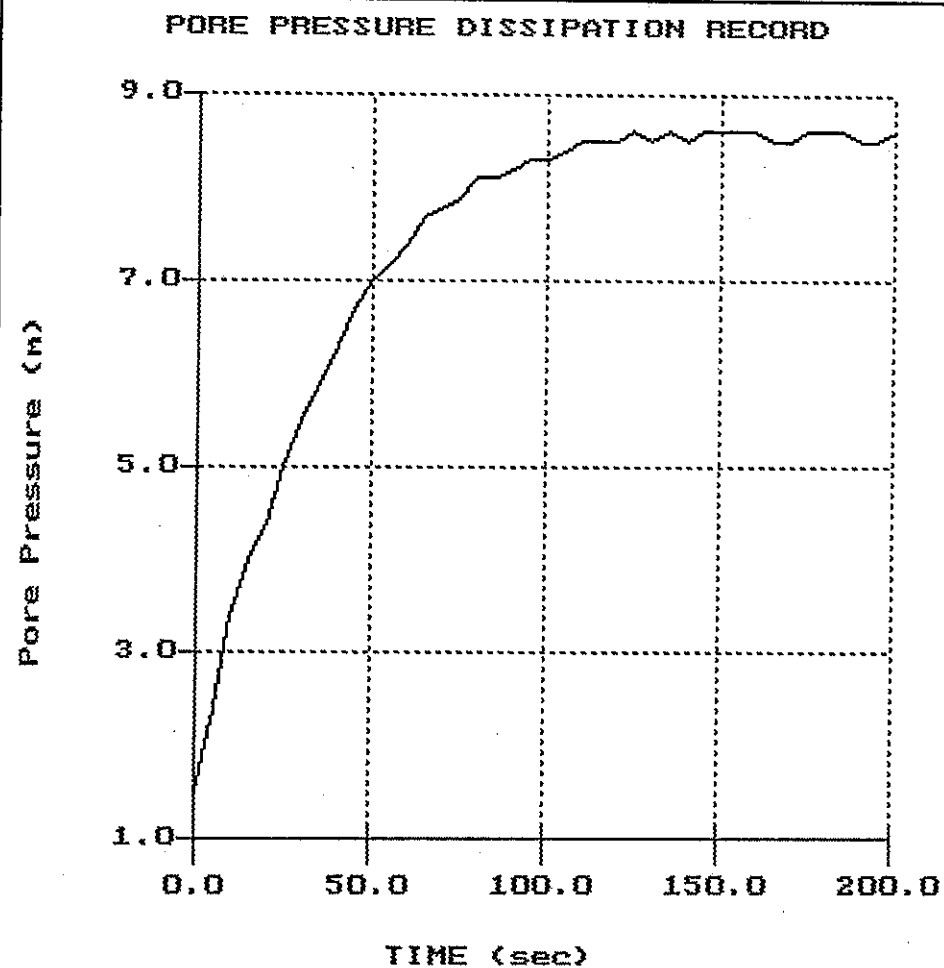
File: 163CP01.PPD
Depth (m): 5.80
(ft): 19.03
Duration: 275.0s



Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15



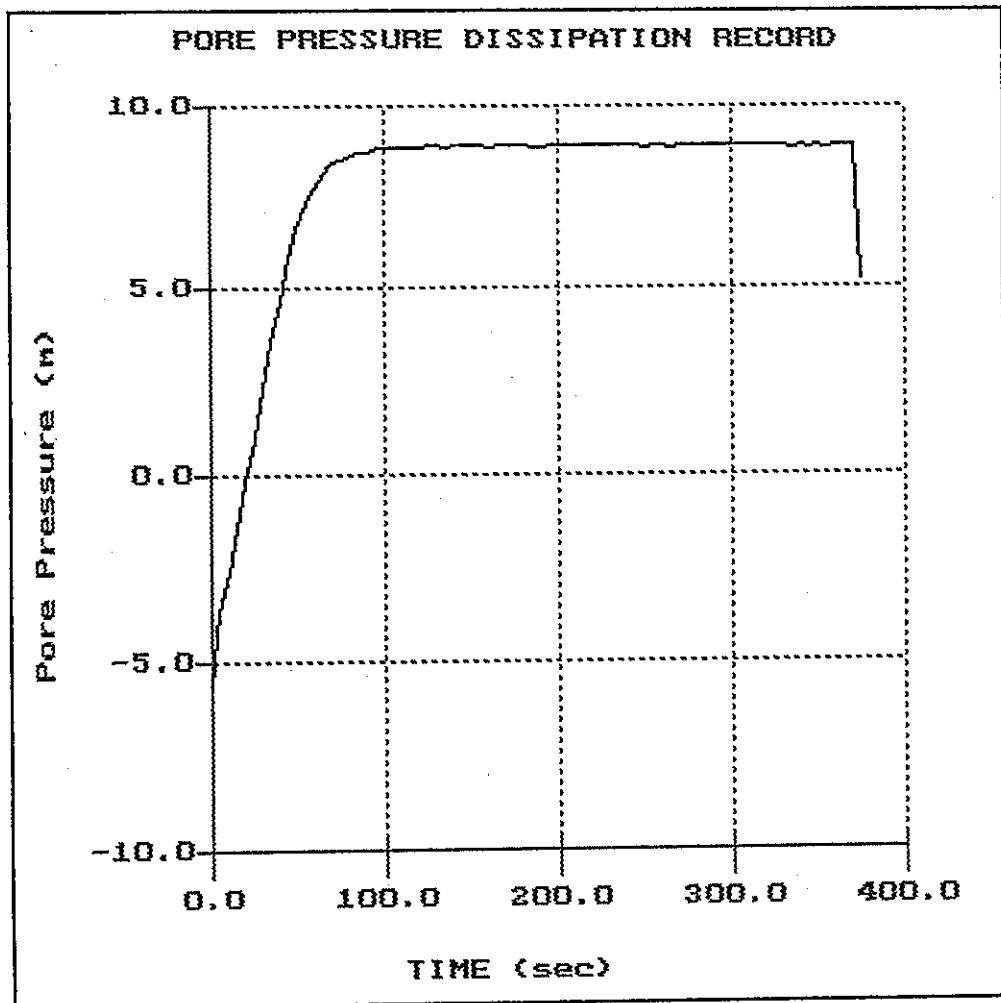
File: 163CP01.PPD
Depth (m): 6.70
(ft): 21.98
Duration : 200.0s

Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15

File: 163CP01.PPD
Depth (m): 7.50
(ft): 24.61
Duration : 375.0s

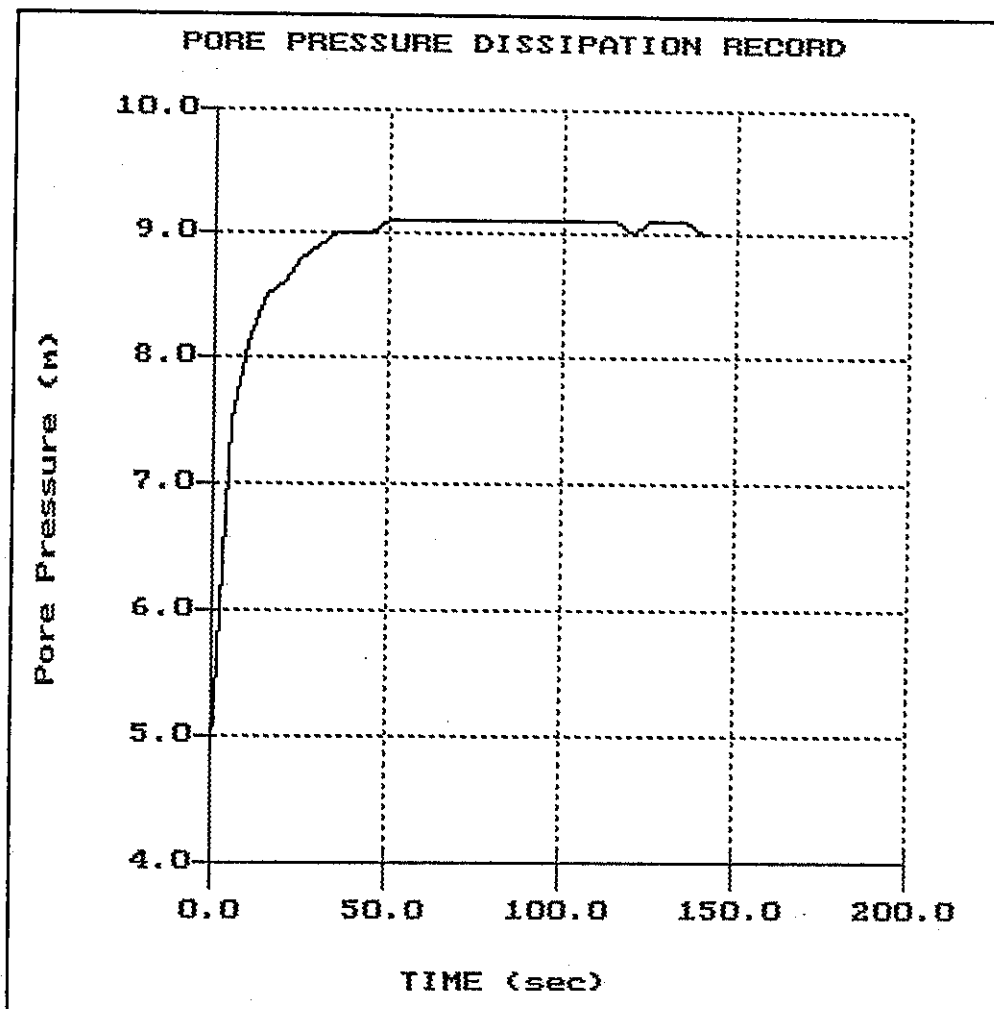


Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15

File: 163CP01.PPD
Depth (m): 7.70
(ft): 25.26
Duration : 140.0s

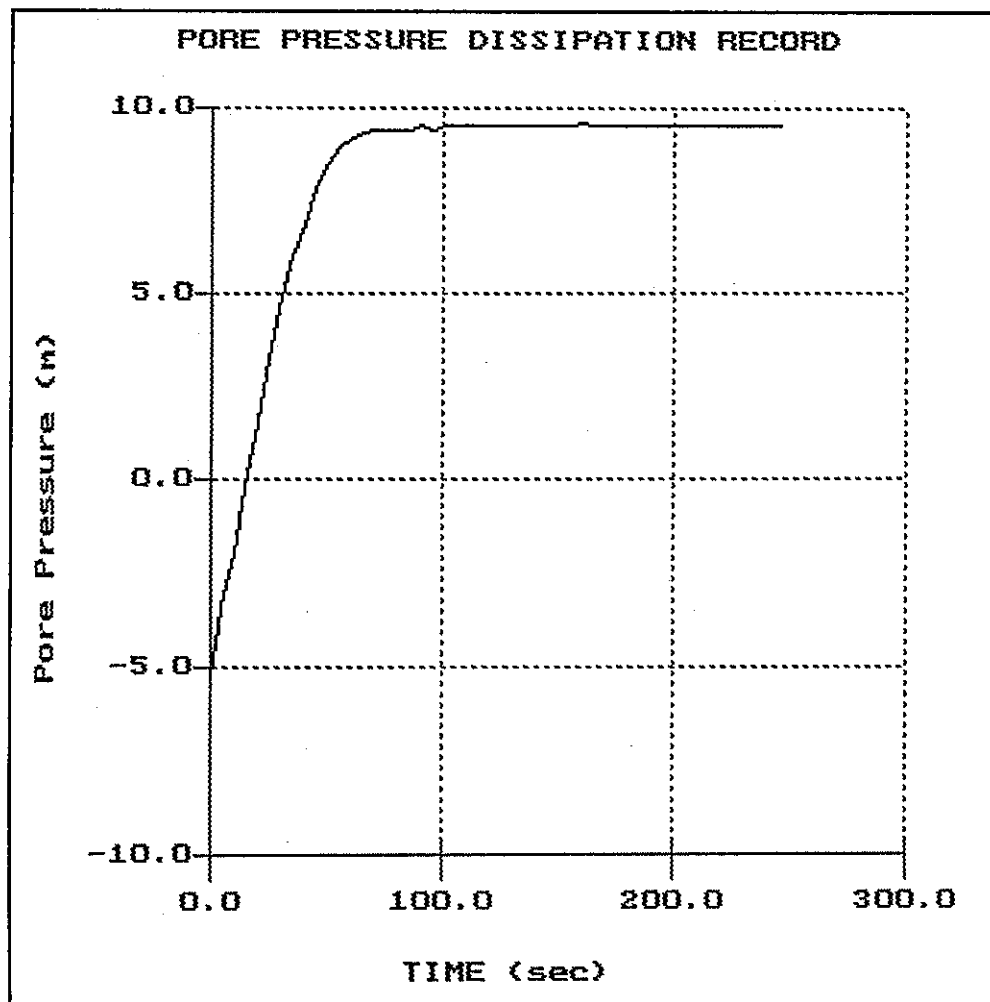


Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15

File: 163CP01.PPD
Depth (m): 8.10
(ft): 26.57
Duration : 245.0s

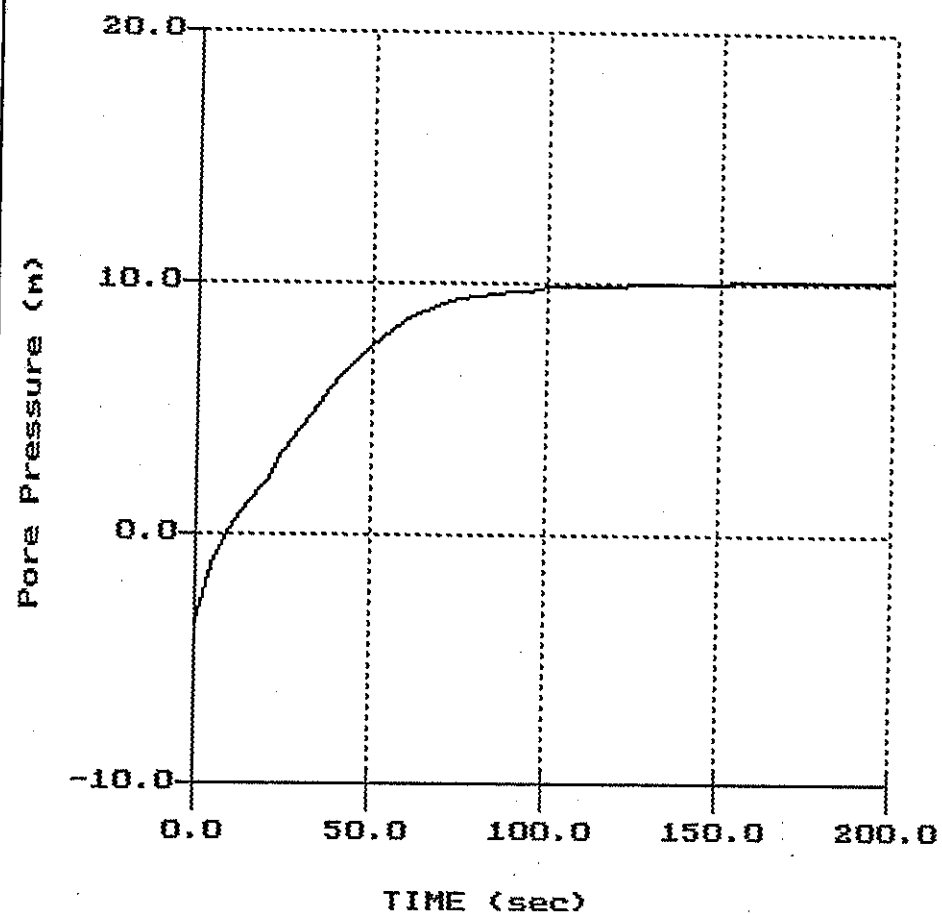


Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15

PORE PRESSURE DISSIPATION RECORD



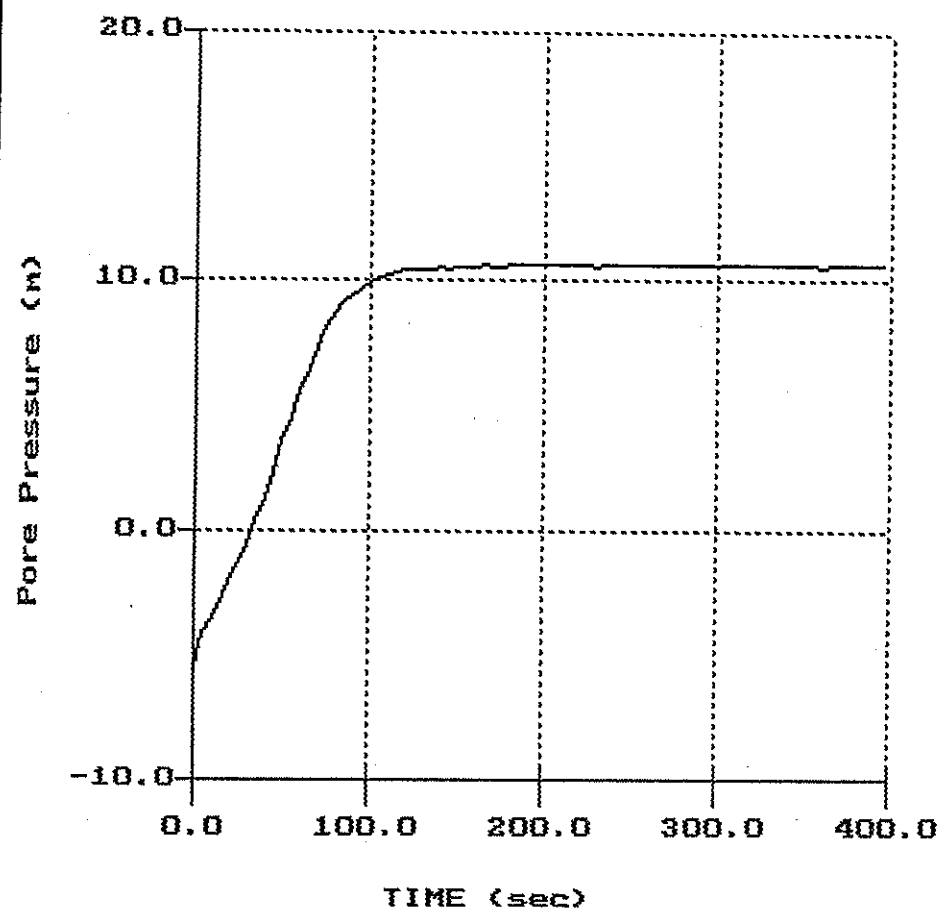
File: 163CP01.PPD
Depth (m): 8.60
(ft): 28.22
Duration : 200.0s

Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15

PORE PRESSURE DISSIPATION RECORD

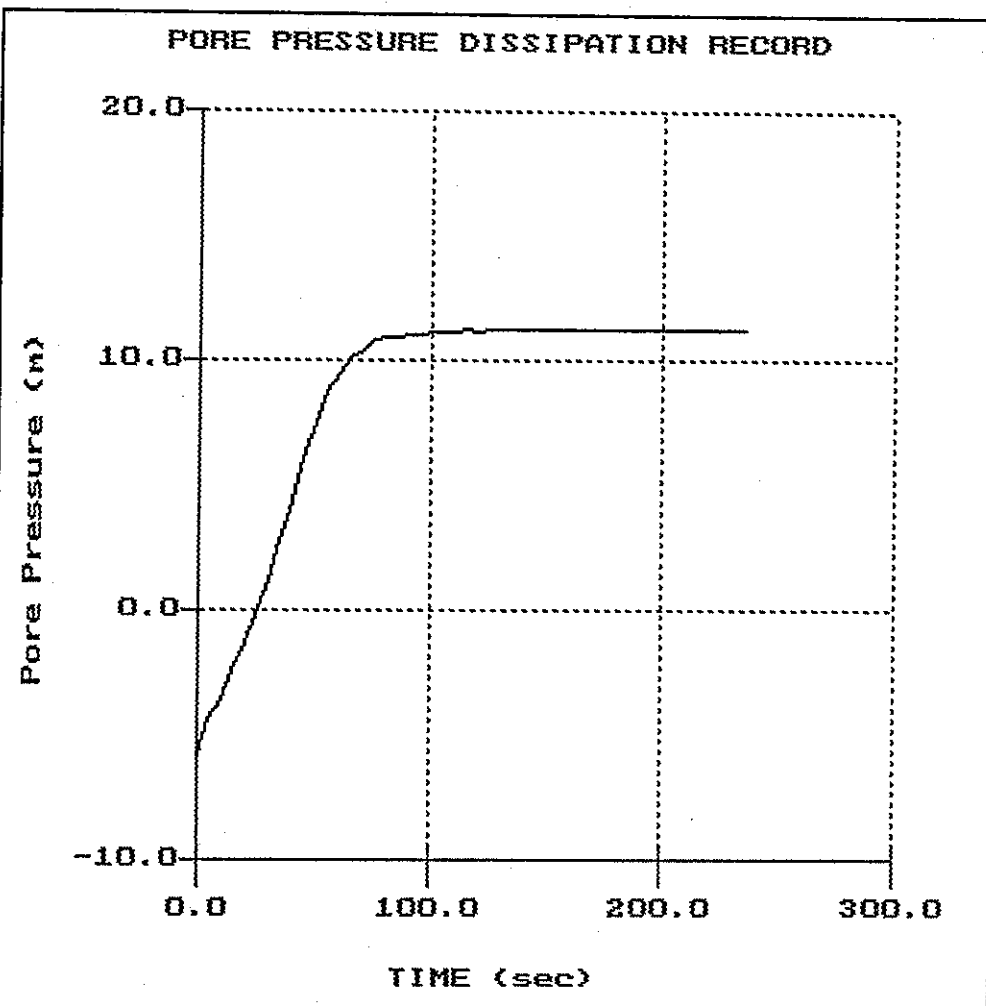


File: 163CP01.PPD
Depth (m): 9.05
(ft): 29.69
Duration : 395.0s

Knight Piesold

Hole: CPT 96-1 (1)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 08:15

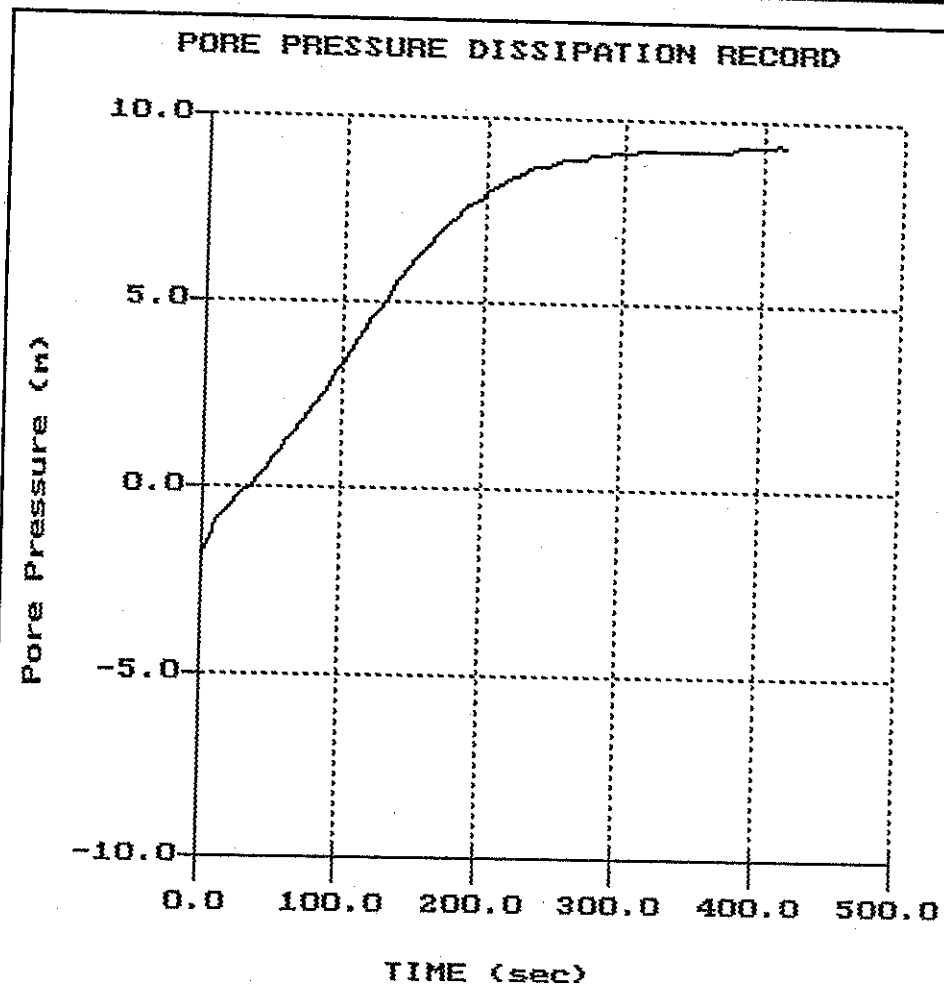


File: 163CP01.PPD
Depth (m): 9.50
(ft): 31.17
Duration : 235.0s

Knight Piesold

Hole: PRW 96-3 (2)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 11:43

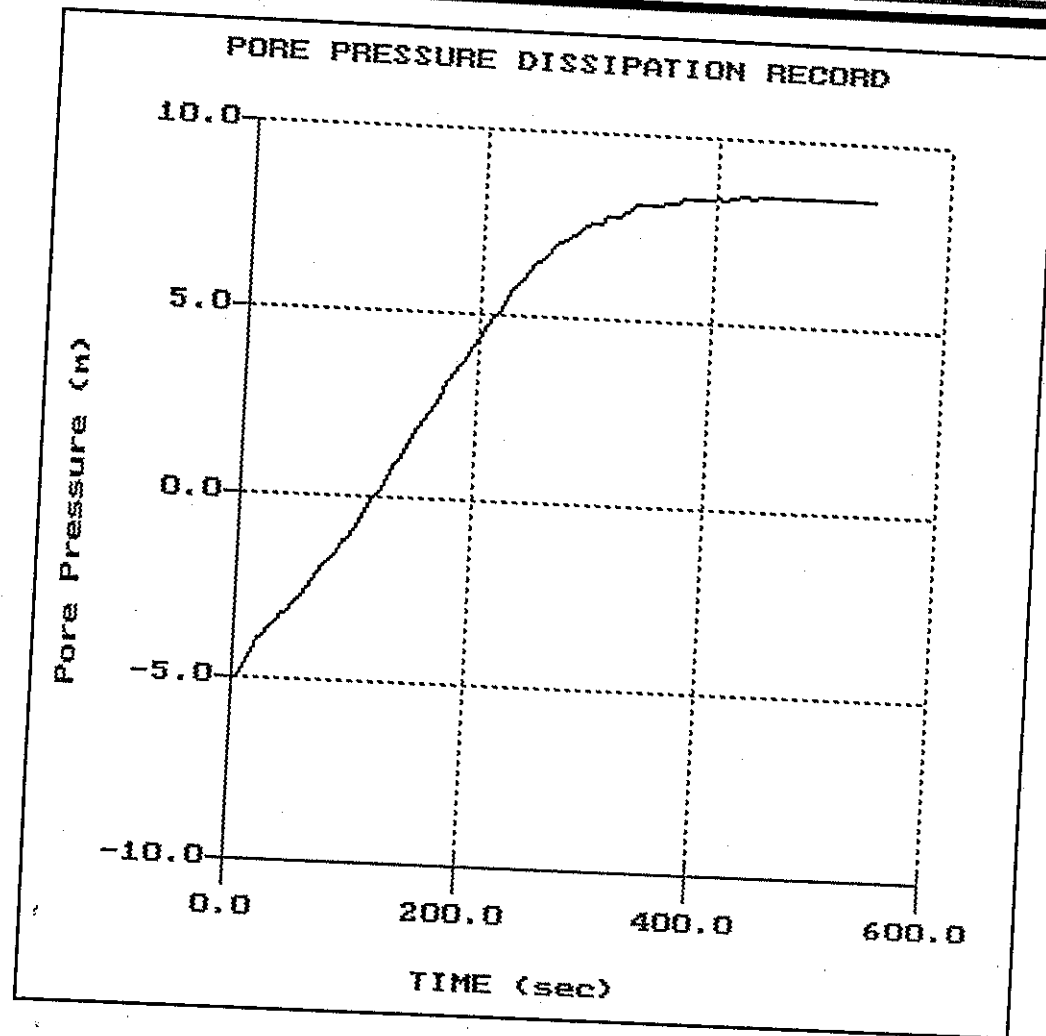


File: 163CP02.PPD
Depth (m): 8.25
(ft): 27.07
Duration : 415.0s

Knight Piesold

Hole: PRW 96-4 (3)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 13:51

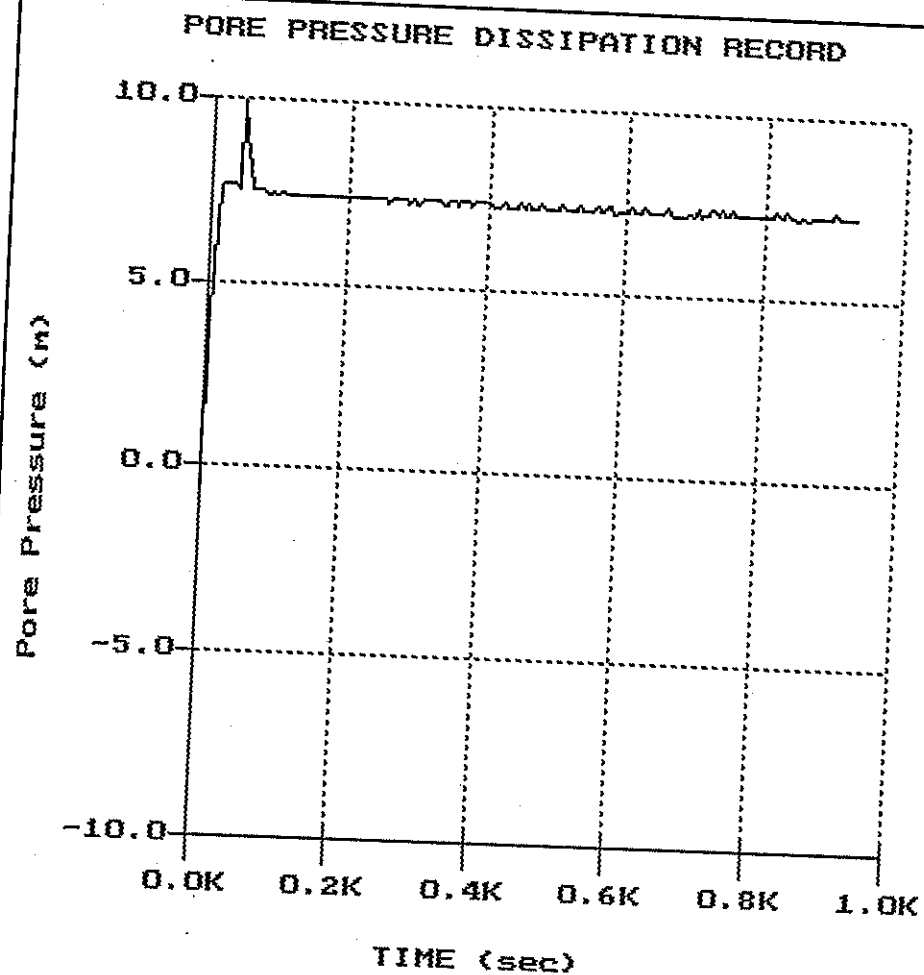


File: 163CP03.PPD
Depth (m): 10.25
(ft): 33.63
Duration : 535.0s

Knight Piesold

Hole: PRW 96-2 (4)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 16:27

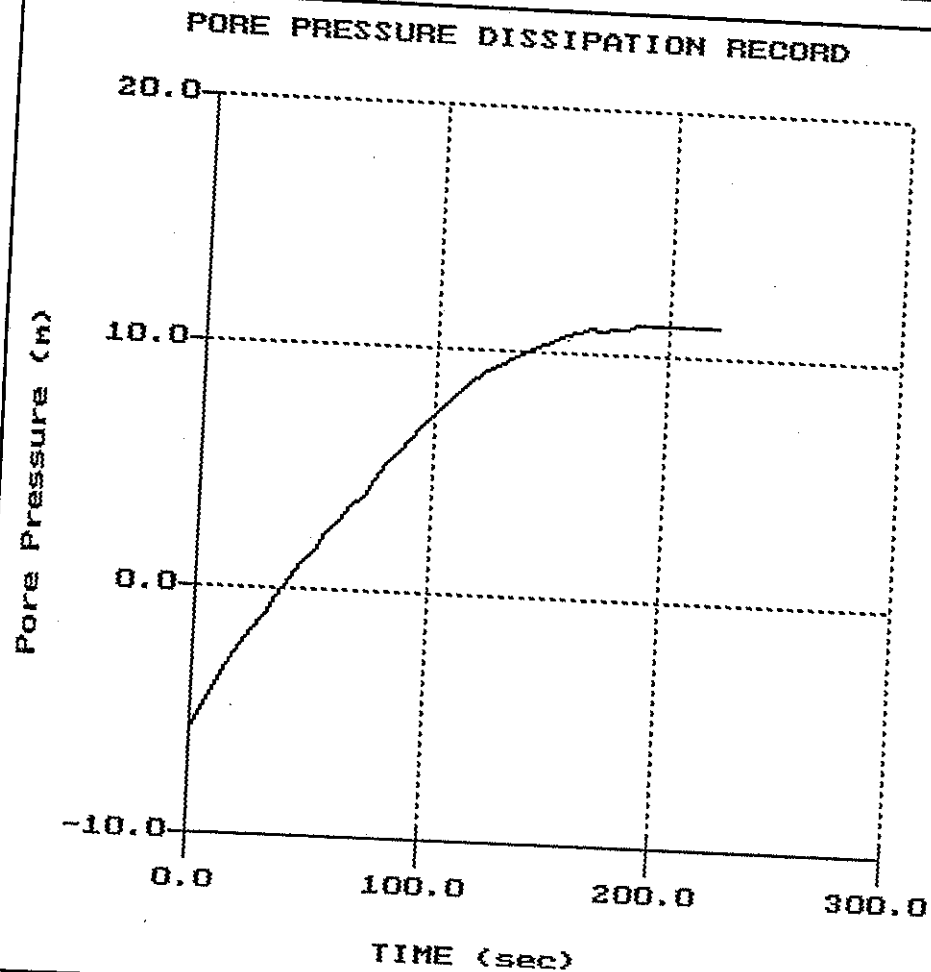


File: 163CP04.PPD
Depth (m): 7.25
(ft): 23.79
Duration : 930.0s

Knight Piesold

Hole: PRW 96-2 (4)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:27:96 16:27

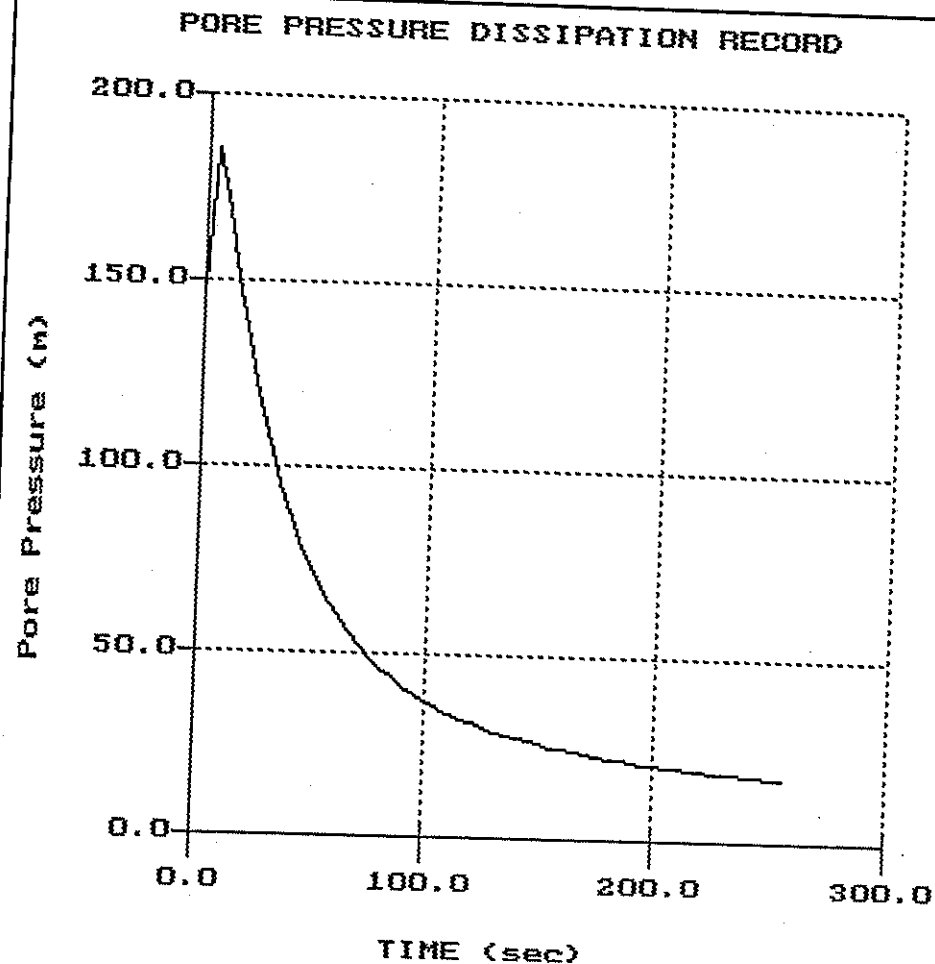


File: 163CP04.PPD
Depth (m): 11.75
(ft): 38.55
Duration : 220.0s

Knight Piesold

Hole: PRW 96-2 (4A)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 08:43



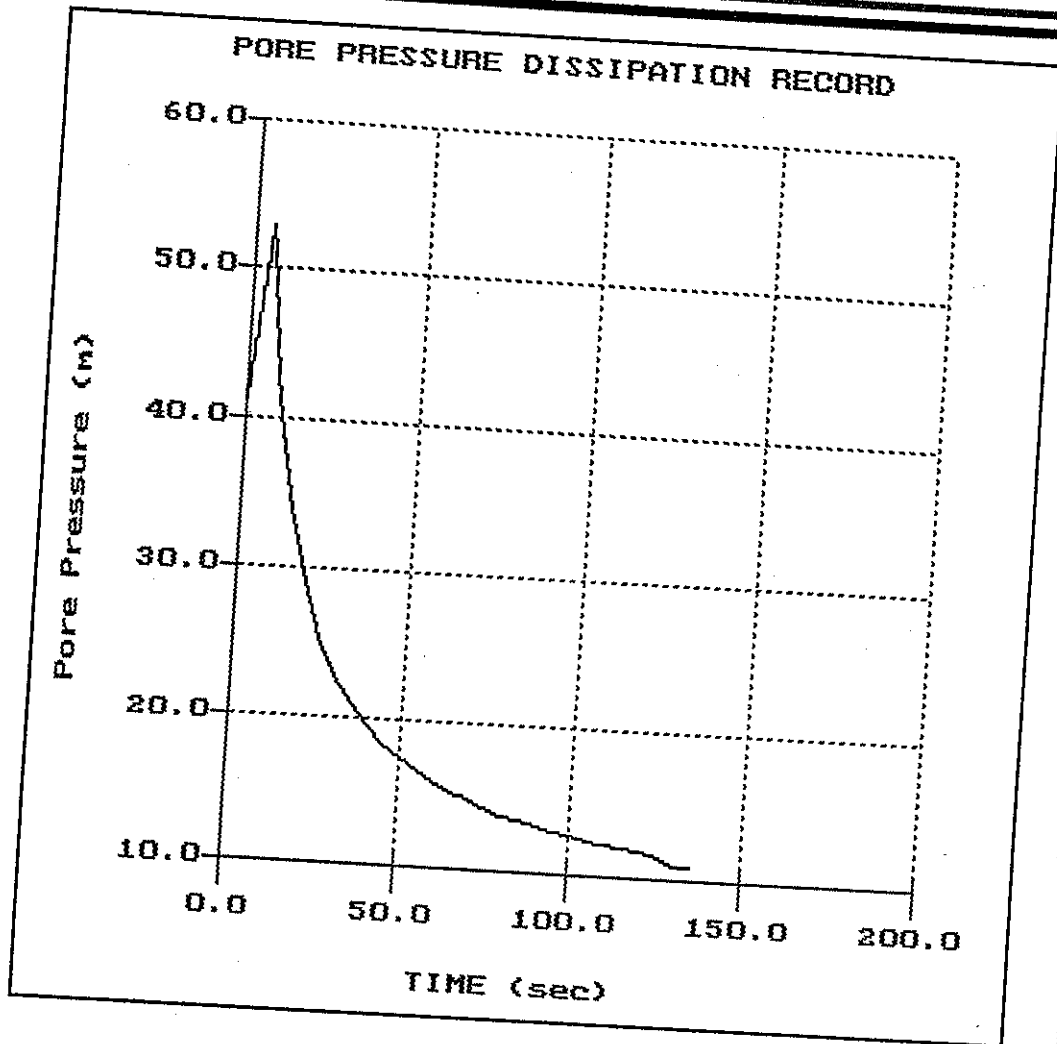
File: 163CP04A.PPD
Depth (m): 8.75
(ft): 28.71
Duration : 255.0s

Knight Piesold

Hole: PRW 96-2 (4A)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 08:43

File: 163CP04A.PPD
Depth (m): 9.75
(ft): 31.99
Duration: 135.0s

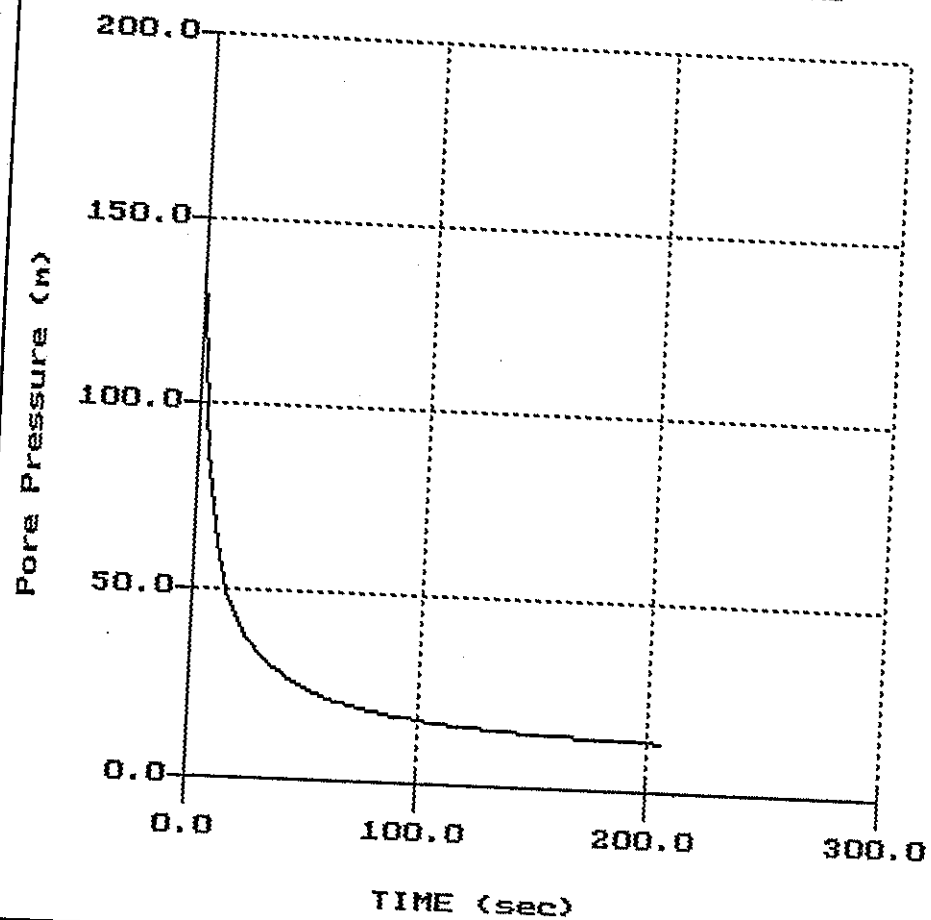


Knight Piesold

Hole: PRW 96-2 (4A)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 08:43

PORE PRESSURE DISSIPATION RECORD



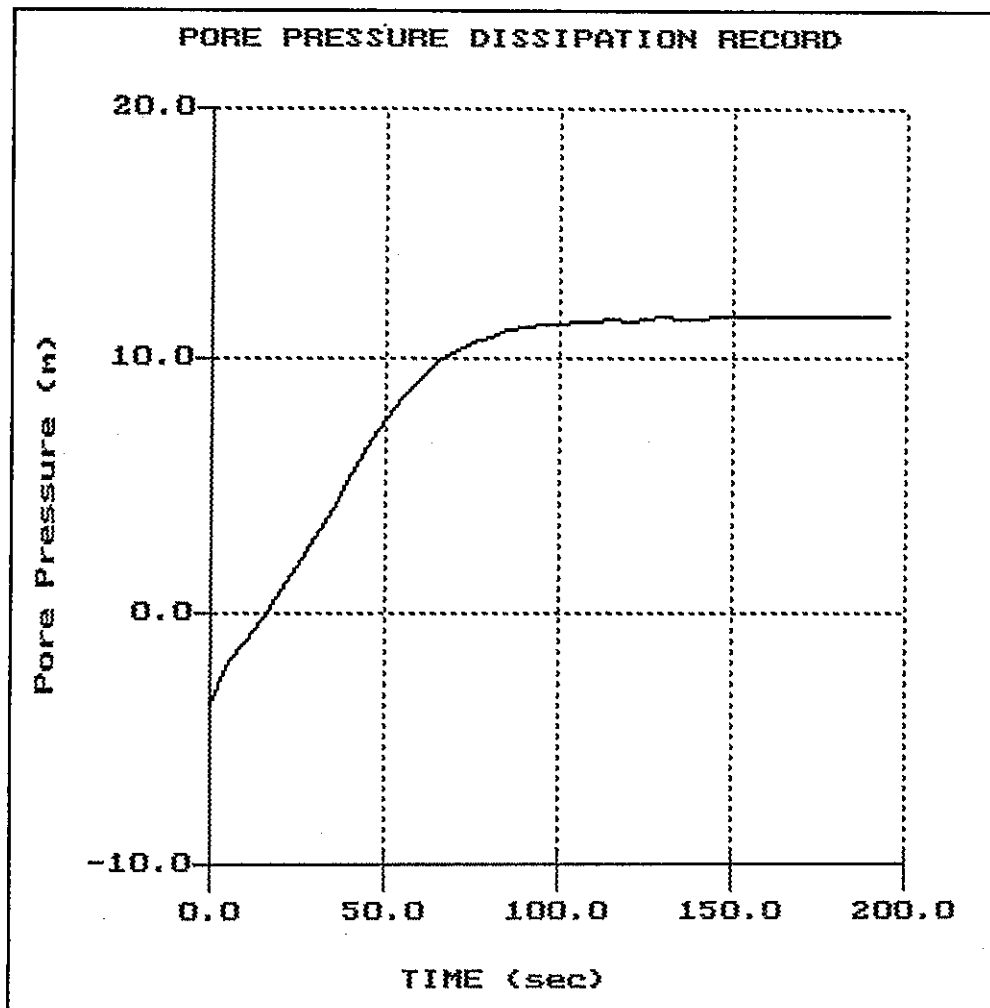
File: 163CP04A.PPD
Depth (m): 10.75
(ft): 35.27
Duration : 205.0s

Knight Piesold

Hole: PRW 96-2 (4A)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 08:43

File: 163CP04A.PPD
Depth (m): 11.75
(ft): 38.55
Duration: 195.0s

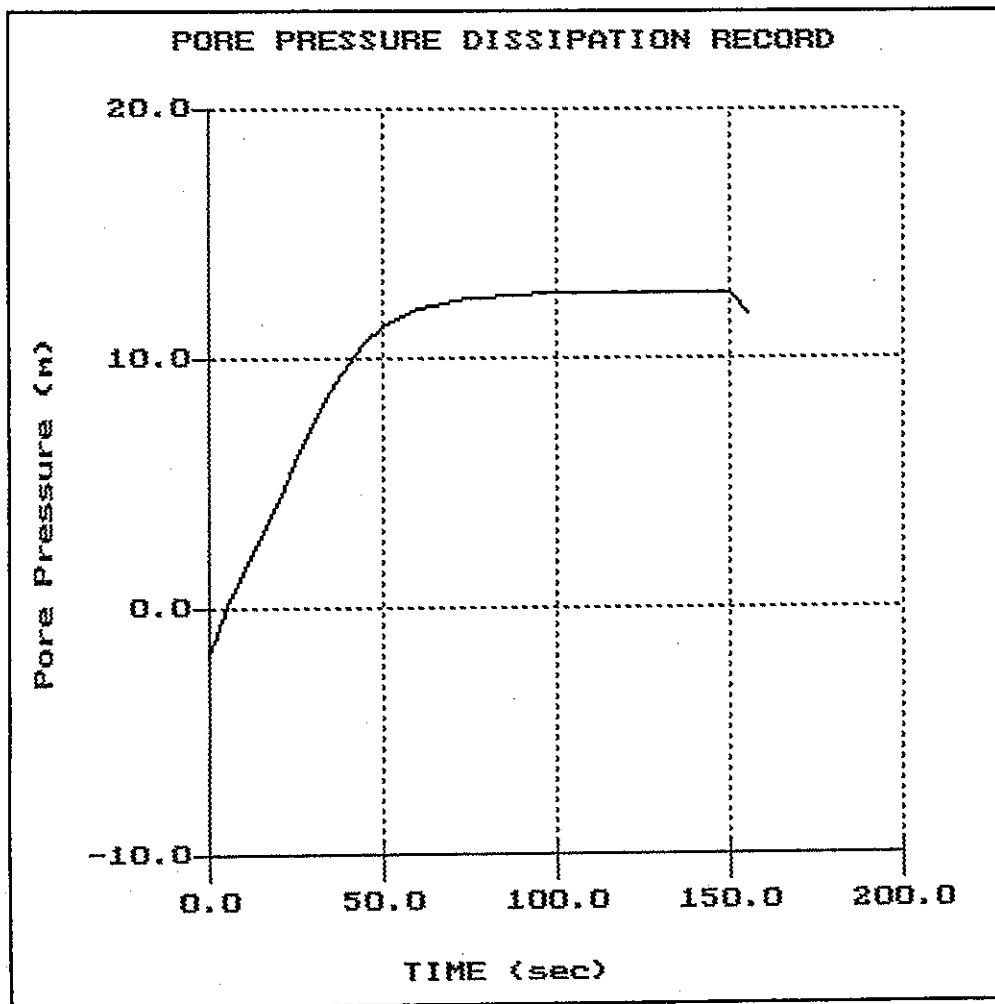


Knight Piesold

Hole: PRW 96-2 (4A)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 08:43

File: 163CP04A.PPD
Depth (m): 12.75
(ft): 41.83
Duration: 155.0s

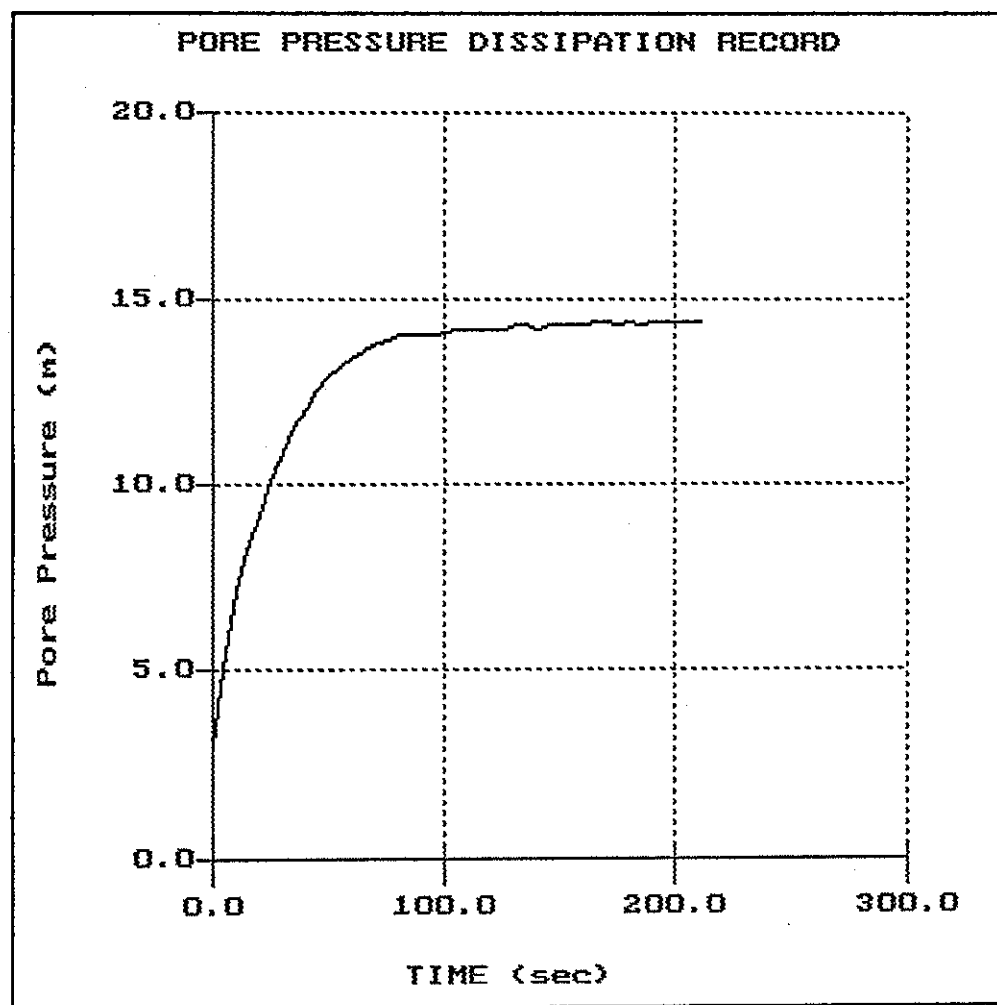


Knight Piesold

Hole: PRW 96-2 (4A)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 08:43

File: 163CP04A.PPD
Depth (m): 14.75
(ft): 48.39
Duration : 210.0s

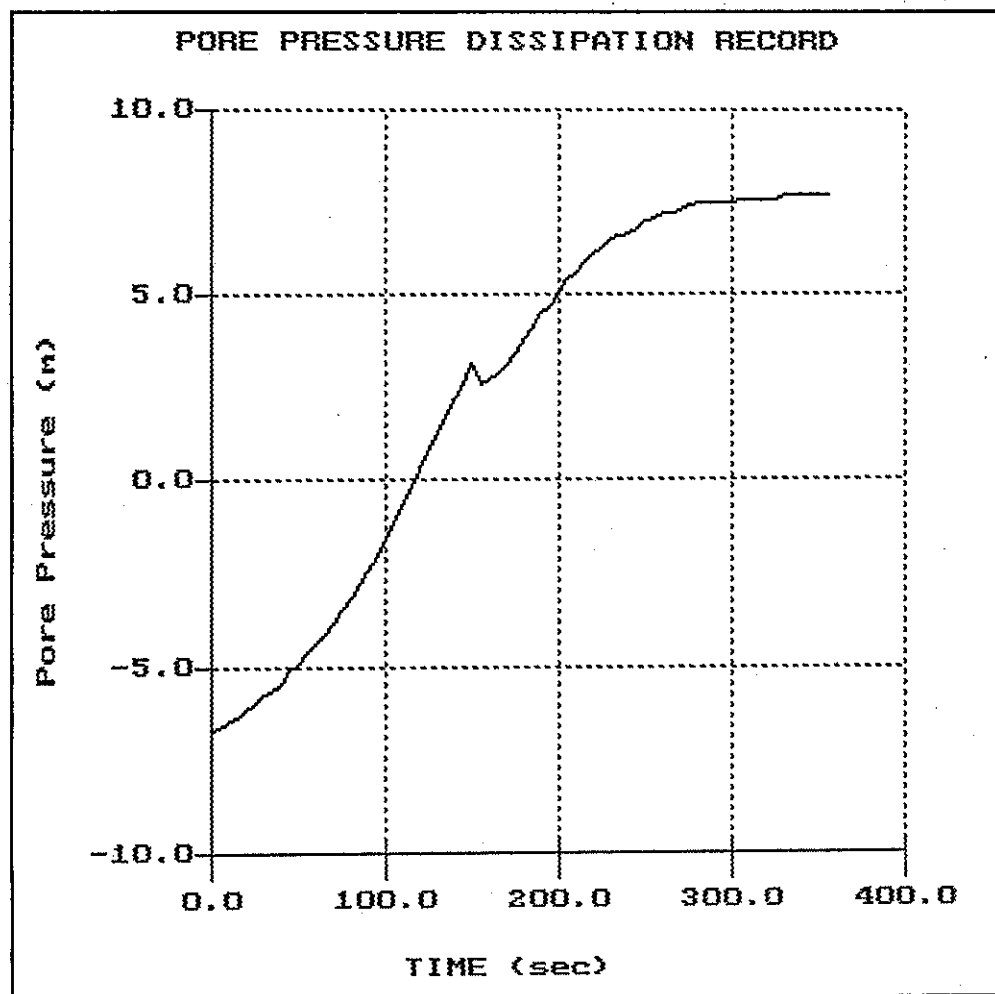


Knight Piesold

Hole: CPT 96-2 (6)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 13:48

File: 163CP06.PPD
Depth (m): 7.75
(ft): 25.43
Duration: 355.0s

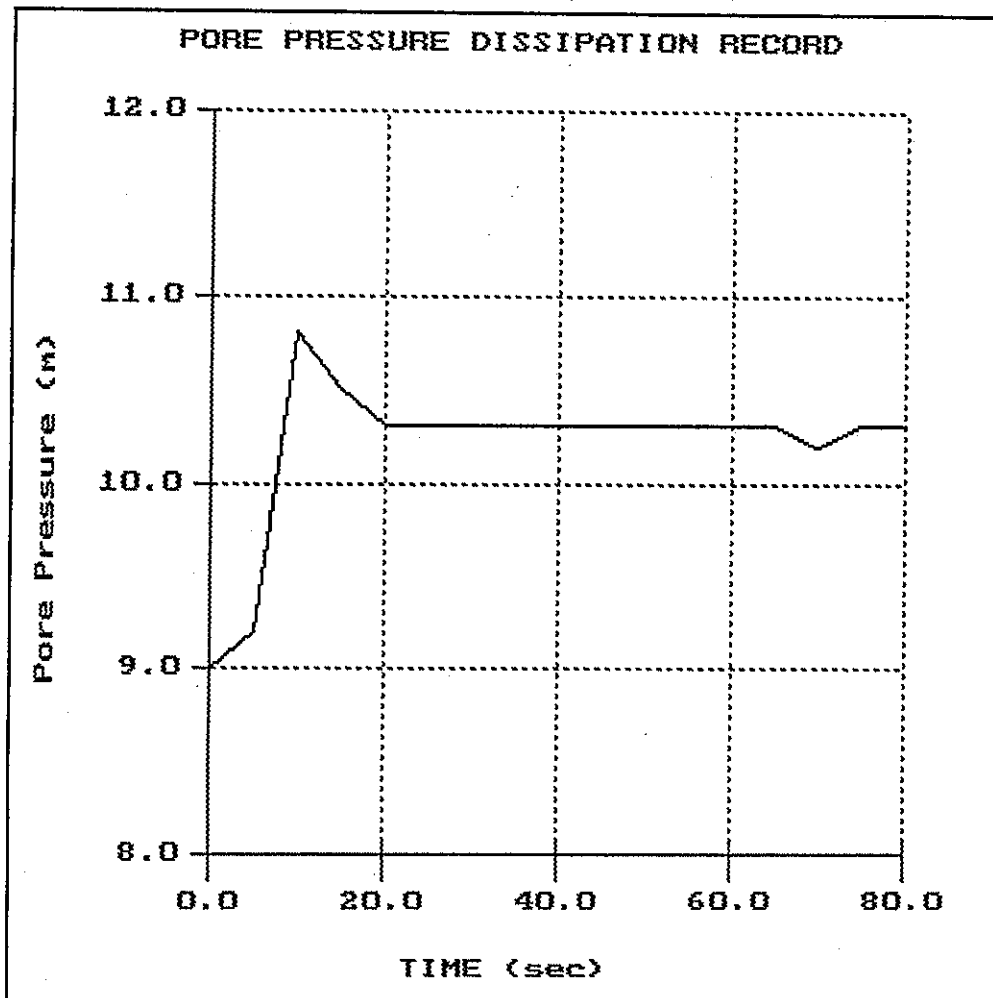


Knight Piesold

Hole: CPT 96-3 (?)
Location: MT. POLLEY DAM

Cone: 10 TON A 023
Date: 07:28:96 15:08

File: 163CP07.PPD
Depth (m): 10.55
(ft): 34.61
Duration: 80.0s

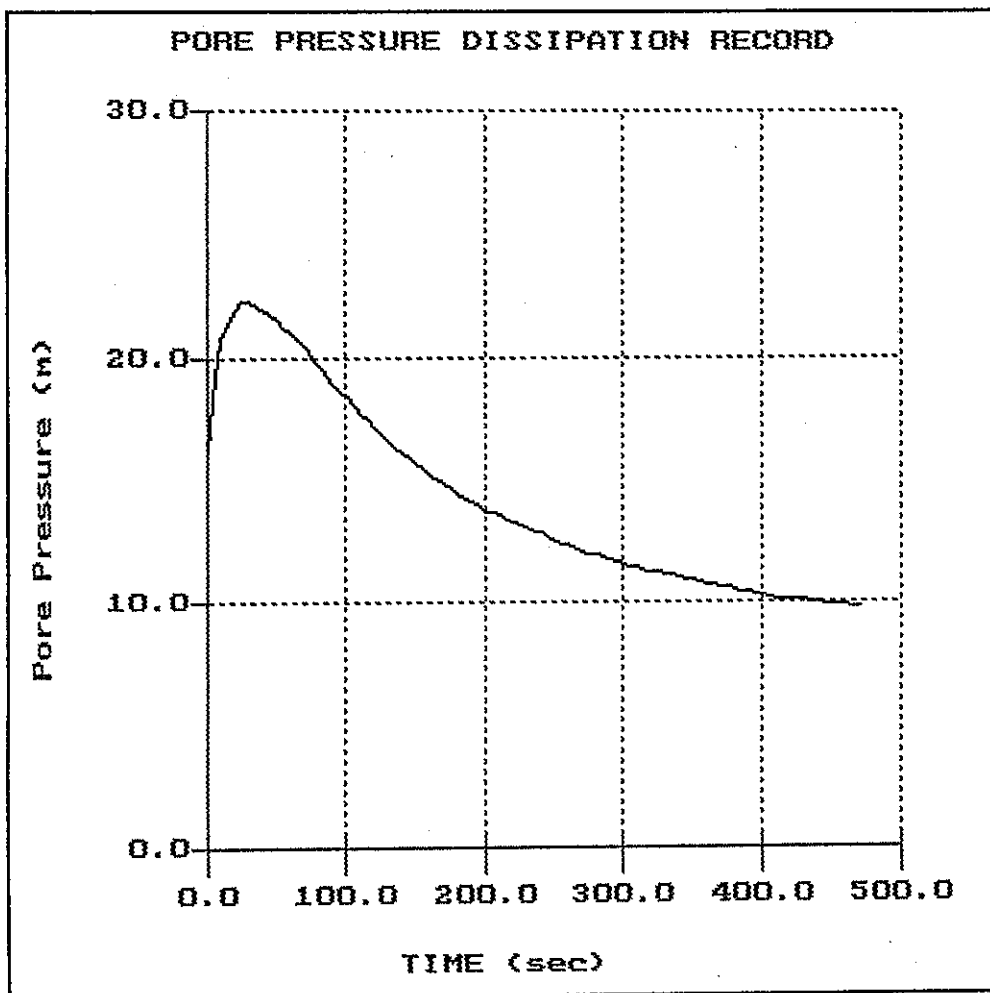


Knight Piesold

Hole: CPT 96-4 (8)
Location: MT. POLLEY DAM

Cone: 10 TON A 005
Date: 07:28:96 16:17

File: 163CP08.PPD
Depth (m): 6.95
(ft): 22.80
Duration: 470.0s

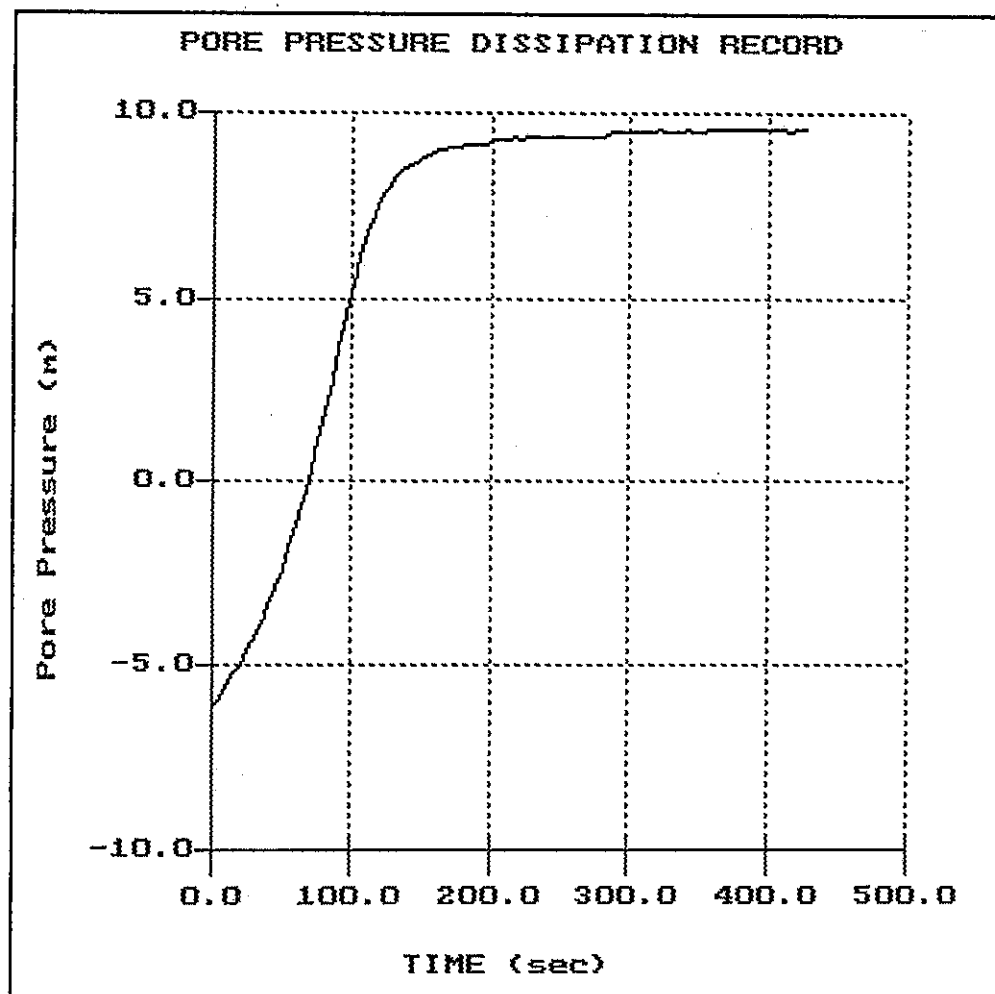


Knight Piesold

Hole: CPT 96-4 (8)
Location: MT. POLLEY DAM

Cone: 10 TON A 005
Date: 07:28:96 16:17

File: 163CP08.PPD
Depth (m): 8.95
(ft): 29.36
Duration : 425.0s

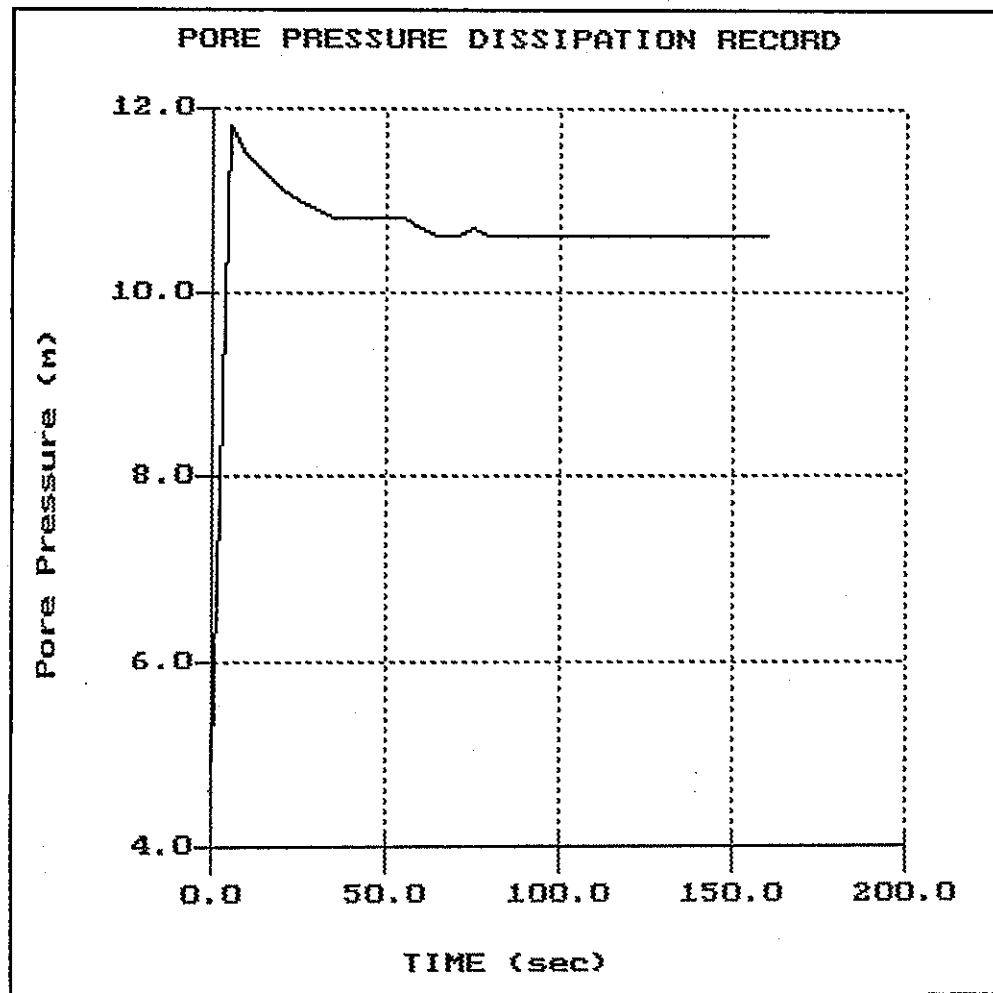


Knight Piesold

Hole: CPT 96-4 (8)
Location: MT. POLLEY DAM

Cone: 10 TON A 005
Date: 07:28:96 16:17

File: 163CP08.PPD
Depth (m): 9.95
(ft): 32.64
Duration: 160.0s

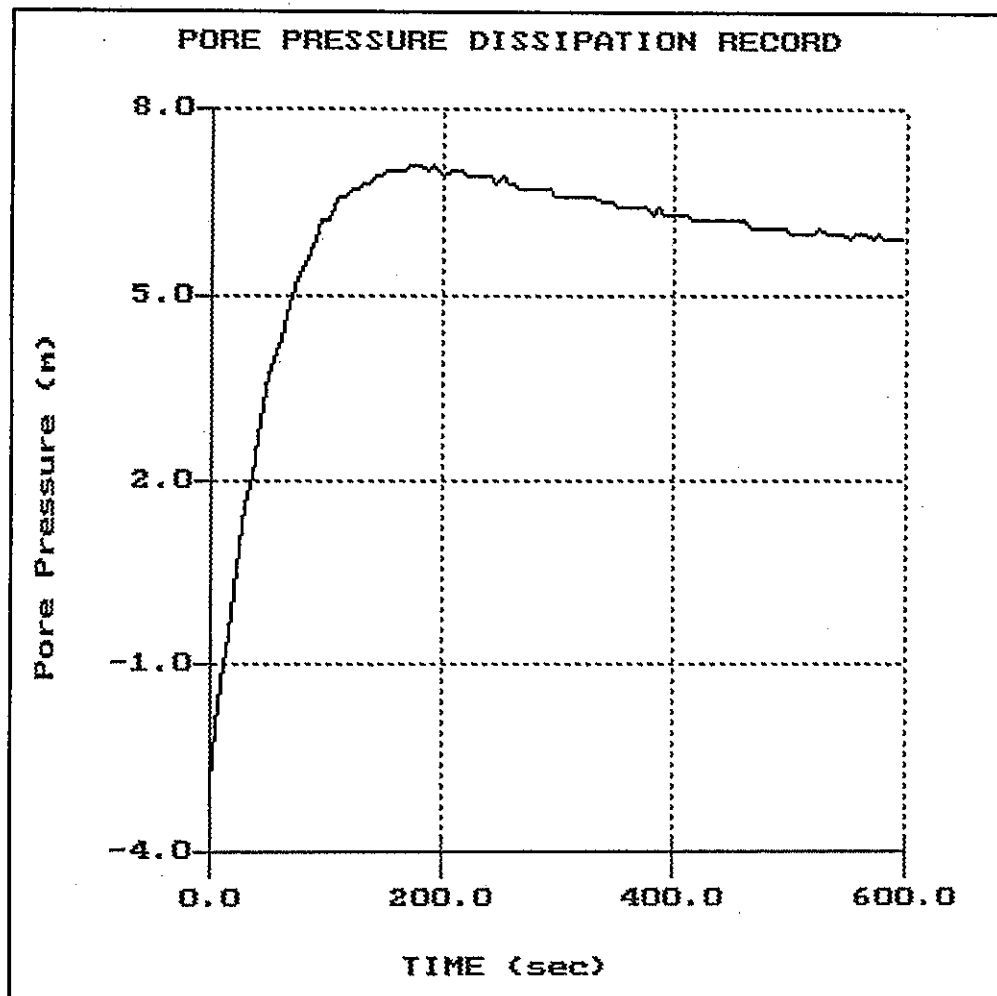


Knight Piesold

Hole: CPT 96-5 (9)
Location: MT. POLLEY DAM

Cone: 10 TON A 005
Date: 07:28:96 17:20

File: 163CP09.PPD
Depth (m): 5.10
(ft): 16.73
Duration : 595.0s

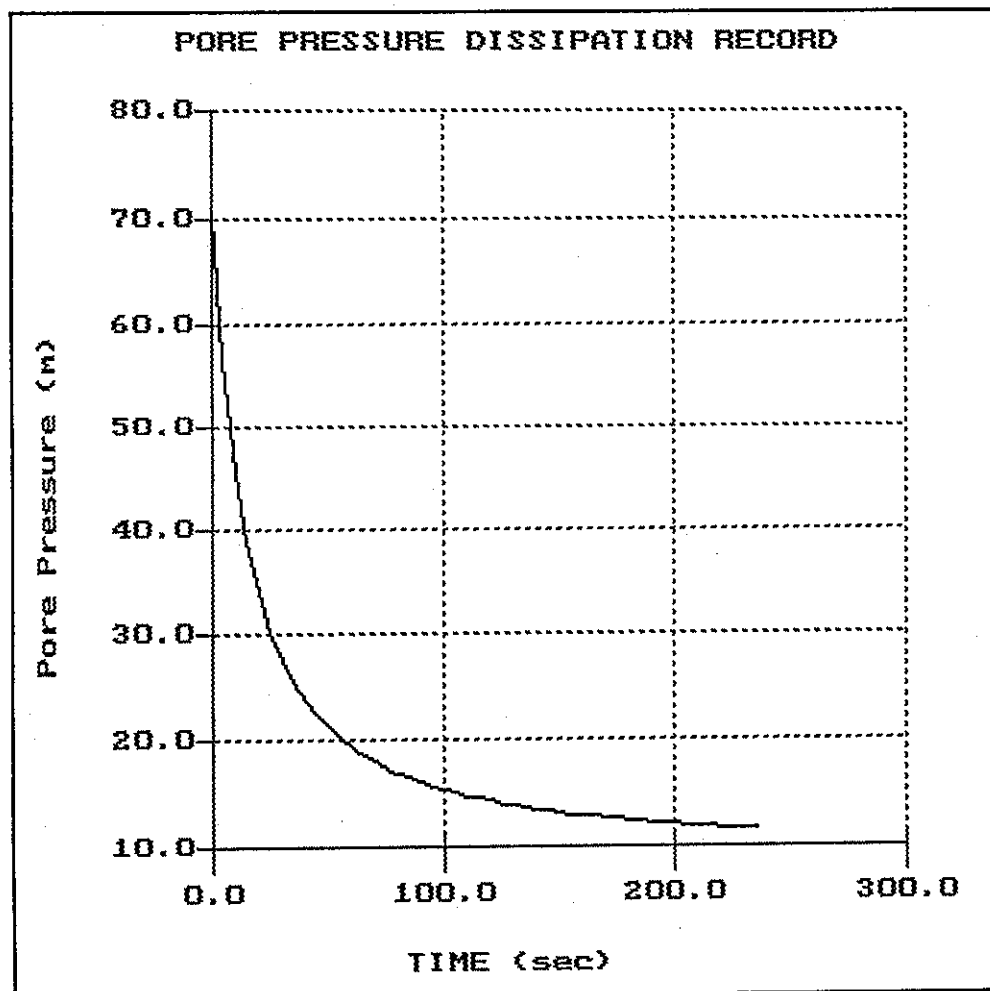


Knight Piesold

Hole: CPT 96-5 (9)
Location: MT. POLLEY DAM

Cone: 10 TON A 005
Date: 07:28:96 17:20

File: 163CP09.PPD
Depth (m): 8.40
(ft): 27.56
Duration : 235.0s

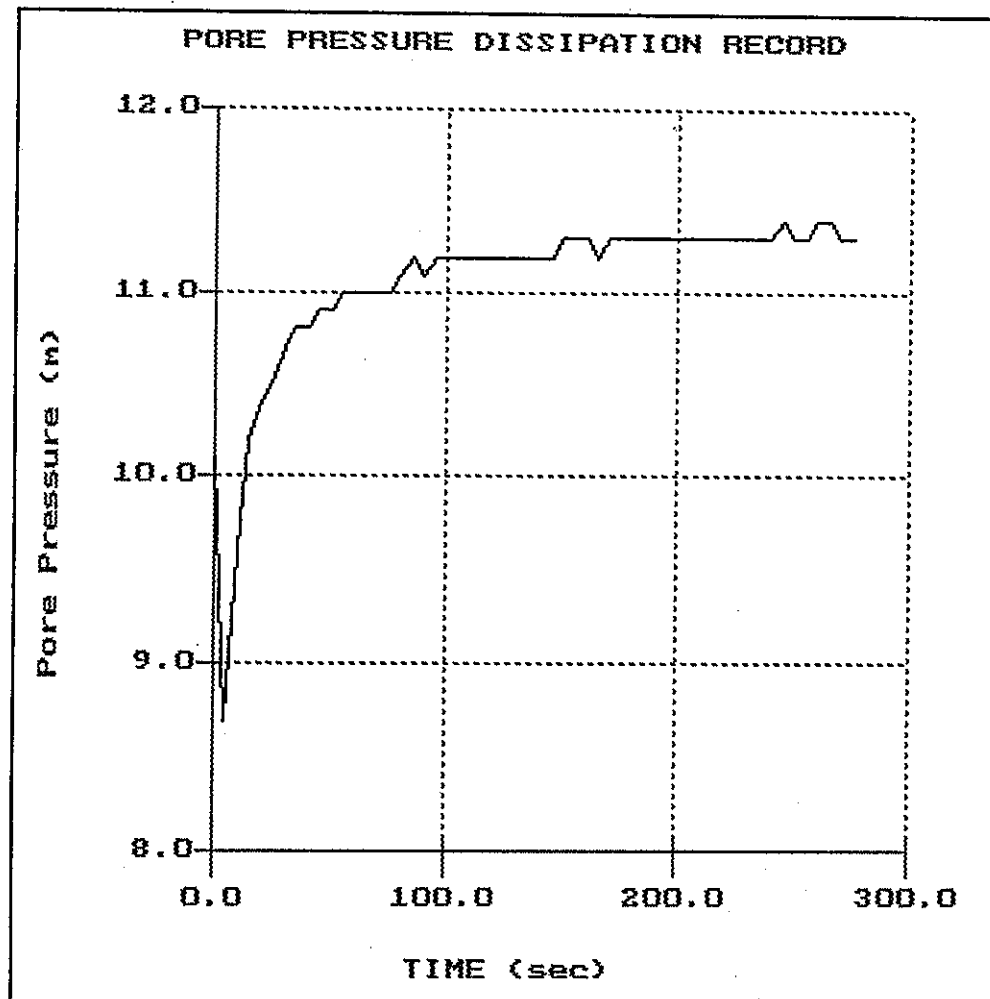


Knight Piesold

Hole: CPT 96-5 (9)
Location: MT. POLLEY DAM

Cone: 10 TON A 005
Date: 07:28:96 17:20

File: 163CP09.PPD
Depth (m): 10.00
(ft): 32.81
Duration: 275.0s



APPENDIX E
SHEAR WAVE VELOCITY DATA

ConeTec Investigations Ltd.
 Seismic Cone Data Reduction
 KNIGHT & PEISOLD MOUNT POLLEY MINE
 SCPT-4A

Shear Source Offset 0.6m / Seismometer 0.20m above tip

Source Hammer and Beam Average

July 27, 1996

Geophone	Depth	Distance	Crossover	Corrected Crossover	of sensor	Velocity Profile
	(m)	(m)	(msec)	(msec)	(m)	(m/sec)

8.5	8.521150	29.1	29.02777	-4.25	292.8
9	9.019977	31.6	31.53001	-8.75	199.8
9.5	9.518928	33.9	33.83258	-9.25	217.1
10.5	10.51712	37.7	37.63859	-10	262.7
11.5	11.51564	41.2	41.14403	-11	285.2
12.5	12.51439	44.4	44.34893	-12	312.0
13.5	13.51332	47.7	47.65295	-13	302.6
14.5	14.51240	51.3	51.25613	-14	277.5
15.5	15.51160	55.1	55.05876	-15	262.9

ConeTec Investigations Ltd.
 Seismic Cone Data Reduction
 KNIGHT & PEISOLD MOUNT POLLEY MINE
 SCPT-1

Shear Source Offset 0.6m / Seismometer 0.20m above tip

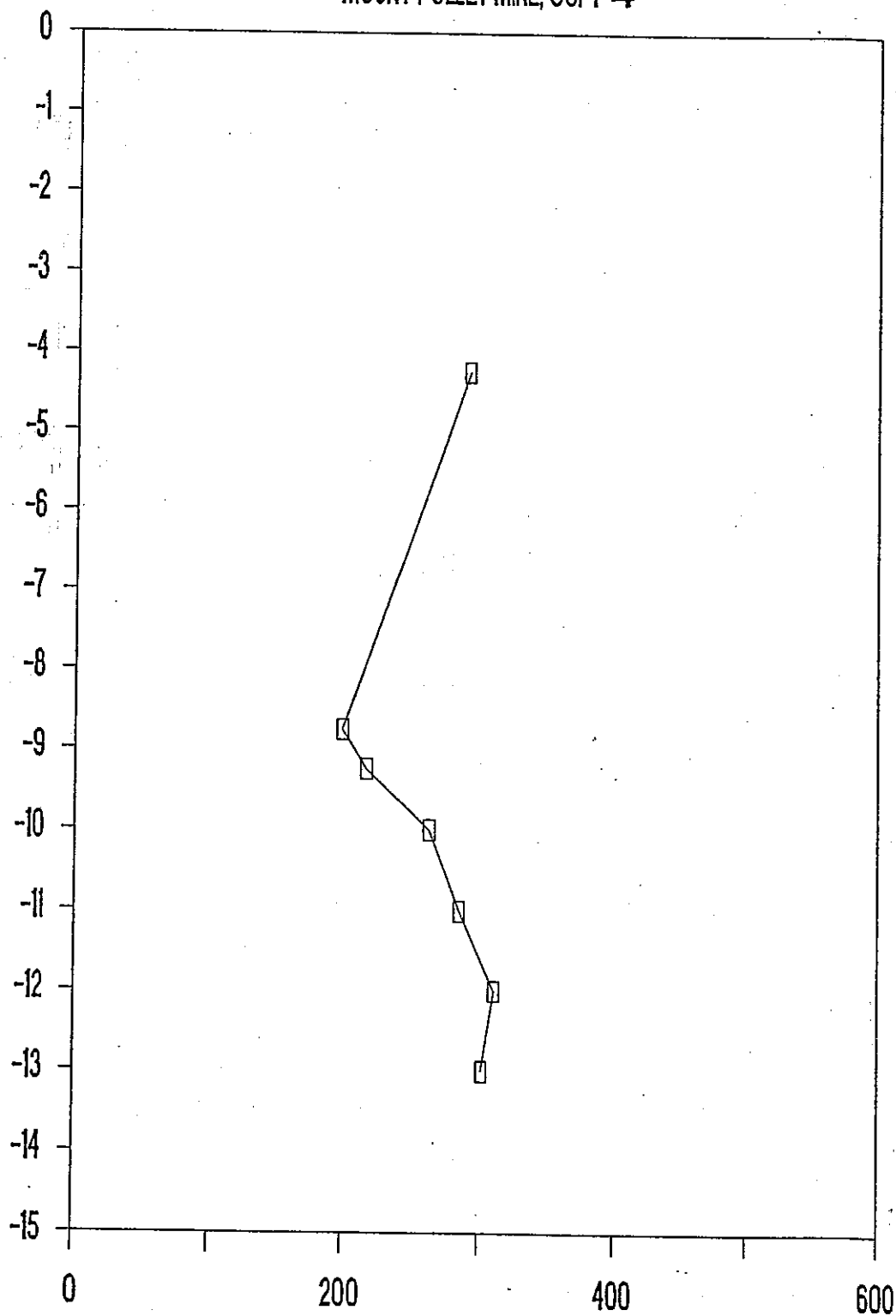
Source Hammer and Beam
 July 27, 1996
 Geophone
 Depth (m) Distance (m) Crossover (msec) Corrected Crossover (msec) of sensor (m) Average Depth (m) Velocity Profile (m/sec)

0.6	0.848528	8.5	6.010407	-0.3	187.5
1.6	1.708800	12.5	11.70411	-1.1	175.6
2.6	2.668332	16.9	16.46721	-2.1	209.9
3.6	3.649657	21.6	21.30610	-3.1	206.6
4.6	4.638965	25.8	25.58329	-4.1	233.7
5.6	5.632051	29.6	29.43155	-5.1	259.8
6.45	6.477846	33.5	33.35599	-6.025	216.5
7.25	7.274785	37.1	36.97360	-6.85	221.1
7.85	7.872896	39.1	38.98628	-7.55	298.1
8.3	8.321658	40.9	40.79355	-8.075	248.9
8.75	8.770547	42.8	42.69972	-8.525	236.0
9.3	9.319334	45.2	45.10622	-9.025	228.5

SHEAR WAVE VELOCITY VS DEPTH

MOUNT POLLEY MINE, SCPT-4

Depth Below Grade (metres)



Shear Wave Velocity- 1st Crossover(m/s)

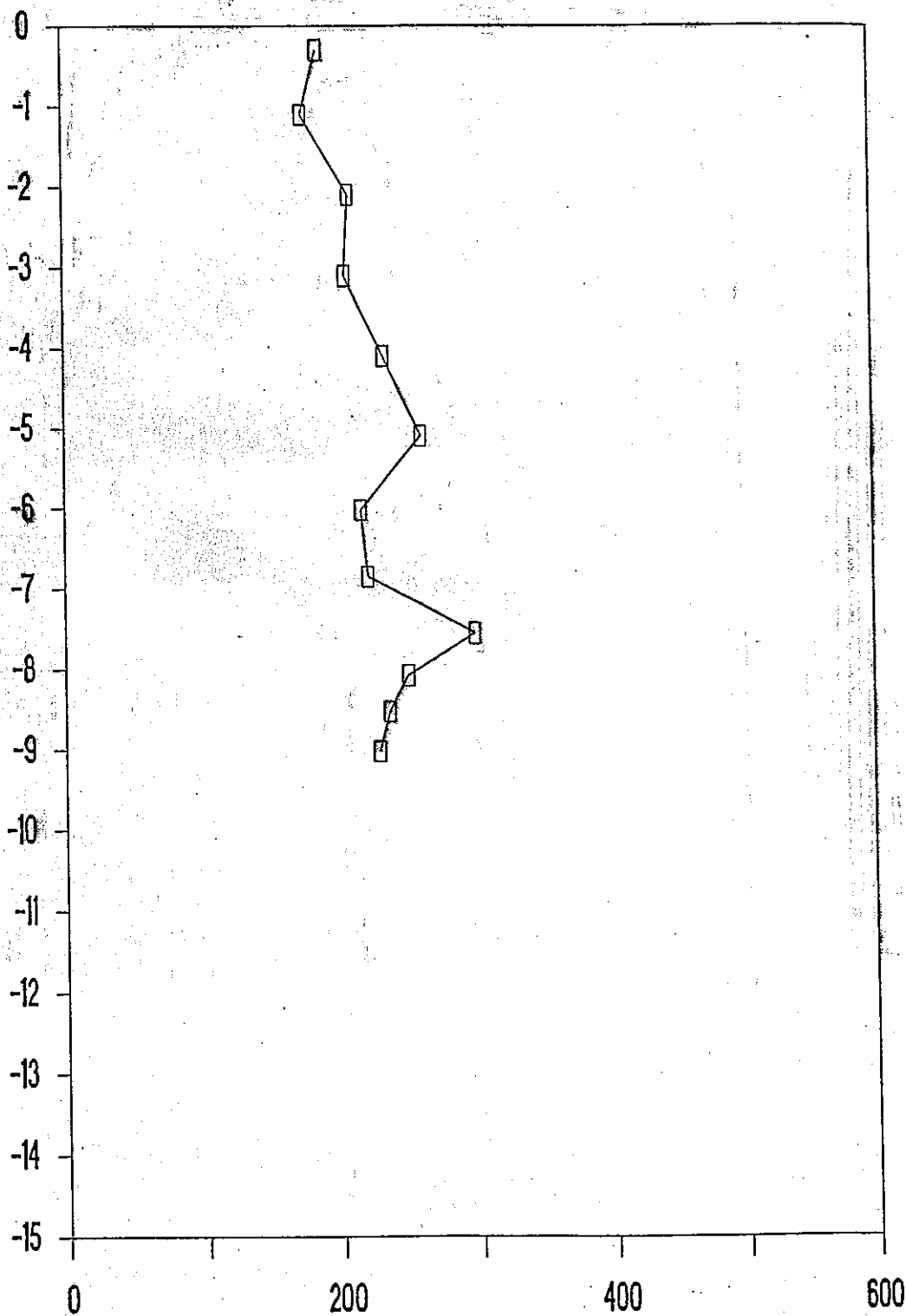
□ Vs

Vs SCPT4

SHEAR WAVE VELOCITY VS DEPTH

MOUNT POLLEY MINE, SCPT-1

Depth Below Grade (metres)



Shear Wave Velocity- 1st Crossover(m/s)

□ Vs SCPT-1