PROSPERITY
A Gold-Copper Project of Taseko Mines Limited

Taseko Prosperity Gold-Copper Project

Appendix 3-6-N

Taseko Mines Limited

TASEKO MINES LIMITED
FISH LAKE PROJECT

REPORT ON
PRELIMINARY GEOTECHNICAL INVESTIGATIONS
(REF. NO. 1733/1)

JANUARY 1993

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TASEKO MINES LIMITED
FISH LAKE PROPERTY

REPORT ON
PRELIMINARY GEOTECHNICAL INVESTIGATIONS
REPORT NO. 1733/1

THIS REPORT HAS BEEN PREPARED EXCLUSIVELY FOR TASEKO MINES LIMITED FOR THE PURPOSE OF PROJECT EVALUATION AND PERMITTING.

TASEKO MINES LIMITED
FISH LAKE PROJECT

REPORT ON
PRELIMINARY GEOTECHNICAL INVESTIGATIONS
(REF. NO. 1733/1)

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TASEKO MINES LIMITED
FISH LAKE PROJECT

REPORT ON
PRELIMINARY GEOTECHNICAL INVESTIGATIONS
(REF. NO. 1733/1)

EXECUTIVE SUMMARY

A preliminary geotechnical investigation program was conducted at the Fish Lake property in October, 1992 by Knight Piesold Ltd. The program was limited to Tailings Storage Site 2 and included the following:

- ◇ General reconnaissance of the area.
- ◇ Helicopter supported drilling of five boreholes in the foundations of proposed tailings impoundment structures.
- ◇ Identification and evaluation of foundation materials for geological and geotechnical parameters.
- ◇ In-situ permeability testing of various units.
- ◇ Installation of five groundwater quality monitoring wells for baseline data collection.

The results of the investigation program are summarized below:

- ◇ Glacial till overburden cover is minimal, up to 3.96 m.
- ◇ The Miocene basalt cap is extensive and varies in thickness from 0 to 30 m.
- ◇ Random sections of coarse sediments are located within the basalt cap.

- ◇ The basalt is underlain by a sedimentary sequence which grades from coarse gravel and cobbles, to sand, to layered silts, fine sands and clay.

- ◇ Tailings Storage Site 2 has a relatively low permeability foundation. The average permeability of the units encountered is 10^{-5} cm/s.

- ◇ Five groundwater quality monitoring wells were installed in the boreholes and sampling for baseline groundwater quality has been initiated.

The preliminary geotechnical investigation program has shown that Site 2 has the potential to be a good site for storage of mine tailings. Drilling and in-situ testing have shown that the site has a relatively low permeability foundation (10^{-5} cm/s) that is competent and extensive.

SECTION 1.0 - INTRODUCTION AND SCOPE OF WORK

The Fish Lake project is a large gold-copper deposit located approximately 125 km southwest of Williams Lake, B.C., as shown on Figure 1. Permanent storage of mine tailings for the project must include the possibility of completely mining the deposit, which has an estimated preliminary geological reserve of 1.27 billion tons. The preliminary geotechnical investigations were conducted at proposed Tailings Storage Site 2, located south of Fish Lake as shown on Drawing No. 1733.001.

Previous work conducted by Knight Piesold Ltd. on the project includes the following:

(i) Initial overview in February, 1991.

(ii) A site visit, followed by issuing of "Report on Preliminary Geotechnical Evaluation, Report No. 1731/1" in July/August, 1991.

(iii) Hydrogeological investigations in the orebody and issuing of "Report on Preliminary Hydrogeological Investigations, (1732/2)" in April/May, 1992.

This report presents the results of the investigations conducted at site during October, 1992. The work comprised five helicopter supported boreholes and included general surface reconnaissance, geological and geotechnical logging of drill core, in-situ permeability testing and the installation of groundwater quality monitoring wells.

The investigations were undertaken at this time because of the availability of equipment from the on-going exploration drilling program. In addition, it was believed that Site 2 was the best location for tailings storage. Further work will be required if this site is selected. Should any other potential tailings storage sites be preferred, work of the same detail will be required to evaluate its suitability for storage of tailings.

SECTION 2.0 - GEOTECHNICAL INVESTIGATIONS

2.1 DRILLING OBSERVATIONS AND RESULTS

The preliminary geotechnical investigations at Tailings Storage Site 2 were undertaken with the goal of minimizing surface disturbance. For this reason, a helicopter supported drill program was selected. Vancouver based Quest Canada provided a specially modified heli-portable hydraulic powered Val D'Or diamond drill to conduct the work. Helicopter support was provided by Canadian Helicopters, of Williams Lake, who utilized an A Star helicopter with a lifting capacity of approximately 550 kg for drill moves and crew changes.

General surficial reconnaissance conducted prior to drilling identified abundant basalt outcrop in the area, indicating that overburden cover was minimal. Therefore, SPT sampling of overburden materials was not required for preliminary geotechnical investigations. The investigation program was focused on obtaining core samples for visual identification of foundation materials and conducting in-situ permeability testing, where possible, to provide information required for a first pass evaluation of the site's suitability for storage of tailings.

A total of 5 boreholes was drilled in the foundations of proposed tailings impoundment structures. The borehole depths ranged from 33.83 to 68.88 m and the total footage drilled was 281.94 m. Drilling typically consisted of setting a shallow HW casing in basalt, followed by HQ coring. All casings were left in the hole to aid in monitoring well installations. Recoveries were generally good, with the exception of some sandy, weakly consolidated sedimentary sections where only gravel and cobbles were recovered. Recovery in basalt was typically 90 to 100 percent. All core was logged for geological identification of materials and for geotechnical parameters. The test hole and geotechnical drilling bedrock logs are included in Appendices A and B, respectively.

Summaries of the drill holes are presented below.

(i) KP92-1 Main Embankment

Hole KP92-1 was drilled just west of Fish Creek, on the alignment for the Main Embankment. Drilling encountered a thin glacial till overburden layer (to 1.52 m) consisting of silt and sand with some gravel and cobbles. Immediately below the till is a sequence of Miocene aged basalt flows which, although similar in composition, range from medium grained, competent and weakly vesicular to fine grained, highly vesicular and glassy materials. The basalt flows extend to 56.39 m. RQD is quite varied in the basalt and is often difficult to determine, especially in the vuggy sections where the weaker rock is easily disturbed by drilling.

Occasional sequences of alluvial/fluvial sediments are located from 18.59 to 21.79 m and from 45.42 to 46.02 m, within the basalt flows. These sediments are stratified and are typically overconsolidated. The sediments are also present below the basalt, where greenish-grey sands and overconsolidated silts were recovered. Hole KP92-1 was drilled to a total depth of 59.74 m.

(ii) KP92-2 Main Embankment

Hole KP92-2 was also drilled on the Main Embankment alignment, approximately 1100 m east of KP92-1. Glacial till overburden extends to a depth of 3.35 m and is underlain by the Miocene basalt previously discussed. Most of the basalt at this location is the glassy, highly vesicular type. The basalt extends to 25.30 m and has low RQD. It is broken and altered to chlorite in sections. Underlying the basalt is an overconsolidated sedimentary deposit. The sedimentary deposit grades from coarse sandy gravel to a uniform sand and, finally, to layered silts and fine sands. The hole was terminated in the sediments at a depth of 68.88 m.

(iii) KP92-3 South Saddle Dam

Hole KP92-3 was drilled at the western side of the South Saddle Dam, approximately 6 km south of the Main Embankment. Here, glacial till overburden extends to 3.96 m and is underlain by sediments similar to those encountered in hole KP92-2. The sediments grade from coarse sand with gravel and cobbles to a medium to fine grained sand to silts, fine sands and clays. No basalt was encountered in hole KP92-3. However, basalt ridges were observed in the nearby vicinity.

(iv) KP92-4 West Saddle Dam

Hole KP92-4 was drilled on the ridge top along the alignment of the West Saddle Dam. The hole was located approximately 1200 m south of the Main Embankment. Drilling intersected competent, moderate to high RQD, weakly vesicular basalt from surface to 29.41 m. Underlying the competent basalt is a coarse sedimentary unit which consists of cobbles and gravel with some sand. This unit extends to 36.88 m. It is underlain by basalt which varies from chloritized and brecciated to competent material, similar to that identified near surface. The basalts extend to 46.33 m, where more gravelly sediments were encountered. These sediments extend to the bottom of the hole at 59.74 m, but have other thin units within them, including 0.91 m of stratified sand and silt and 2.29 m of brecciated basalt.

(v) KP92-5 West Saddle Dam/Main Embankment

Hole KP92-5 was also drilled along the West Saddle Dam alignment. The hole was located approximately 400 m south of the western abutment of the Main Embankment. Drilling intersected competent basalt which extends from surface to 6.40 m. Underlying this is a coarse sedimentary unit of cobbles and gravel with some sand and silt which extends to 17.98 m. basalts varying from competent to vuggy or brecciated and chloritized underlie the sedimentary unit. The hole was terminated at 33.83 m due to

difficulties associated with collapsing of the sediments nearer to the top of the hole.

2.2 IN-SITU PERMEABILITY TESTING

In-situ permeability testing was conducted with the Longyear Type II Wireline Packer System. Testing comprised the following:

- core to required depth.
- pull back drill rods to expose test interval.
- lower packer assembly to drill bit and inflate the packers, thereby isolating the test interval.
- pump water into test interval at a constant head and record the volume of water that flows into the formation.

Three ascending and two descending stages are required to verify the validity of each packer test. Tests were attempted at 30 foot intervals, unless precluded by poor drilling conditions. Testing was limited in several holes because of material collapsing around the drill rods.

A total of seventeen packer tests were completed during the investigation program. A summary of the results is presented on Table 1 and detailed results are included in Appendix C. Testing has indicated that the permeability of the Miocene basalts ranges from 2×10^{-4} cm/s to 9×10^{-7} cm/s, with an average of 4×10^{-5} cm/s. These values are based on testing in all types of basalt, including competent and weakly vesicular, highly vesicular and vuggy, and brecciated and chloritized sections.

Intervals containing varying thicknesses of both basalt and sediments were also tested. These results show permeabilities that range from 3×10^{-4} cm/s to 2×10^{-6} cm/s. The average permeability of this material is 6×10^{-5} cm/s.

Two tests were completed in the sedimentary deposits. The results showed permeability values of 8×10^{-6} cm/s and 3×10^{-5} cm/s, with an average value of 2

x 10^{-5} cm/s. These tests were completed in the finer grained, more competent silty materials. Testing was not conducted in coarser grained sections because pressurizing the formations would have destabilized the drill holes.

2.3 MONITORING WELL INSTALLATIONS

Groundwater quality monitoring wells were installed in the boreholes after the rig had moved. Drill casings were left to ensure that the holes would not collapse at surface. The monitoring wells were installed to allow for sampling as part of the baseline groundwater quality data collection program. The completion zones were not pre-selected. Rather, the wells were completed above sections that had collapsed, typically sandy gravel horizons. The wells were sampled shortly after drilling, using Knight Piesold's Reel EZ/Grundfos pump and converter. Hole KP92-4 was dry at the time of sampling. Completion details for each monitoring well are included in Appendix D.

SECTION 3.0 - CONCLUSIONS AND RECOMMENDATIONS

The preliminary geotechnical investigations have indicated that Site 2 has the potential to be a good site for the storage of mine tailings. The site is characterized as having a relatively low permeability foundation (10^{-5} cm/s) that is competent and extensive. However, it will be necessary to confirm that the low permeability foundation is present over the entire area in order to verify the integrity of the proposed tailings basin.

The most cost effective way to evaluate the continuity of the low permeability foundation would be:

- ◇ Identify the geomorphology of the area using air photos and possibly landsat imaging.
- ◇ Airborne geophysical surveys covering the entire storage site.
- ◇ Ground geophysical surveys to investigate anomalous areas identified by the airborne surveys.
- ◇ Verification of geophysical data by drilling and in-situ testing in a manner similar to the recently completed investigations, concentrating on the anomalous areas previously identified.

TABLE 1
TASEKO MINES LIMITED
FISH LAKE PROJECT

SUMMARY OF IN-SITU PERMEABILITY TESTING

Hole No.	Test No.	Test Interval (ft) From	To	Permeability k (cm/sec)	Comments
KP92-1	1	19.0	46.0	8×10^{-6}	Alternating basalt
	2	48.5	76.0	2×10^{-5}	Basalt and sediments
	3	78.5	106.0	6×10^{-5}	Alternating basalt
	4	108.5	136.0	2×10^{-5}	Alternating basalt
	5	138.5	166.0	4×10^{-5}	Basalt and sediments
	6	168.5	196.0	4×10^{-5}	Basalt and sediments
KP92-2	1	19.0	46.0	4×10^{-5}	Alternating basalt
	2	48.5	76.0	2×10^{-4}	Vesicular basalt
	3	78.5	106.0	7×10^{-6}	Basalt over sediments
KP92-3	1	99.0	126.0	8×10^{-6}	Interbedded sediments
	2	139.0	166.0	3×10^{-5}	Layered silts
KP92-4	1	19.0	46.0	3×10^{-6}	Basalt
	2	58.5	86.0	4×10^{-7}	Basalt
	3	88.5	116.0	4×10^{-6}	Basalt over sediments
	4	128.5	156.0	9×10^{-7}	Basalt (brecciated)
	5	148.5	196.0	2×10^{-6}	Sediments and basalt
KP92-5	1	19.0	46.0	3×10^{-4}	Sediments and basalt

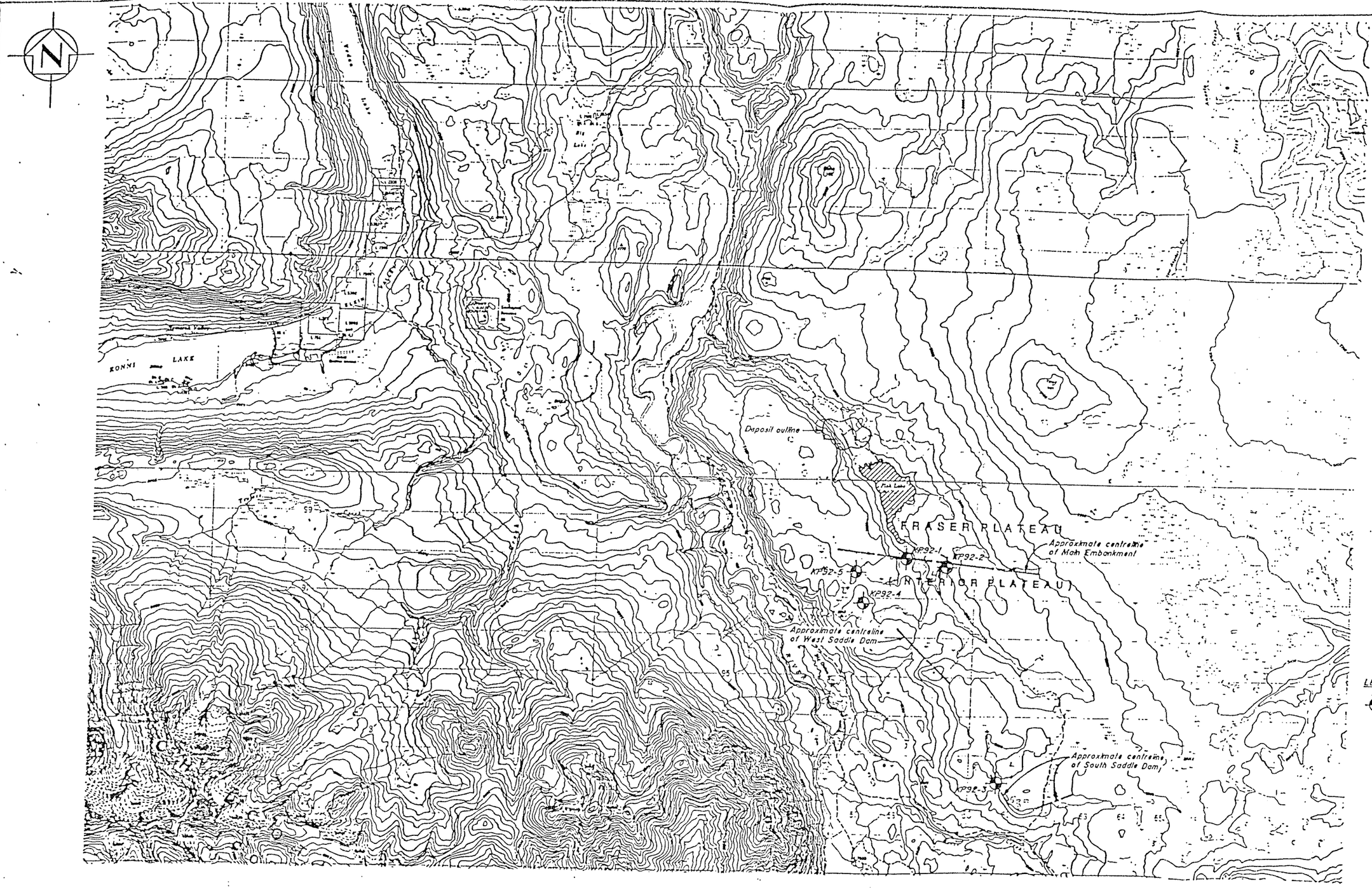
1733.A12

TASEKO MINES LIMITED
FISH LAKE PROJECT
PROJECT LOCATION MAP

Dec. 7, 1992

KNIGHT AND PIESOLD LTD.
CONSULTING ENGINEERS

FIGURE 1



Scale 1000 500 0 1000 2000 3000 4000 5000 m

DRG NO	DESCRIPTION
	REFERENCE DRAWINGS

REV	DATE	DESCRIPTION	APPROVED
		REVISIONS	

REV	DATE	DESCRIPTION	APPROVED
1	DEC. 1/92	REVISED DRILLHOLE LOCATIONS	
		REVISIONS	

KNIGHT AND PIESOLD LIMITED
CONSULTING ENGINEERS – VANCOUVER, B.C.

DESIGNED BSB
DRAWN RDT
CHECKED KDE
APPROVED

TASEKO MINES LTD.

FISH LAKE PROPERTY

TAILINGS STORAGE FACILITY
PRELIMINARY SITE INVESTIGATION
DRILLHOLE LOCATIONS

DATE SEPT. 25, 1992 | SCALE AS SHOWN | DRG NO 1733.001 | REV 1

APPENDIX A

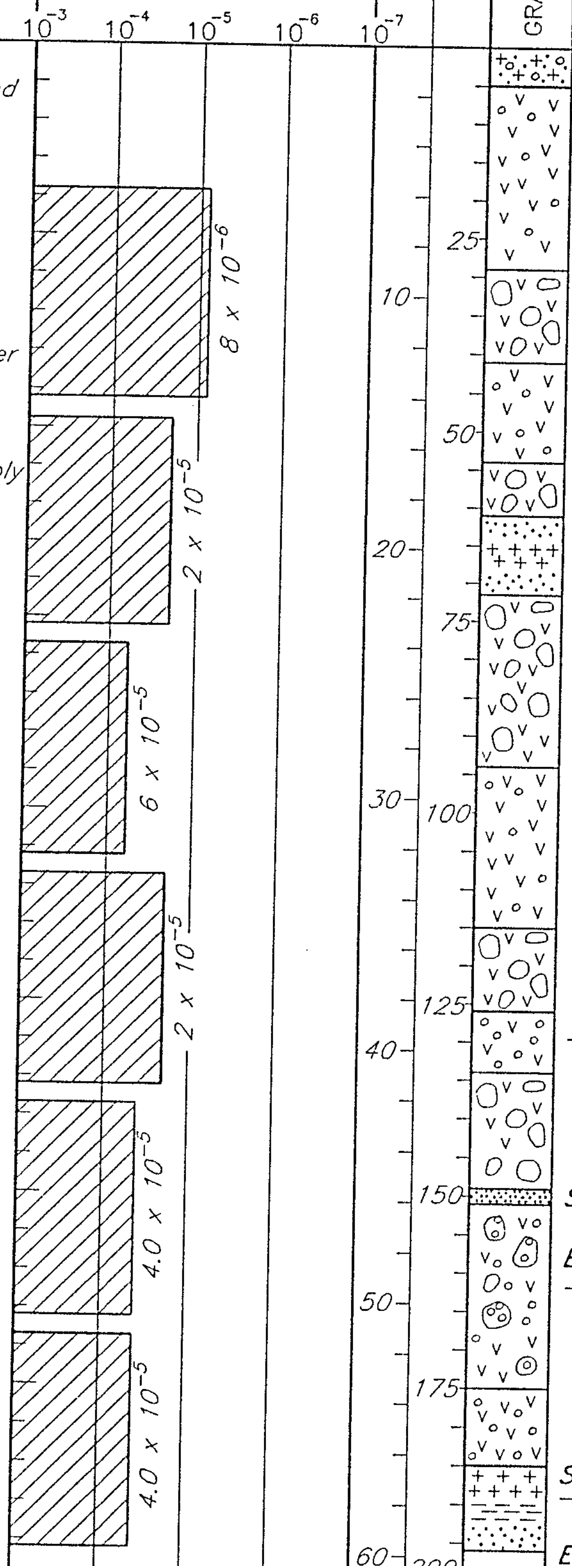
TEST HOLE LOGS

KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	TEST HOLE LOG	TEST HOLE No. *KP92-1* SHEET *1* of *1*

PROJECT *FISH LAKE*	PROJECT NO. *1733*
LOCATION OF TEST HOLE *Main Embankment*	GROUND EL. *4825 ft.*
DATE BEGUN *Oct. 12/92* DATE FINISHED *Oct. 13/92*	LOGGED BY *KDE*

NOTES — Water loss, type and size of hole, drilling method, groundwater level, etc.

PERMEABILITY cm/s — **DEPTH** (m) (ft.) — **GRAPHIC LOG** — **DESCRIPTION AND CLASSIFICATION OF MATERIAL**



Notes:

Heli-portable Val D'Or diamond drill

Set HW casing to 4 ft. Core overburden with EZ-Mud

Core with HQ at 4 ft., using water only.

Lose return at 17-20ft., probably open fracture.

Return up to collar, but going into ground, for entire hole.

Samples:
KP92-1-1@10ft.
KP92-1-2@34ft.
KP92-1-3@69ft.
KP92-1-4@159ft.
KP92-1-5@188ft.

Description and classification of material:

OVERBURDEN -Brownish SILT and SAND with some gravel and cobbles, trace clay. Glacial Till

BASALT
-Alternating sequences of dark, fine grained highly vesicular and vuggy basalt with sections of fine to medium grained, lighter grey, weakly vesicular basalt. Fine sections are more competent

SEDIMENTS
-Interbedded brown SILT and fine SAND with trace organics. Bedding approx. perpendicular to core axis. Debris flow from 63'-68.5'

BASALT
-as above, with sections of flow top breccia

-15cm Mudstone seam at 129 ft.

SEDIMENTS -SILTY SAND with some GRAVEL, brown dense

BASALT
-Flow top breccia, highly vesicular, chloritic

SEDIMENTS
-Green, overconsolidated silt/mudstone with some sandy sections. No bedding evident

END OF HOLE 196 ft.

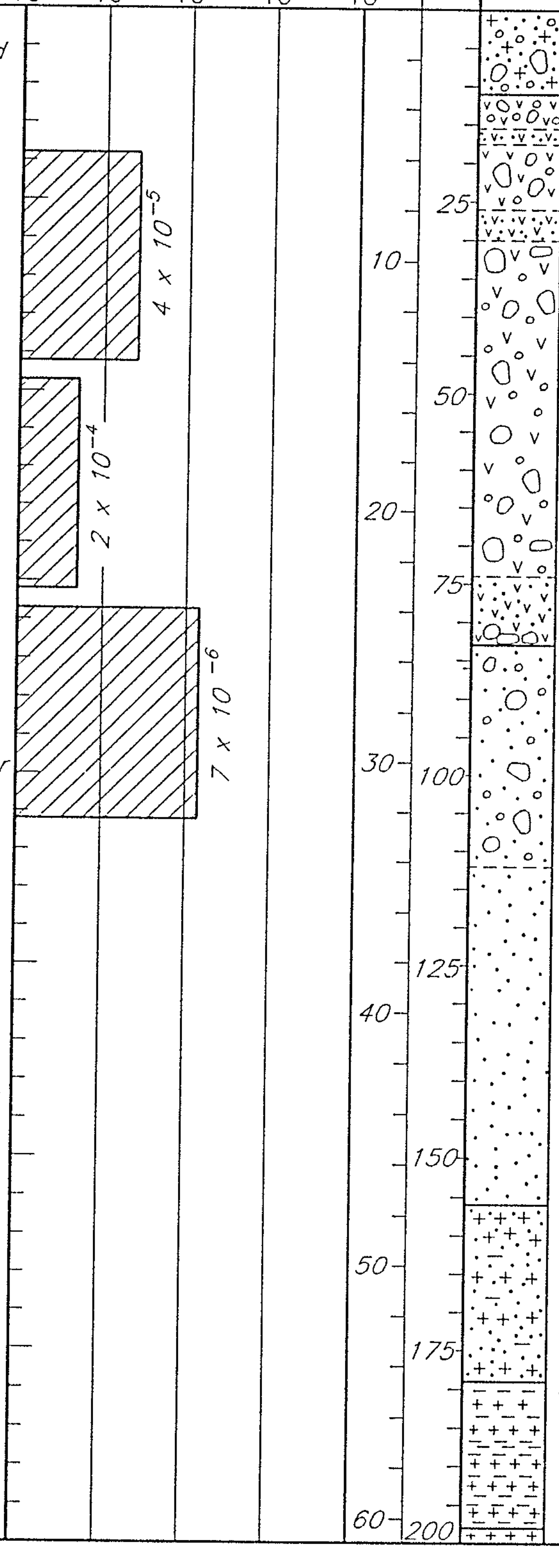
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. *KP92-2*
SHEET *1* of *2*

PROJECT *FISH LAKE*	PROJECT NO. *1733*
LOCATION OF TEST HOLE *Main Embankment*	GROUND EL. *4900 ft.*
DATE BEGUN *Oct. 13/92* DATE FINISHED *Oct. 15/92*	LOGGED BY *KDE*

NOTES (Water loss, type and size of hole, drilling method, groundwater level, etc.)	PERMEABILITY cm/s	DEPTH (m) (ft.)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Heli-portable Val D'Or diamond drill				*OVERBURDEN* –Brown SILT and SAND with some gravel and cobbles, occasional boulder, trace clay. Glacial till.
Set HW casing to 4.5 ft. Core overburden with EZ-Mud				*BASALT* –Alternating sequences of dark grey fine grained, highly vesicular and vuggy basalt with sections of fine to medium grained, lighter grey, weakly vesicular basalt. Fine sections are generally narrow, more competent
Core basalt with water only	4×10^{-5}			
	2×10^{-4}			
First 2 ft. of sedimentary sequence cored	7×10^{-6}			*SEDIMENTARY SEQUENCE* –Top of sequence is brownish red SILTY SAND with sub-rounded to sub-angular heterolithic GRAVEL fragments
Hole sanding in badly after packer test from 78.5– to 106 ft.				
Only gravel recovered from 86–112 ft.				
Small sand seam recovered 95.5–96 ft.				–SAND, no recovery
Zero recovery from 112–156 ft.				
				–Pale brownish to brownish green SILT to SANDY SILTSTONE. Very dense, stratified with drill induced breaks approx. perpendicular to core axis. Thin sequences of SILT/SAND + CLAY are evident
				–Dark grey green SILT to CLAYEY SILT Very dense, laminated as above (Mudstone). Drill breaks along bedding planes perpendicular to core axis



KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. KP92-2
SHEET 2 of 2

PROJECT FISH LAKE
LOCATION OF TEST HOLE Main Embankment
DATE BEGUN Oct. 13/92 DATE FINISHED Oct. 15/92

PROJECT NO. 1733
GROUND EL. 4900 ft.
LOGGED BY KDE

NOTES	PERMEABILITY	DEPTH		GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Water loss, type and size of hole, drilling method, groundwater level, etc.	cm/s 10^{-3} 10^{-4} 10^{-5} 10^{-6} 10^{-7}	(m)	(ft.)		
			225		–Brownish grey SILTY CLAY to CLAYEY SILT (MUDSTONE). Unit becoming increasingly dense with depth. Finely laminated (varves) with bedding planes approximately perpendicular to core axis. Breaks along bedding planes are drill induced.
		70			END OF HOLE 226 ft.
			250		
		80			
			275		
		90			
			300		
		100			
			325		
			350		
		110			
			375		
		120			
			400		

Samples:
KP92-2-1@8ft.
KP92-2-2@86ft.
KP92-2-3@166ft.
KP92-2-4@184ft.
KP92-2-5@196ft.
KP92-2-6@218ft.

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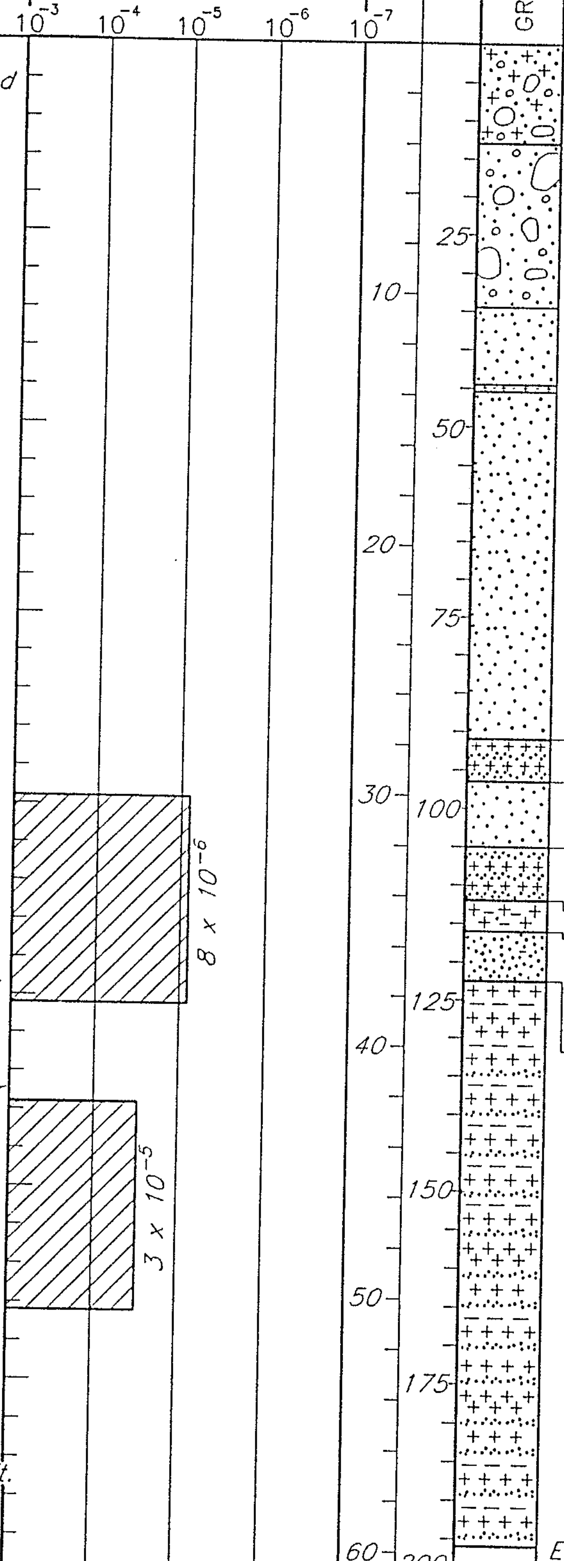
TEST HOLE LOG

TEST HOLE No. KP92-3
SHEET 1 of 1

PROJECT: FISH LAKE
LOCATION OF TEST HOLE: South Saddle Dam
DATE BEGUN: OCT. 15/92 DATE FINISHED: OCT. 17/92
PROJECT NO. 1733
GROUND EL. 5175 ft.
LOGGED BY KDE

NOTES Water loss, type and size of hole, drilling method, groundwater level, etc.	PERMEABILITY cm/s	DEPTH (m) (ft.)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL



Notes:

Heli-portable Val D'Or diamond drill

Set HW casing to 4.5 ft. with EZ-Mud

Core HQ from 4.5 ft. to 196' with water only

No geotechnical logging for RQD. All breaks drill induced on bedding planes perpendicular to core axis, recovery generally 100%

Hole making water for a short time 176-186 ft. Stopped after 5 minutes.

Samples:
KP92-3-1@7ft.
KP92-3-2@23ft.
KP92-3-3@44ft.
KP92-3-4@65ft.
KP92-3-5@95ft.
KP92-3-6@108ft.
KP92-3-7@120.5ft.
KP92-3-8@147ft.
KP92-3-9@196ft.

Description and Classification of Material:

OVERBURDEN
Brown SILT and SAND with GRAVEL, some COBBLES, occasional BOULDER. Glacial till.

SEDIMENTARY SEQUENCE
Grey SAND with GRAVEL and COBBLES, generally sub-rounded.

Greyish brown fine to medium grained SAND Medium dense

1 cm CLAYEY SILT, pale beige color

Pale greenish grey brown fine to medium grained SAND, stratified with bedding approx. perpendicular to core axis

Interbedded fine SAND and SILT. Pale brown to yellowish brown. Dense, bedding approx. perpendicular to core axis:

Fine to medium grained SAND, as above.

Interbedded SILT and fine SAND

Brown grey CLAYEY SILT with trace of fine SAND

Fine to medium grained SAND, brownish yellow with some highly oxidized sections. Trace of SILT/CLAY

Grey brown interbedded SILT and FINE SAND with CLAY. Highly stratified (varved) with layers typically 1-5mm thick. Numerous drill breaks on bedding planes perpendicular to core axis. Density and strength increasing with depth.

END OF HOLE 196 ft.

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TEST HOLE LOG

TEST HOLE No. KP92-4
SHEET 1 of 1

PROJECT FISH LAKE
LOCATION OF TEST HOLE West Saddle Dam
DATE BEGUN Oct. 17/92 DATE FINISHED Oct. 18/92

PROJECT NO. 1733
GROUND EL. 5075 ft.
LOGGED BY KDE

NOTES	PERMEABILITY cm/s	DEPTH (m)	DEPTH (ft.)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Set HW casing to 2ft. Core HQ 2ft. to 196 ft. with water only					**BASALT** –Dark grey, fine to medium grained, weakly vesicular, strong and competent.
Recovery in basalt generally 100%	3×10^{-6}	10	25		
			50		
	4×10^{-7}	20	75		Broken zone healed by mud 72–72.5ft.
Recovery in coarse sediments generally limited to gravel and cobbles.	4×10^{-6}	30	100		**SEDIMENTS** –COBBLES and GRAVEL with sand. Only minor sand recovered. Cobbles and gravel generally subrounded to subangular, heterolithic.
		40	125		**BASALT** –Flow top breccia. Heterolithic rounded fragments in Basalt matrix, Sections are highly chloritized.
	9×10^{-7}				**BASALT** –Dark grey fine to medium grained, weakly vesicular, strong and competent
			150		**SEDIMENTS** –COBBLES and GRAVEL with greenish SAND chloritized.
Zero recovery from 189.5 ft.	2×10^{-6}	50			–Green SAND with some SILT.
			175		–Green SAND with some GRAVEL and COBBLES, trace SILT. Cobbles and gravel are heterolithic including vuggy basalt. Dense, cemented.
Samples: KP92-4-1@10ft. KP92-4-2@118ft. KP92-4-3@132ft. KP92-4-4@165ft. KP92-4-5@179ft.		60	200		**BASALT** – Flow top Breccia COBBLES and GRAVEL, as above 152–164 ft. END OF HOLE 196 ft.

CAD FILE: \CAD\FIG\A10 Plot scale 1=1

KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

TEST HOLE LOG

TEST HOLE No. KP92-5
SHEET 1 of 1

PROJECT FISH LAKE
LOCATION OF TEST HOLE West Saddle Dam
DATE BEGUN Oct. 18/92 DATE FINISHED Oct. 19/92

PROJECT NO. 1733
GROUND EL. 5000 ft.
LOGGED BY KDE

NOTES	PERMEABILITY cm/s	DEPTH (m)	DEPTH (ft.)	GRAPHIC LOG	DESCRIPTION AND CLASSIFICATION OF MATERIAL
Heli-portable Val D'Or diamond drill HW casing to 4' Core HQ to 110' Use EZ-Mud for entire hole because of bad caving, squeezing.	10^{-3} 10^{-4} 10^{-5} 10^{-6} 10^{-7} 2×10^{-4}	10 20 30 40 50 60	25 50 75 100 125 150 175 200		**BASALT** –Dark grey, fine to medium grained, strong, weakly vesicular. **SEDIMENTS** –COBBLES and GRAVEL with SAND, some SILT Brown to red color. Heterolithic. **BASALT** –Dark grey, fine to medium grained, strong, weakly vesicular. **BASALT** – Dark grey–green broken (brecciated), chloritized vuggy/highly vesicular. **BASALT** – Dark green–grey slightly vesicular, fine to medium grained. Similar to 0'–21' but slightly chloritized. **BASALT** –Dark grey, fine to medium grained, strong, weakly vesicular. END OF HOLE 111 ft.
Hole lost at 111' due to caving at sandy zone (53') Hole not properly flushed prior to installation of monitoring well					
Samples: KP92-5-1@6ft. KP92-5-2@37ft. KP92-5-3@77ft. KP92-5-4@98ft. KP92-5-5@102ft.					

Plot s... CADV...

APPENDIX B

GEOTECHNICAL DRILLING BEDROCK LOGS

Knight Piesold Ltd.
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GEOTECHNICAL DRILLING BEDROCK LOG

PROJECT No. 1733
SHEET 1 of 4

PROJECT FISH LAKE
DATE OCT. 13, 1992
LOGGED BY KDE

HOLE No. KP92-1
CORE SIZE HQ
CONTRACTOR QUEST

TOTAL DEPTH 196 ft
COORDINATES: N
E

REF. EL. 4825 ft (collar)
BEARING
DIP -90

file: u:\user\kde\1733\corelog\kp921.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 10 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
5.0	Approx. 50%	–	–	–	–	OVERBURDEN – brown to brownish-red SILT and SAND with GRAVEL and COBBLES, occasional BOULDER. No fines recovered.		–	–	–	
7.0	75%	0%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, (vesicles to 1mm).			50 40	1	Joints are planar to irregular, rough, 1-2 mm aperture, with muddy clay infilling
12.0	100%	75%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, (vesicles to 1mm). As above.			60-70 80	2	Joints as above. Occasional mud seam to 1 cm.
16.0	75%	50%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, (vesicles to 1mm). As above.			80 70	1	Joints are planar, smooth to rough, with muddy clay infilling, as above.
21.0	100%	68%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, (vesicles to 1mm). As above.			80 15	1-2	Joints are planar, smooth to rough, with muddy clay infilling, as above.
26.0	100%	83%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, (vesicles to 1mm). As above.			50 70	1-2	Joints are planar, smooth to rough, with muddy clay infilling, as above.
31.0	100%	0%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, to 29. From 29, vuggy highly vesicular, fine grained, black, weak.			15	3	Joints are planar, smooth to rough, with muddy clay infilling, as above. Mud seam at contact.
36.0	100%	68%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak, as above.			60	1-2	Rough planar to irregular joints with talcy clay infilling. Numerous irregular drill induced breaks in vesicular basalt.
41.0	100%	75%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak, as above.			65	1-2	Rough planar to irregular joints with talcy clay infilling. Numerous irregular drill induced breaks as above.
46.0	100%	7%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, (vesicles to 1mm).			70 10-20	2	Joint at 10-20 is curved, planar with smooth chloritic infilling. Other joints as above.
51.0	100%	50%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, (vesicles to 1mm). As above.			10-15 70	1-2	Joint at 10-15 is curved, planar with smooth chloritic infilling. Other joints as above.
56.0	100%	100%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent, to 54. From 54, vuggy highly vesicular, fine grained, black, weak.			70	1-2	Rough planar joint at 70, aperture to 2mm, occasional slickensided surface talcy caly infilling.

Knight Piésold Ltd.

CONSULTING ENGINEERS

GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733

SHEET 2 of 4

PROJECT FISH LAKE
DATE OCT. 13, 1992
LOGGED BY KDE

HOLE No. KP92-1
CORE SIZE HQ
CONTRACTOR QUEST

TOTAL DEPTH 196 ft
COORDINATES: N
E

REF. EL. 4825 ft (collar)
BEARING
DIP -90

file: u:\user\kde\1733\corelog\kp921.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm)	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
61.0	95%	53%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak, as above.			15	1-2	Rough planar to irregular joints with talcy clay infilling. Numerous irregular drill induced breaks in vesicular basalt.
66.0	100%	35%	–	R2	–	SEDIMENTS – Interbedded SILT and SAND.			80-90	2	Random breaks along bedding planes in SEDIMENTS. Occasional irregular break in coarser sections.
71.0	93%	88%	–	R2	SW	SEDIMENTS – Interbedded SILT and SAND, as above.			80-90	1	Random breaks along bedding planes in SEDIMENTS. Occasional irregular break in coarser sections.
76.0	50%	0%	–	R2/R3	SW	SEDIMENTS – Interbedded SILT and SAND, as above to 71.5. From 71.5 BASALT – Vuggy highly vesicular, fine grained, black, weak. Chlorite coatings on vesicles.			45	3-4	Joints are planar, rough with some gouge. Random irregular breaks in vuggy, vesicular sections.
81.0	67%	10%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak. Chlorite coatings on vesicles. As above.			10-15	3-4	Joints are planar, rough with some gouge. Random irregular breaks in vuggy, vesicular sections.
86.0	100%	93%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak. Chlorite coatings on vesicles. As above.			70	2	Joints are planar, rough with some gouge. Random irregular breaks in vuggy, vesicular sections.
91.0	100%	93%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak. Chlorite coatings to 94. From 94 BASALT – Weakly vesicular, fine to medium grained, dark grey, competent.			70	2	Joints are planar, rough with some gouge. Random irregular breaks in vuggy, vesicular sections.
96.0	100%	90%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent. As above.			45 60	1-2	Joints are planar, rough with some gouge. Random irregular breaks in vuggy, vesicular sections.
101.0	100%	80%	–	R3/R4	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent. As above.			25 20	1-2	Planar smooth joint with 1mm aperture and slightly polished surface. Continues curved, slickensided
106.0	100%	92%	–	R3/R4	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent. As above.			45 25	1-2	Planar, smooth to rough joints to 1mm with talcy infilling.
111.0	100%	60%	–	R3/R4	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent to 115. From 115, BASALT – Vuggy vesicular, fine grained, black, weak. Chlorite coatings.			60 30 80	1-2	Rough planar joints with talcy infilling.
116.0	100%	67%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak. Chlorite coatings on vesicles. As above.			65 30	1-2	Rough planar joints with talcy infilling as above.

Knight Piesold Ltd.
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GEOTECHNICAL DRILLING BEDROCK LOG

PROJECT No. 1733
SHEET 1 of 4

PROJECT FISH LAKE
DATE OCT. 15, 1992
LOGGED BY KDE
HOLE No. KP92-2
CORE SIZE HQ
CONTRACTOR QUEST
TOTAL DEPTH 226 ft
COORDINATES: N
E
REF. EL. 4900 ft (collar)
BEARING
DIP -90
file: u:\user\kde\1733\corelog\kp922.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 9 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
4.5	–	–	–	–	–	OVERBURDEN – No core recovered.					
8.0	Approx. 57%	–	–	–	–	OVERBURDEN – Brown SILT and SAND with some GRAVEL and COBBLES, trace CLAY. GLACIAL TILL.					
11.0	100%	–	–	–	–	OVERBURDEN – Brown SILT and SAND with some GRAVEL and COBBLES, trace CLAY. GLACIAL TILL. As above.					
16.0	92%	0%	–	R2	SW/MW	BASALT – Vuggy/vesicular, fine grained, brownish black to 15.5. From 15.5, weakly vesicular, fine to medium grained, dark grey, more competent.			45 70	5+	Rough planar joints to 2mm with oxidized/clay infilling. Numerous random drill induced breaks.
21.0	92%	0%	–	R2/R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, more competent to 17.5. From 17.5, vuggy/ vesicular, fine grained, black, weaker.			5-10 80	5+	Rough joints and drill breaks, as above.
26.0	100%	0%	–	R2/R3	SW	BASALT – Vuggy/vesicular, fine grained, black, weaker as above.			80 35	3-4	Rough joints and drill breaks, as above. Joint at 35 to 4mm, with clay, some crushed rock.
31.0	92%	62%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, more competent to 30. From 30, vuggy/vesicular, fine grained, black, weaker.			70-80	2	Rough joints and drill breaks, as above. Talcy infilling.
36.0	95%	0%	–	R3	SW	BASALT – Vuggy/vesicular, fine grained, black, weaker as above.			15-20	5+	Rough joints and drill breaks, as above.
41.0	100%	42%	–	R3	SW	BASALT – Vuggy/vesicular, fine grained, black, weaker as above.			15 80	3-5	Rough joints and drill breaks, as above.
46.0	100%	0%	–	R2/R3	SW	BASALT – Vuggy/vesicular, fine grained, black, weaker as above. Greenish/red color due to chloritic alteration.			10-15	5+	Joint at 10-15 is planar and polished. Numerous drill breaks, as above.
51.0	100%	0%	–	R2/R3	SW	BASALT – Vuggy/vesicular, fine grained, black, weaker as above. Greenish/red color due to chloritic alteration.			5-15 50 70-80	2-3	Rough joints and drill breaks, as above. Some chlorite healing.
56.0	100%	10%	–	R2/R3	SW	BASALT – Vuggy/vesicular, fine grained, black, weaker as above. Greenish/red color due to chloritic alteration.			30	2-3	Some brecciated sections. Rough joints and drill breaks, as above. Some chlorite healing.

Knight Piesold Ltd.

CONSULTING ENGINEERS

GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733

SHEET 3 of 4

PROJECT FISH LAKE | HOLE No. KP92-1 | TOTAL DEPTH 196 ft | REF. EL. 4825 ft (collar)

DATE OCT. 13, 1992 | CORE SIZE HQ | COORDINATES: N | BEARING | file:

LOGGED BY KDE | CONTRACTOR QUEST | E | DIP -90 | u:\user\kde\1733\corelog\kp921.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm)	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
121.0	100%	25%	–	R2/R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak. Chlorite coatings on vesicles. As above.			70 30	2	Joints as above, but planar and rough along with numerous irregular drill breaks in vuggy basalt.
126.0	100%	50%	–	R2/R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak. Chlorite coatings on vesicles. As above.			15 75-85	2-3	Joints as above, but planar and rough along with numerous irregular drill breaks in vuggy basalt.
131.0	100%	33%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak. Chlorite coatings on vesicles. As above. At 129, 15cm seam of green MUDSTONE.			25 50 75	1-2	Joints as above, contact with mud seam 75 to CA. Minor crushed rock and talc along joint surface.
136.0	100%	0%	–	R3	SW	BASALT – Vuggy highly vesicular, fine grained, black, weak as above to 134. From 134, BASALT – brecciated, dark green/black with chloritic groundmass.			0-5 75-85	3	Joints planar and rough to 1 mm with minor crushed rock, talc infilling. Numerous drill breaks in vuggy basalt.
141.0	100%	73%	–	R2	SW	BASALT – Brecciated, dark green/black with chloritic groundmass. As above.			?	2-3	Irregular breaks along planes of weakness in breccia.
146.0	100%	93%	–	R2/R3	SW	BASALT – Brecciated, dark green/black with chloritic groundmass. As above.			25 50	1	Irregular breaks along planes of weakness in breccia, as above.
151.0	100%	87%	–	R3	SW	BASALT – Brecciated, dark green/black with chloritic groundmass as above to 149. From 149, SEDIMENTS – interbedded SILT and SAND.			2 80	2	Irregular breaks along planes of weakness in breccia, as above.
156.0	95%	39%	–	R2/R3	SW	BASALT – Flow top breccia with basalt clasts in basaltic groundmass. Dark green/black.			20 70	2-3	Smooth planar joints with 1-3 mm aperture, containing, minor crushed rock and gouge.
161.0	100%	28%	–	R2/R3	SW	BASALT – Flow top breccia with basalt clasts in basaltic groundmass. Dark green/black.			60-70	2-3	Planar rough joints to 2 mm with crushed rock and gouge.
166.0	95%	32%	–	R2/R3	SW	BASALT – Flow top breccia with basalt clasts in basaltic groundmass. Dark green/black.			0	2-3	Planar, smooth to rough joint with crushed rock 20 to CA. Numerous irregular drill breaks.
171.0	100%	43%	–	R2/R3	SW	BASALT – Flow top breccia with basalt clasts in basaltic groundmass. Dark green/black.			45 80	3	Planar rough joints to 2 mm with crushed rock and gouge, as above.
176.0	95%	0%	–	R3	SW	BASALT – Flow top breccia with basalt clasts in basaltic groundmass to 175. From 175, BASALT – Weakly vesicular dark grey, competent with brecciated sections.			?	3	Irregular breaks along planes of weakness in breccia.

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GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733
SHEET 4 of 4

PROJECT FISH LAKE
DATE OCT. 13, 1992
LOGGED BY KDE
HOLE No. KP92-1
CORE SIZE HQ
CONTRACTOR QUEST
TOTAL DEPTH 196 ft
COORDINATES: N
E
REF. EL. 4825 ft (collar)
BEARING
DIP -90
file: u:\user\kde\1733\corelog\kp921.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 10 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
181.0	100%	52%	–	R3	SW	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent with chloritic breccisted sections as above.			?	3	Irregular breaks along planes of weakness in breccia.
186.0	95%	44%	70	R2/R3	–	BASALT – Weakly vesicular, fine to medium grained, dark grey, competent to 185. From 185 SEDIMENTS – green SILT and fine SAND (SILTSTONE).			70	3	Drill induced breaks in sediments. No natural defects evident.
191.0	95%	60%	70	R2	–	SEDIMENTS – green SILT and fine SAND (SILTSTONE).			30	3	Drill induced breaks in sediments. No natural defects evident. Weak jointing at 30 to core axis.
196.0	43%	10%	70	R2	–	SEDIMENTS – green SILT and fine SAND (SILTSTONE).			30	5+	Drill induced breaks in sediments. No natural defects evident. Weak jointing at 30 to core axis.
						END OF HOLE AT 196ft					

Knight Piesold Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733
SHEET 2 of 4

PROJECT FISH LAKE
DATE OCT. 15, 1992
LOGGED BY KDE
HOLE No. KP92-2
CORE SIZE HQ
CONTRACTOR QUEST
TOTAL DEPTH 226 ft
COORDINATES: N
E
REF. EL. 4900 ft (collar)
BEARING
DIP -90
file: u:\user\kde\1733\corelog\kp922.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 10 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
61.0	100%	0%	-	R2/R3	SW	BASALT - Vuggy/vesicular, fine grained, black, weaker as above. Oxide rich, red color due to alteration.			70	2	Some brecciated sections. Rough joints and drill breaks, as above. Some chlorite healing.
66.0	100%	30%	-	R3	SW	BASALT - Vuggy/vesicular, fine grained, as above. Oxide rich, red color due to alteration. Has 1.5 ft of weakly vesicular, fine to medium grained rock.			70	2	Some brecciated sections. Rough joints and drill breaks, as above. Some chlorite healing.
71.0	100%	0%	-	R2/R3	SW	BASALT - Vuggy/vesicular, fine grained, black, weaker as above. Greenish/red color due to chloritic alteration.			10-15 70	2-3	Some brecciated sections with rough, chlorite filled planar joints and random drill breaks, as above.
76.0	100%	35%	-	R3	SW	BASALT - Vuggy/vesicular, fine grained, as above. From 74, alternating sequences of vuggy/vesicular and more competent, fine to medium grained rock.			70	2	Some brecciated sections with rough, chlorite filled planar joints and random drill breaks, as above.
81.0	100%	68%	-	R3	SW	BASALT - Alternating sequences of vuggy/vesicular and more competent, fine to medium grained rock.			70	2	Rough planar joints to 2 mm with chlorite/carbonate infilling. Random drill breaks, as above.
86.0	100%	58%	-	R2	SW	BASALT - Alternating sequences of vuggy/vesicular and more competent, fine to medium grained rock to 83. At 83, SEDIMENTS - SILTY SAND with GRAVEL.			70	2	As above. Contact with sediments is rough, planar at 70 to core axis.
91.0	Approx. 33%	-	-	-	-	SEDIMENTS - SILTY SAND with GRAVEL, as above. Only gravel recovered.					No natural defects in sediments.
96.0	Approx. 50%	-	-	-	-	SEDIMENTS - SILTY SAND with GRAVEL, as above. Only gravel recovered.					No recovery.
101.0	Approx. 60%	-	-	-	-	SEDIMENTS - SILTY SAND with GRAVEL, as above. Only gravel recovered.					No recovery.
106.0	Approx. 60%	-	-	-	-	SEDIMENTS - SILTY SAND with GRAVEL, as above. Only gravel recovered.					No recovery.
111.0	Approx. 40%	-	-	-	-	SEDIMENTS - SILTY SAND with GRAVEL, as above. Only gravel recovered.					No recovery.
112.0	Approx. 25%	-	-	-	-	SEDIMENTS - SILTY SAND with GRAVEL, as above. Only gravel recovered.					No recovery.

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GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733
SHEET 3 of 4

PROJECT FISH LAKE
DATE OCT. 15, 1992
LOGGED BY KDE

HOLE No. KP92-2
CORE SIZE HQ
CONTRACTOR QUEST

TOTAL DEPTH 226 ft
COORDINATES: N
E

REF. EL. 4900 ft (collar)
BEARING
DIP -90

file:
u:\user\kde\1733\corelog\kp922.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 10 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
117.0	0%	-	-	-	-	Zero recovery. Most likely SAND from SEDIMENTS sequence washed away.					No recovery.
123.0	0%	-	-	-	-	As above. Zero recovery. Most likely SAND from SEDIMENTS sequence washed away.					No recovery.
128.0	0%	-	-	-	-	As above. Zero recovery. Most likely SAND from SEDIMENTS sequence washed away.					No recovery.
136.0	0%	-	-	-	-	As above. Zero recovery. Most likely SAND from SEDIMENTS sequence washed away.					No recovery.
141.0	0%	-	-	-	-	As above. Zero recovery. Most likely SAND from SEDIMENTS sequence washed away.					No recovery.
146.0	0%	-	-	-	-	As above. Zero recovery. Most likely SAND from SEDIMENTS sequence washed away.					No recovery.
151.0	0%	-	-	-	-	As above. Zero recovery. Most likely SAND from SEDIMENTS sequence washed away.					No recovery.
156.0	0%	-	-	-	-	As above. Zero recovery. Most likely SAND from SEDIMENTS sequence washed away.					No recovery.
164.0	Approx. 75%	-	90	-	-	SEDIMENTS-Brownish green SILT/SAND to weak SILTSTONE/SANDSTONE. Stratified, dense but breaks easily.					Drill induced breaks along bedding planes perrendicular to core axis. No natural defects.
166.0	Approx. 75%	-	90	-	-	SEDIMENTS-Brownish green SILT/SAND to weak SILTSTONE/SANDSTONE. Stratified, dense but breaks easily. As above.					Drill induced breaks along bedding planes perrendicular to core axis. No natural defects.
171.0	100%	-	90	-	-	SEDIMENTS-Brownish green SILT/SAND to weak SILTSTONE/SANDSTONE. Stratified, dense but breaks easily. As above.					Drill induced breaks along bedding planes. As above.
176.0	100%	-	90	-	-	SEDIMENTS-Brownish green SILT/SAND to weak SILTSTONE/SANDSTONE. Stratified, dense but breaks easily. As above.					Drill induced breaks along bedding planes. As above.

Knight Piesold Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733
SHEET 4 of 4

PROJECT FISH LAKE
DATE OCT. 15, 1992
LOGGED BY KDE
HOLE No. KP92-2
CORE SIZE HQ
CONTRACTOR QUEST
TOTAL DEPTH 226 ft
COORDINATES: N
E
REF. EL. 4900 ft (collar)
BEARING
DIP -90
file: u:\user\kde\1733\corelog\kp922.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) m c f vf	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
180.0	100%	–	90	–	–	SEDIMENTS – SILT/SAND as above to 179. From 179, fine SAND/SILT and trace CLAY. Finely laminated MUDSTONE/SILTSTONE (varved).					Drill induced breaks along bedding planes. As above.
185.0	100%	–	90	–	–	SEDIMENTS – Fine SAND/SILT and trace CLAY. Finely laminated MUDSTONE/SILTSTONE (varved). As above.					Drill induced breaks along bedding planes. As above.
191.0	100%	–	90	–	–	SEDIMENTS – Fine SAND/SILT and trace CLAY. Finely laminated MUDSTONE/SILTSTONE (varved). As above.					Drill induced breaks along bedding planes. As above.
198.0	Approx. 75%	–	90	–	–	SEDIMENTS – Fine SAND/SILT and trace CLAY. Finely laminated MUDSTONE/SILTSTONE (varved). As above.					Drill induced breaks along bedding planes. As above.
216.0	Approx. 90%	–	90	–	–	SEDIMENTS – Fine SAND/SILT and trace CLAY. Finely laminated MUDSTONE/SILTSTONE (varved). As above.					Drill induced breaks along bedding planes. As above.
221.0	100%	–	90	–	–	SEDIMENTS – Fine SAND/SILT and trace CLAY. Finely laminated MUDSTONE/SILTSTONE (varved). As above.					Drill induced breaks along bedding planes. As above.
226.0	100%	–	90	–	–	SEDIMENTS – Fine SAND/SILT and trace CLAY. Finely laminated MUDSTONE/SILTSTONE (varved). As above.					Drill induced breaks along bedding planes. As above.
						END OF HOLE AT 226 ft.					

Knight Piesold Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733
SHEET 1 of 4

PROJECT FISH LAKE
DATE OCT. 18, 1992
LOGGED BY KDE

HOLE No. KP92-4
CORE SIZE HQ
CONTRACTOR QUEST

TOTAL DEPTH 196 ft
COORDINATES: N
E

REF. EL. 5075 ft (collar)
BEARING
DIP -90

file:
u:\user\kde\1733\corelog\kp924.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 9 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
2.0	Approx. 75%	0%	–	R2/R3	SW	BASALT–Massive, dark grey, fine to medium grained, weakly vesicular, competent.			–	–	JOINTS – planar to irregular, rough to smooth, 1–2mm with talcy slightly oxidized surfaces.
5.0	100%	0%	–	R3	SW	BASALT – Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30 50	2–3	JOINTS – planar to irregular, rough to smooth, as above.
10.0	100%	63%	–	R3	SW	BASALT–Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			10 30 50	1–2	JOINTS – planar to irregular, rough to smooth, as above. Not oxidized.
15.0	100%	68%	–	R3	SW	BASALT – Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			0–10 60	1–2	JOINTS – as above. Low angle joints are curved, rough to smooth.
16.0	100%	0%	–	R3	SW	BASALT–Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30	1	JOINTS – planar to irregular, rough to smooth, as above.
21.0	100%	90%	–	R3	SW	BASALT – Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			20 70	1	JOINTS – planar to irregular, rough to smooth, as above.
26.0	100%	28%	–	R3	SW	BASALT–Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			0–5 30	1–2	JOINTS – planar to irregular, rough to smooth, as above.
31.0	100%	75%	–	R3	SW	BASALT – Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			0–5 60 30	1	JOINTS – planar to irregular, rough to smooth, as above.
36.0	100%	43%	–	R3	SW	BASALT–Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			0–5 70	2	JOINTS – planar to irregular, rough to smooth, as above.
41.0	100%	80%	–	R3		BASALT – Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			0–5 30 70	1–2	JOINTS – planar to irregular, rough to smooth, as above.
46.0	100%	80%	–	R3		BASALT – Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30 70	1	JOINTS – planar to irregular, rough to smooth, as above.
51.0	100%	75%	–	R3		BASALT – Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			15 30 70	1	JOINTS – planar to irregular, rough to smooth, as above.

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CONSULTING ENGINEERS

GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733

PROJECT	FISH LAKE	HOLE No.	KP92-4	TOTAL DEPTH	196 ft	REF. EL.	5075 ft (collar)
DATE	OCT. 18, 1992	CORE SIZE	HQ	COORDINATES:	N	BEARING	file:
LOGGED BY	KDE	CONTRACTOR	QUEST		E	DIP	-90 u:\user\kde\1733\corelog\kp924.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 10 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
56.0	100%	62%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			0-10 30 70	1	JOINTS - planar to irregular, rough to smooth, as above.
61.0	100%	93%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30	1	JOINTS - planar to irregular, rough to smooth, as above.
66.0	100%	52%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30 20	1	JOINTS - as above, 1 - 3mm with minor crushed rock, slightly oxidized.
71.0	100%	63%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			10 30 70	1	JOINTS - as above, 1 - 3mm with minor crushed rock, slightly oxidized.
74.0	100%	44%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30 70	1 - 2	JOINTS - as above. Brecciated mud seam at 30 to core axis.
79.0	100%	100%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30 15 70	1	JOINTS - planar to irregular, rough to smooth, as above.
86.0	100%	89%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30 15 70	1 - 2	JOINTS - planar to irregular, rough to smooth, as above.
91.0	100%	63%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			0 - 5 30 70	1	JOINTS - planar to irregular, rough to smooth, as above.
96.0	100%	85%	-	R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above.			30 70	2 - 3	JOINTS - planar to irregular, rough to smooth, as above.
100.5	90%	-	-	R2		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above to 96.5. From 96.5, SEDIMENTS - COBBLES with GRAVEL and SAND.			-	-	No defects. Only cobbles and gravel recovered.
103.0	50%	-	-	-		SEDIMENTS - COBBLES with GRAVEL and some SAND. Little sand recovered.			-	-	No defects. Only cobbles and gravel recovered.
105.0	90%	-	-	-		SEDIMENTS - COBBLES with GRAVEL and some SAND. Little sand recovered. As above.			-	-	No defects. Only cobbles and gravel recovered.

Knight Piesold Ltd. CONSULTING ENGINEERS	GEOTECHNICAL DRILLING BEDROCK LOG	PROJECT No. 1733 SHEET 3 of 4

PROJECT FISH LAKE | HOLE No. KP92-4 | TOTAL DEPTH 196 ft | REF. EL. 5075 ft (collar)
DATE OCT. 18, 1992 | CORE SIZE HQ | COORDINATES: N | BEARING | file:
LOGGED BY KDE | CONTRACTOR QUEST | E | DIP -90 | u:\user\kde\1733\corelog\kp924.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 9 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
116.0	Approx. 80%	-	-	-		SEDIMENTS - COBBLES with GRAVEL and some SAND. Little sand recovered. As above.			-	-	No defects. Only cobbles and gravel recovered.
120.5	Approx. 100%	-	-	-		SEDIMENTS - COBBLES with GRAVEL and some SAND. Little sand recovered. As above.			-	-	No defects. Only cobbles and gravel recovered.
126.0	100%	17%	-	R2		SEDIMENTS - COBBLES with GRAVEL and some SAND. As above to 121. From 121 - BASALT. Flow top breccia, with chloritic alteration, green/black color.			15	1-3	JOINTS - planar to irregular, rough to smooth, as above.
131.0	95%	73%	-	R2		BASALT - Flow top breccia, as above.			-	1-2	Random drill breaks on weaknesses.
136.0	93%	85%	-	R2		BASALT - Flow top breccia, as above.			15	1-2	JOINTS - as above. Random drill breaks on weaknesses.
141.0	100%	75%	-	R2/R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent. As above 0 to 96.			15	1	10mm Chlotite veinlet planar, rough.
146.0	100%	100%	-	R2/R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent.			50 70	1-2	JOINTS - Planar, rough, 1-2mm with chlorite/carbonate infilling.'
151.0	100%	100%	-	R2/R3		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent.			15 60	1	JOINTS - Planar, rough, 1-2mm with chlorite/carbonate infilling.'
156.0	75%	-	-	R1		BASALT - Massive, dark grey, fine to medium grained, weakly vesicular, competent to 152. From 152, SEDIMENTS - green SAND with GRAVEL and COBBLES.			-	-	Random drill breaks on weaknesses and bedding planes.
161.0	42%	0%	-	R1/R2		SEDIMENTS - green SAND with GRAVEL and COBBLES as above.			-	-	Random drill breaks on weaknesses and bedding planes, as above.
166.0	67%	28%	90	R1/R2		SEDIMENTS - green SAND with GRAVEL and COBBLES as above to 164. From 164, dense, green SAND.			-	-	Random drill breaks on weaknesses and bedding planes, as above.
172.0	81%	24%	90	R1/R2		SEDIMENTS - Dense green SAND as above to 167. From 167, green SAND with GRAVEL and COBBLES.			-	-	Random drill breaks on weaknesses and bedding planes, as above.

Knight Piesold Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733
SHEET 4 of 4

PROJECT FISH LAKE
DATE OCT. 18, 1992
LOGGED BY KDE
HOLE No. KP92-4
CORE SIZE HQ
CONTRACTOR QUEST
TOTAL DEPTH 196 ft
COORDINATES: N
E
REF. EL. 5075 ft (collar)
BEARING
DIP -90
file: u:\user\kde\1733\corelog\kp924.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 to 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
177.0	100%	18%	-	R2		SEDIMENTS - green SAND with GRAVEL and COBBLES as above.			-	2-4	Random drill breaks on weaknesses and bedding planes, as above.
182.5	100%	48%	-	R2/R3		SEDIMENTS - green SAND with GRAVEL and COBBLES, as above.			-	2	Random drill breaks on weaknesses and bedding planes, as above.
189.5	85%	57%	-	R2/R3		SEDIMENTS - green SAND with GRAVEL and COBBLES, as above to 183.5. From 183.5, BASALT - Flow top breccia as above 121 to 126.			-	1-2	Random drill breaks on weaknesses and bedding planes, as above.
193.0	31%	0%	-	R1		BASALT - Flow top breccia, as above. Some COBBLES GRAVEL recovered (SEDIMENTS?).			-	-	Random drill breaks on weaknesses and bedding planes, as above.
196.0	0%	0%	-	-		No core recovered.			-	-	No core recovered.
						END OF HOLE AT 196ft					

Knight Piesold Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING BEDROCK LOG

PROJECT No. 1733
SHEET 1 of 2

PROJECT FISH LAKE
DATE OCT. 19, 1992
LOGGED BY KDE
HOLE No. KP92-5
CORE SIZE HQ
CONTRACTOR QUEST
TOTAL DEPTH 111 ft
COORDINATES: N
E
REF. EL. 5000 ft (collar)
BEARING
DIP -90
file: u:\user\kde\1733\corelog\kp925.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 10 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
4.0	100%	Approx. 75%	–	R3/R4	SW	BASALT–Weakly vesicular, fine to medium grained, dark grey, massive, more competent.			40 70	1–2	Rough, planar joints, slighlty oxidized, 1–2 mm aperture.
10.0	100%	26%	–	R3/R4	SW	BASALT–Weakly vesicular, fine to medium grained, dark grey, massive, more competent, as above.			70 40 0–5	2–3	Joints as above. Joint at 0–5 is curved, 1–3 mm aperture.
16.0	100%	40%	–	R3/R4	SW	BASALT–Weakly vesicular, fine to medium grained, dark grey, massive, more competent, as above.			5–10 40 70	2	Joints as above.
21.0	80%	20%	–	R3	SW	BASALT–Weakly vesicular, fine to medium grained, dark grey, massive, more competent, as above.			0–10 70	3	Joints as above. Surfaces are talcy (clay minerals).
28.0	Approx. 85%	–	–	–	–	SEDIMENTS–COBBLES and GRAVEL (heterolithic) with SAND, some SILT. Slightly rusty brown.			–	–	No joints. Random breaks along weaknesses at gravel, cobbles.
34.0	Approx. 70%	–	–	–	–	SEDIMENTS–COBBLES and GRAVEL (heterolithic) with SAND, some SILT. Slightly rusty brown. As above.			–	–	No joints. Random breaks along weaknesses at gravel, cobbles. As above.
38.0	100%	–	–	–	–	SEDIMENTS–COBBLES and GRAVEL (heterolithic) with SAND, some SILT. Slightly rusty brown. As above.			–	–	No joints. Random breaks along weaknesses at gravel, cobbles. As above.
46.0	Approx. 70%	–	–	–	–	SEDIMENTS–COBBLES and GRAVEL (heterolithic) with SAND, some SILT. Slightly rusty brown. As above.			–	–	No joints. Random breaks along weaknesses at gravel, cobbles. As above.
53.0	Approx. 95%	–	–	–	–	SEDIMENTS–COBBLES and GRAVEL (heterolithic) with SAND, some SILT. Slightly rusty brown. As above.			–	–	No joints. Random breaks along weaknesses at gravel, cobbles. As above.
58.0	Approx. 60%	–	–	–	–	SEDIMENTS–COBBLES and GRAVEL (heterolithic) with SAND, some SILT. Slightly rusty brown. As above.			–	–	No joints. Random breaks along weaknesses at gravel, cobbles. As above.
62.0	Approx. 80%	–	–	–	–	SEDIMENTS–COBBLES and GRAVEL (heterolithic) with SAND, some SILT. Slightly rusty brown. As above.			–	–	No joints. Random breaks along weaknesses at gravel, cobbles. As above.
66.0	75%	43%		R3	SW	BASALT–Weakly vesicular, fine to medium grained, dark grey, massive, more competent, as above.			30	2–3	Rough planar joints with oxidized infilling, 1–2 mm aperture.

Knight Piesold Ltd.
CONSULTING ENGINEERS

GEOTECHNICAL DRILLING
BEDROCK LOG

PROJECT No. 1733
SHEET 2 of 2

PROJECT FISH LAKE
DATE OCT. 19, 1992
LOGGED BY KDE
HOLE No. KP92-5
CORE SIZE HQ
CONTRACTOR QUEST
TOTAL DEPTH 111 ft
COORDINATES: N
E
REF. EL. 5000 ft (collar)
BEARING
DIP -90
file: u:\user\kde\1733\corelog\kp925.wk3

DRILLING INFORMATION			ROCK DESCRIPTION				ROCK MASS DEFECTS				
Depth (ft)	Core Recovery	RQD	Foliation /Bedding	Hard-ness	Weather-ing	Structure, color, grain size, strength, rocktype. Other comments.	Spacing (cm) 3 10 30 100	Graphic Log	Orienta-tion	Freque-ncy (per ft)	Type, shape, roughness, infilling.
71.0	100%	22%		R2		BASALT - Weakly vesicular, fine to medium grained, dark grey, more competent, as above to 67.5. From 67.5, chloritized green/black, highly vuggy and vesicular.			30 50	4-5	Joints as above. Numerous drill breaks in weaker vesicular material.
76.0	100%	Approx. 25%		R2/R3		BASALT - Chloritized green/black, highly vuggy and vesicular, as above.			10-15 35	2-3	Joints as above. Numerous drill breaks on weaknesses, as above.
81.0	Approx. 85%	63%		R2		BASALT - Chloritized green/black, highly vuggy and vesicular, as above.			10	1-2	Joints as above. Chlorite infilling. Numerous drill breaks on weaknesses. As above.
86.0	100%	Approx. 50%		R2/R3		BASALT - Chloritized green/black, highly vuggy and vesicular to 85. From 85, weakly vesicular, fine to medium grained dark grey, more competent.			70	2-4	Joints as above. Chlorite infilling. As above, chloritized seam to 15 mm at 70 to core axis.
91.0	100%	95%		R3		BASALT - Weakly vesicular, fine to medium grained, dark grey, massive, more competent, as above.			15	1	Joints as above. Chlorite infilling. Numerous drill breaks on weaknesses. As above.
96.0	100%	Approx. 80%		R2/R3		BASALT - Weakly vesicular, fine to medium grained, dark grey, massive, more competent, as above. More vesicular with chlorite alteration and veinlets.			70	1	Joints as above. Chlorite infilling. Numerous drill breaks on weaknesses. As above.
101.0	100%	83%		R3		BASALT - Weakly vesicular, fine to medium grained, dark grey, massive, more competent. More vesicular with chlorite alteration and veinlets, as above.			20-25	1	Joints as above. Chlorite infilling. Chlorite veinlets to 2 cm at 20-25 to core axis.
106.0	100%	Approx. 100%		R3		BASALT - Weakly vesicular, fine to medium grained, dark grey, massive, more competent.			20-30	1	Joints, rough planar, 1-2 mm aperture with minor clay (talc?) infilling
111.0	Approx. 50%	Approx. 100%		R3		BASALT - Weakly vesicular, fine to medium grained, dark grey, massive, more competent. As above. (core most likely left in hole).			20-25	1	Joints, rough planar, 1-2 mm aperture with minor clay (talc?) infilling. As above.
						END OF HOLE AT 111 ft.					

APPENDIX C

RESULTS OF IN-SITU PERMEABILITY TESTING

PACKER TESTING CALCULATION SHEET

PROJECT: FISH LAKE (1733)
LOCATION: MAIN EMBANKMENT
HOLE No: KP92-1
TEST DATE: OCTOBER 11, 1992
COORDS(m) N: E:
REF. ELEV.(m)

HOLE DIAMETER (inches): HQ 3.782
DEPTH TO GDW TABLE BELOW PRESSURE GAUGE (ft): 10.5
BEDROCK DEPTH(ft): 0
TESTED BY: KDE/GRG
ANGLE FROM VERTICAL (deg): 0
HEIGHT OF PRESSURE GAUGE ABOVE GROUND(ft): 2.5

TEST	DEPTH INTERVAL (ft)		FLOW METER (USgal)		ELAPSED TIME	FLOW RATE	GAUGE PRESSURE	HEAD CORR'N	TEST HEAD	PERMEABILITY (cm/sec)	COMMENTS
	from	to	init	final	(min)	(Igpm)	(psi)	(ft)	(ft)		
1	19.0	46.0	18.50	19.19	5	0.115	15.0	0.0	45.1	6.3E-06	
1	19.0	46.0	19.30	20.09	5	0.132	20.0	0.0	56.7	5.7E-06	ALTERNATING SECTIONS
1	19.0	46.0	20.30	22.05	5	0.292	25.0	0.0	68.2	1.1E-05	OF VUGGY AND
1	19.0	46.0	22.15	23.25	5	0.183	17.0	0.0	49.8	9.1E-06	COMPETENT BASALT
1	19.0	46.0	23.45	24.08	5	0.105	10.0	0.0	33.6	7.7E-06	
2	48.5	76.0	32.80	36.60	5	0.633	20.0	0.0	56.7	2.7E-05	ALTERNATING SECTIONS
2	48.5	76.0	38.00	42.20	5	0.700	30.0	0.0	79.8	2.1E-05	OF VUGGY AND
2	48.5	76.0	43.50	49.00	5	0.916	40.0	0.0	102.9	2.2E-05	COMPETENT BASALT
2	48.5	76.0	50.50	54.50	5	0.666	28.0	0.0	75.2	2.2E-05	WITH A LAYER OF
2	48.5	76.0	55.20	58.00	5	0.466	20.0	0.0	56.7	2.0E-05	SANDY SEDIMENTS
3	78.5	106.0	46.00	58.50	5	2.083	25.0	0.0	68.2	7.4E-05	
3	78.5	106.0	64.50	77.50	5	2.166	35.0	0.0	91.3	5.8E-05	ALTERNATING SECTIONS
3	78.5	106.0	83.00	100.00	5	2.832	55.0	0.0	137.5	5.0E-05	OF VUGGY AND
3	78.5	106.0	103.00	114.50	5	1.916	35.0	0.0	91.3	5.1E-05	COMPETENT BASALT
3	78.5	106.0	117.00	125.30	5	1.383	25.0	0.0	68.2	4.9E-05	
4	108.5	136.0	35.00	42.40	5	1.233	35.0	0.0	91.3	3.3E-05	
4	108.5	136.0	44.60	53.30	5	1.449	55.0	0.0	137.5	2.6E-05	ALTERNATING SECTIONS
4	108.5	136.0	57.00	67.10	5	1.683	70.0	0.0	172.2	2.4E-05	OF VUGGY AND
4	108.5	136.0	70.00	76.20	5	1.033	60.0	0.0	149.1	1.7E-05	COMPETENT BASALT
4	108.5	136.0	77.50	81.00	5	0.583	35.0	0.0	91.3	1.6E-05	

filename u:\user\kde\1733\KP92-1A.WK3

PACKER TESTING CALCULATION SHEET

PROJECT: FISH LAKE (1733)
LOCATION: MAIN EMBANKMENT
HOLE No: KP92-1
TEST DATE: OCTOBER 11, 1992
COORDS(m) N: E:
REF. ELEV.(m)

HOLE DIAMETER (inches): HQ 3.782
DEPTH TO GDW TABLE BELOW PRESSURE GAUGE (ft): 10.5
BEDROCK DEPTH(ft): 0
TESTED BY: KDE/GRG
ANGLE FROM VERTICAL (deg): 0
HEIGHT OF PRESSURE GAUGE ABOVE GROUND(ft): 2.5

TEST	DEPTH INTERVAL (ft)		FLOW METER (USgal)		ELAPSED TIME	FLOW RATE	GAUGE PRESSURE	HEAD CORR'N	TEST HEAD	PERMEABILITY (cm/sec)	COMMENTS
	from	to	init	final	(min)	(Igpm)	(psi)	(ft)	(ft)		
5	138.5	166.0	691.00	701.50	5	1.749	30.0	0.0	79.8	5.3E-05	
5	138.5	166.0	7.50	24.10	5	2.766	60.0	0.0	149.1	4.5E-05	VUGGY BASALT
5	138.5	166.0	31.00	50.90	5	3.315	90.0	0.0	218.4	3.7E-05	WITH MINOR
5	138.5	166.0	55.00	67.70	5	2.116	60.0	0.0	149.1	3.5E-05	SANDY SEDIMENTS
5	138.5	166.0	69.00	76.40	5	1.233	30.0	0.0	79.8	3.8E-05	
6	168.5	196.0	800.00	844.30	5	7.380	65.0	0.0	160.6	1.1E-04	
6	168.5	196.0	858.00	895.30	4	7.768	125.0	0.0	299.2	6.3E-05	BROKEN BASALT
6	168.5	196.0	903.00	919.30	5	2.716	100.0	0.0	241.4	2.7E-05	OVERLYING
6	168.5	196.0	921.00	925.10	5	0.683	60.0	0.0	149.1	1.1E-05	SANDY SEDIMENTS

filename u:\user\kde\1733\KP92-1B.WK3

PACKER TESTING CALCULATION SHEET

PROJECT: FISH LAKE (1733)
LOCATION: MAIN EMBANKMENT
HOLE No: KP92-2
TEST DATE: OCTOBER 13, 1992
COORDS(m) N: E:
REF. ELEV.(m)

HOLE DIAMETER (inches): HQ 3.782
DEPTH TO GDW TABLE BELOW PRESSURE GAUGE (ft): 22.5
BEDROCK DEPTH(ft): 0
TESTED BY: GRG
ANGLE FROM VERTICAL (deg): 0
HEIGHT OF PRESSURE GAUGE ABOVE GROUND(ft): 2.5

TEST	DEPTH INTERVAL (ft)		FLOW METER (USgal)		ELAPSED TIME	FLOW RATE	GAUGE PRESSURE	HEAD CORR'N	TEST HEAD	PERMEABILITY (cm/sec)	COMMENTS
	from	to	init	final	(min)	(Igpm)	(psi)	(ft)	(ft)		
1	19.0	46.0	65.0	70.70	5	0.950	10.0	0.0	45.1	5.2E-05	
1	19.0	46.0	72.0	77.60	5	0.933	16.0	0.0	59.0	3.9E-05	ALTERNATING SECTIONS
1	19.0	46.0	79.0	87.20	5	1.366	25.0	0.0	79.7	4.2E-05	OF VUGGY AND
1	19.0	46.0	88.2	93.40	5	0.866	16.0	0.0	59.0	3.6E-05	COMPETENT BASALT
1	19.0	46.0	94.0	97.50	5	0.583	10.0	0.0	45.1	3.2E-05	
2	48.5	76.0	40.00	93.20	5	8.863	30.0	0.0	91.8	2.4E-04	
2	48.5	76.0	4.00	59.10	5	9.180	35.0	0.0	103.3	2.2E-04	VUGGY, HIGHLY
2	48.5	76.0	70.00	125.70	5	9.280	40.0	0.0	114.9	2.0E-04	VESICULAR BASALT
2	48.5	76.0	137.00	176.70	5	6.614	35.0	0.0	103.3	1.6E-04	
2	48.5	76.0	184.00	218.70	5	5.781	30.0	0.0	91.8	1.5E-04	
3	78.5	106.0	20.00	21.75	5	0.292	30.0	0.0	91.8	7.7E-06	
3	78.5	106.0	22.30	24.45	5	0.358	40.0	0.0	114.9	7.6E-06	COMPETENT BASALT
3	78.5	106.0	25.10	27.65	5	0.425	50.0	0.0	138.0	7.5E-06	OVERLYING
3	78.5	106.0	28.00	29.75	5	0.292	40.0	0.0	114.9	6.2E-06	SAND AND GRAVEL
3	78.5	106.0	30.00	31.20	5	0.200	30.0	0.0	91.8	5.3E-06	

filename u:\user\kde\1733\KP92-2.WK3

PACKER TESTING CALCULATION SHEET

PROJECT: FISH LAKE (1733)
LOCATION: SOUTH SADDLE DAM
HOLE No: KP92-3
TEST DATE: OCTOBER 16, 1992
COORDS(m) N: E:
REF. ELEV.(m)

HOLE DIAMETER (inches): HQ 3.782
DEPTH TO GDW TABLE BELOW PRESSURE GAUGE (ft): 5
BEDROCK DEPTH(ft): 0
TESTED BY: GRG
ANGLE FROM VERTICAL (deg): 0
HEIGHT OF PRESSURE GAUGE ABOVE GROUND(ft): 2.5

TEST	DEPTH INTERVAL (ft)		FLOW METER (USgal)		ELAPSED TIME	FLOW RATE	GAUGE PRESSURE	HEAD CORR'N	TEST HEAD	PERMEABILITY (cm/sec)	COMMENTS
	from	to	init	final	(min)	(Igpm)	(psi)	(ft)	(ft)		
1	99.0	126.0	51.50	54.30	5	0.466	30.0	0.0	74.3	1.6E-05	
1	99.0	126.0	54.90	57.00	5	0.350	45.0	0.0	108.9	7.9E-06	INTERBEDDED
1	99.0	126.0	57.50	59.80	5	0.383	65.0	0.0	155.1	6.1E-06	SANDS AND SILTS
1	99.0	126.0	60.30	61.55	5	0.208	45.0	0.0	108.9	4.7E-06	
1	99.0	126.0	61.70	62.50	5	0.133	30.0	0.0	74.3	4.4E-06	
2	139.0	166.0	67.50	73.50	5	1.000	30.0	0.0	74.3	3.3E-05	
2	139.0	166.0	74.80	81.80	5	1.166	35.0	0.0	85.8	3.4E-05	LAYERED SILTS
2	139.0	166.0	84.00	91.50	5	1.250	40.0	0.0	97.4	3.2E-05	AND SILTS WITH
2	139.0	166.0	93.00	97.30	5	0.716	35.0	0.0	85.8	2.1E-05	TRACE CLAY
2	139.0	166.0	298.00	301.00	5	0.500	30.0	0.0	74.3	1.7E-05	

filename u:\user\kde\1733\KP92-3.WK3

PACKER TESTING CALCULATION SHEET

PROJECT: FISH LAKE (1733)
LOCATION: WEST SADDLE DAM
HOLE No: KP92-4
TEST DATE: OCTOBER 17, 1992
COORDS(m) N: E:
REF. ELEV.(m)

HOLE DIAMETER (inches): HQ 3.782
DEPTH TO GDW TABLE BELOW PRESSURE GAUGE (ft): 150
BEDROCK DEPTH(ft): 0
TESTED BY: KDE/GRG
ANGLE FROM VERTICAL (deg): 0
HEIGHT OF PRESSURE GAUGE ABOVE GROUND(ft): 2.5

TEST	DEPTH INTERVAL (ft)		FLOW METER (USgal)		ELAPSED TIME	FLOW RATE	GAUGE PRESSURE	HEAD CORR'N	TEST HEAD	PERMEABILITY (cm/sec)	COMMENTS
	from	to	init	final	(min)	(Igpm)	(psi)	(ft)	(ft)		
1	19.0	46.0	5.2	5.98	5	0.130	18.0	0.0	76.6	4.2E-06	
1	19.0	46.0	6.1	6.98	5	0.147	25.0	0.0	92.7	3.9E-06	
1	19.0	46.0	7.2	8.19	5	0.165	35.0	0.0	115.8	3.5E-06	COMPETENT BASALT
1	19.0	46.0	8.3	8.88	5	0.097	25.0	0.0	92.7	2.6E-06	
1	19.0	46.0	8.9	9.37	5	0.078	15.0	0.0	69.6	2.8E-06	
2	58.5	86.0	1.40	1.55	5	0.025	35.0	0.0	155.6	3.9E-07	
2	58.5	86.0	1.60	1.80	5	0.033	45.0	0.0	178.7	4.5E-07	
2	58.5	86.0	1.85	2.05	5	0.033	50.0	0.0	190.2	4.3E-07	COMPETENT BASALT
2	58.5	86.0	2.10	2.29	5	0.032	45.0	0.0	178.7	4.3E-07	
2	58.5	86.0	2.30	2.44	5	0.023	35.0	0.0	155.6	3.7E-07	
3	88.5	116.0	4.60	6.05	5	0.242	30.0	0.0	174.0	3.4E-06	
3	88.5	116.0	6.50	8.40	5	0.317	45.0	0.0	208.7	3.7E-06	COMPETENT BASALT
3	88.5	116.0	19.00	21.35	5	0.392	60.0	0.0	243.3	3.9E-06	OVERLYING
3	88.5	116.0	21.70	23.40	5	0.283	45.0	0.0	208.7	3.3E-06	COBBLES AND GRAVEL
3	88.5	116.0	23.60	24.95	5	0.225	30.0	0.0	174.0	3.1E-06	
4	128.5	156.0	6.70	7.25	5	0.092	40.0	0.0	232.9	9.6E-07	
4	128.5	156.0	7.40	8.00	5	0.100	60.0	0.0	279.1	8.7E-07	BRECCIATED BASALT
4	128.5	156.0	8.30	9.10	5	0.133	80.0	0.0	325.3	1.0E-06	OVERLYING
4	128.5	156.0	9.20	9.80	5	0.100	60.0	0.0	279.1	8.7E-07	COMPETENT BASALT
4	128.5	156.0	39.90	40.31	5	0.068	40.0	0.0	232.9	7.1E-07	

filename u:\user\kde\1733\KP92-4A.WK3

PACKER TESTING CALCULATION SHEET

PROJECT: FISH LAKE (1733)
LOCATION: WEST SADDLE DAM
HOLE No: KP92-4
TEST DATE: OCTOBER 17, 1992
COORDS(m) N: E:
REF. ELEV.(m)

HOLE DIAMETER (inches): HQ 3.782
DEPTH TO GDW TABLE BELOW PRESSURE GAUGE (ft): 150
BEDROCK DEPTH(ft): 0
TESTED BY: KDE/GRG
ANGLE FROM VERTICAL (deg): 0
HEIGHT OF PRESSURE GAUGE ABOVE GROUND(ft): 2.5

TEST	DEPTH INTERVAL (ft)		FLOW METER (USgal)		ELAPSED TIME	FLOW RATE	GAUGE PRESSURE	HEAD CORR'N	TEST HEAD	PERMEABILITY (cm/sec)	COMMENTS
	from	to	init	final	(min)	(Igpm)	(psi)	(ft)	(ft)		
5	148.5	196.0	44.00	45.72	5	0.287	50.0	0.0	265.5	1.7E-06	
5	148.5	196.0	46.00	48.20	5	0.367	90.0	0.0	357.9	1.6E-06	SANDY SEDIMENTS
5	148.5	196.0	49.00	55.50	5	1.083	125.0	0.0	438.7	3.9E-06	WITH SOME
5	148.5	196.0	56.00	59.30	5	0.550	90.0	0.0	357.9	2.4E-06	BASALT SECTIONS
5	148.5	196.0	59.50	61.22	5	0.287	50.0	0.0	265.5	1.7E-06	

filename u:\user\kde\1733\KP92-4B.WK3

PACKER TESTING CALCULATION SHEET

PROJECT: FISH LAKE (1733)
LOCATION: MAIN EMBANKMENT
HOLE No: KP92-5
TEST DATE: OCTOBER 18, 1992
COORDS(m) N: E:
REF. ELEV.(m)

HOLE DIAMETER (inches): HQ 3.782
DEPTH TO GDW TABLE BELOW PRESSURE GAUGE (ft): 10
BEDROCK DEPTH(ft): 6.5
TESTED BY: GRG
ANGLE FROM VERTICAL (deg): 0
HEIGHT OF PRESSURE GAUGE ABOVE GROUND(ft): 2.5

TEST	DEPTH INTERVAL (ft)		FLOW METER (USgal)		ELAPSED TIME	FLOW RATE	GAUGE PRESSURE	HEAD CORR'N	TEST HEAD	PERMEABILITY (cm/sec)	COMMENTS
	from	to	init	final	(min)	(Igpm)	(psi)	(ft)	(ft)		
1	19.0	46.0	376.00	413.60	5	6.264	12.0	0.0	37.7	4.1E-04	
1	19.0	46.0	433.00	481.30	5	8.047	20.0	0.0	56.2	3.5E-04	COBBLES AND GRAVEL
1	19.0	46.0	492.00	540.60	5	8.097	23.0	0.0	63.1	3.2E-04	WITH SAND, SOME SILT.
1	19.0	46.0	550.00	586.70	5	6.114	20.0	0.0	56.2	2.7E-04	
1	19.0	46.0	590.00	605.60	5	2.599	12.0	0.0	37.7	1.7E-04	

filename u:\user\kde\1733\KP92-5.WK3

APPENDIX D

WATER QUALITY MONITORING WELL COMPLETION DETAILS

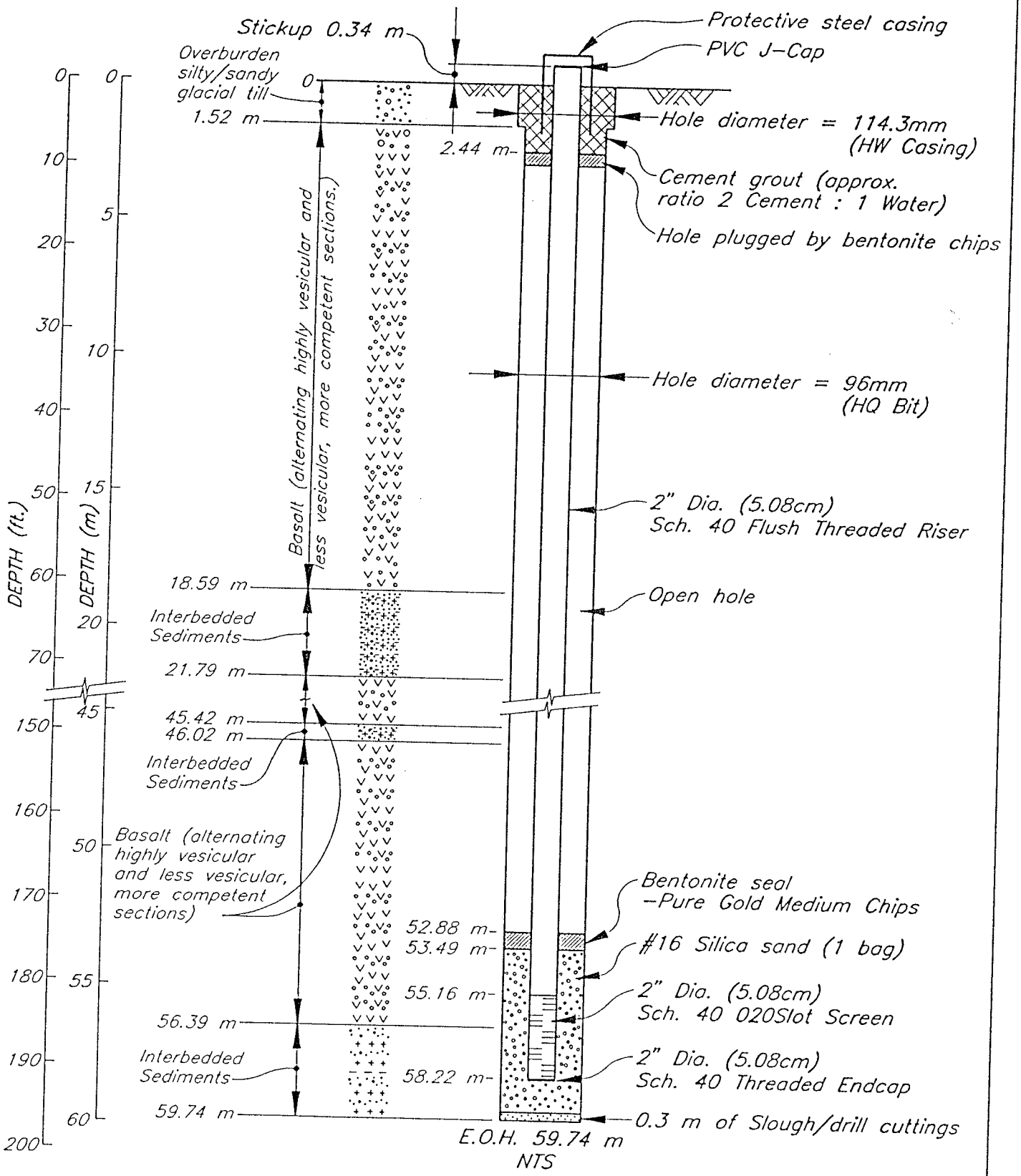
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

1733.A2

PROJECT *FISH LAKE*
LOCATION N: _____ E: _____
COMPLETION DATE *Oct. 13, 1992*

PROJECT No. *1733*
HOLE No. *KP92-1*
GROUND ELEVATION *4825 ft.*



CAD FILE: \PROJECTS\1733\FIG\A2 Plot scale 1=1

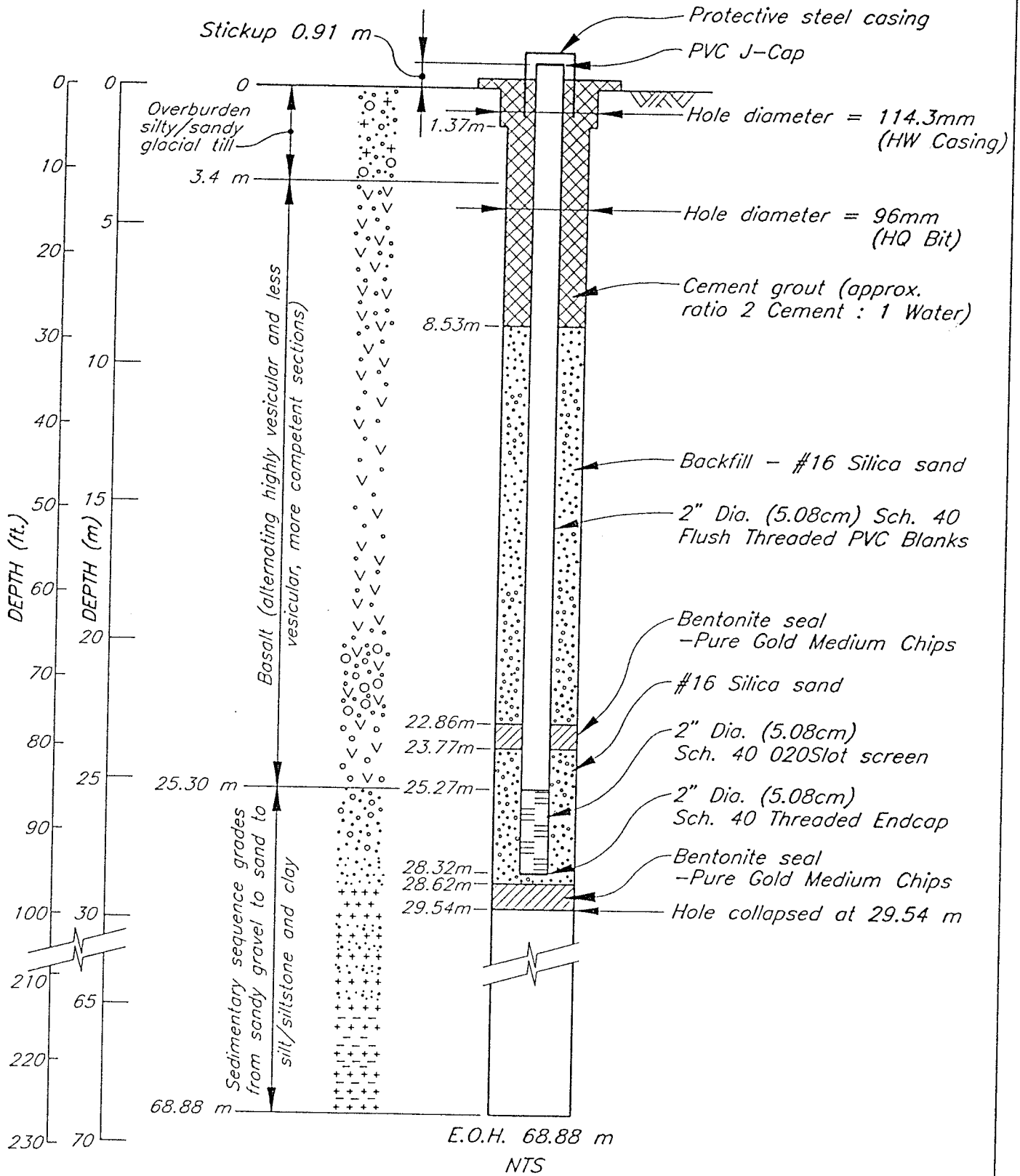
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

1733.A4

PROJECT *FISH LAKE*
LOCATION N: _____ E: _____
COMPLETION DATE *Oct. 17, 1992*

PROJECT No. *1733*
HOLE No. *KP92-2*
GROUND ELEVATION *4900 ft.*



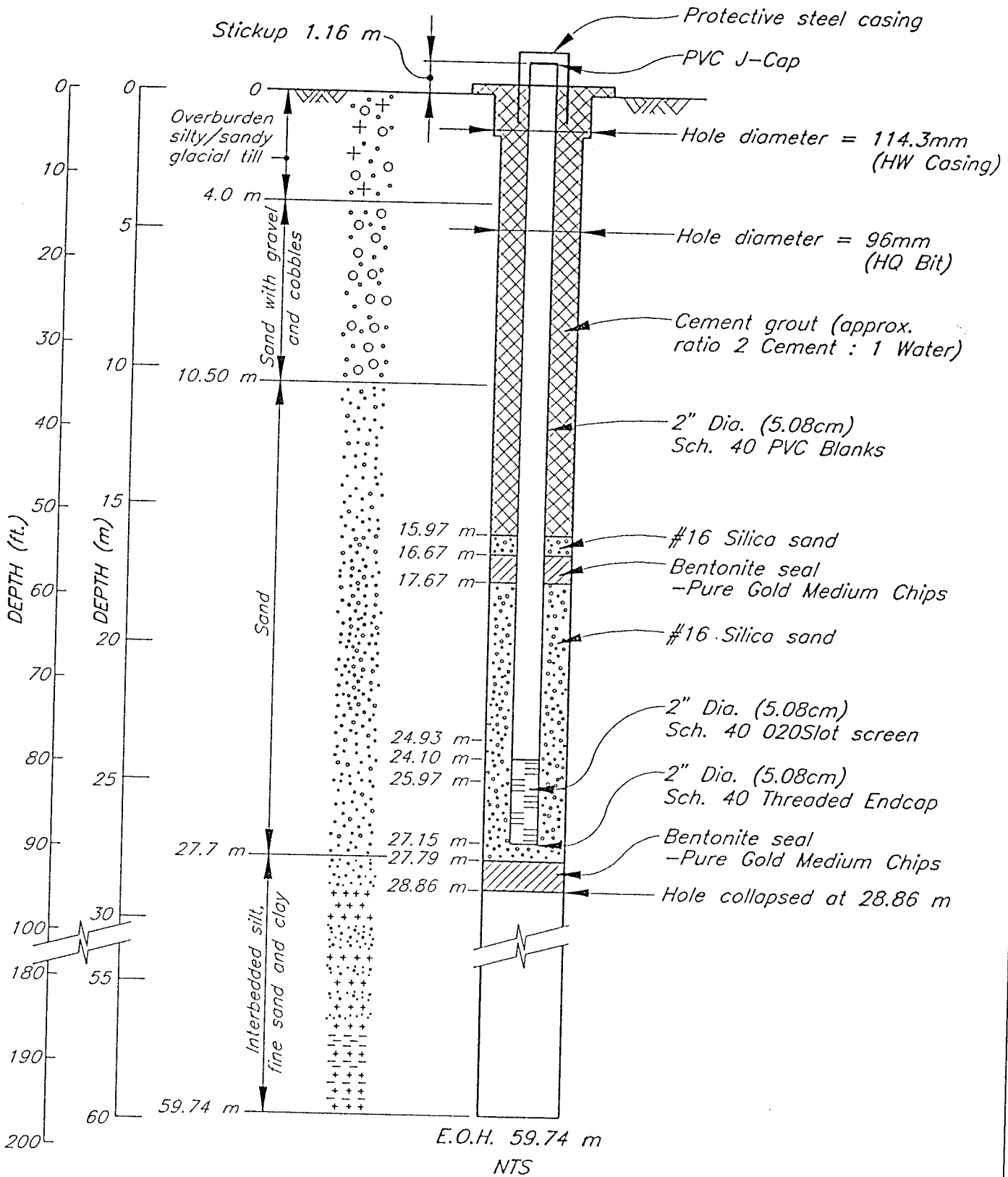
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

1733.A1

PROJECT *FISH LAKE*
LOCATION N: _____ E: _____
COMPLETION DATE *Oct. 18, 1992*

PROJECT No. *1733*
HOLE No. *KP92-3*
GROUND ELEVATION *5175 ft.*



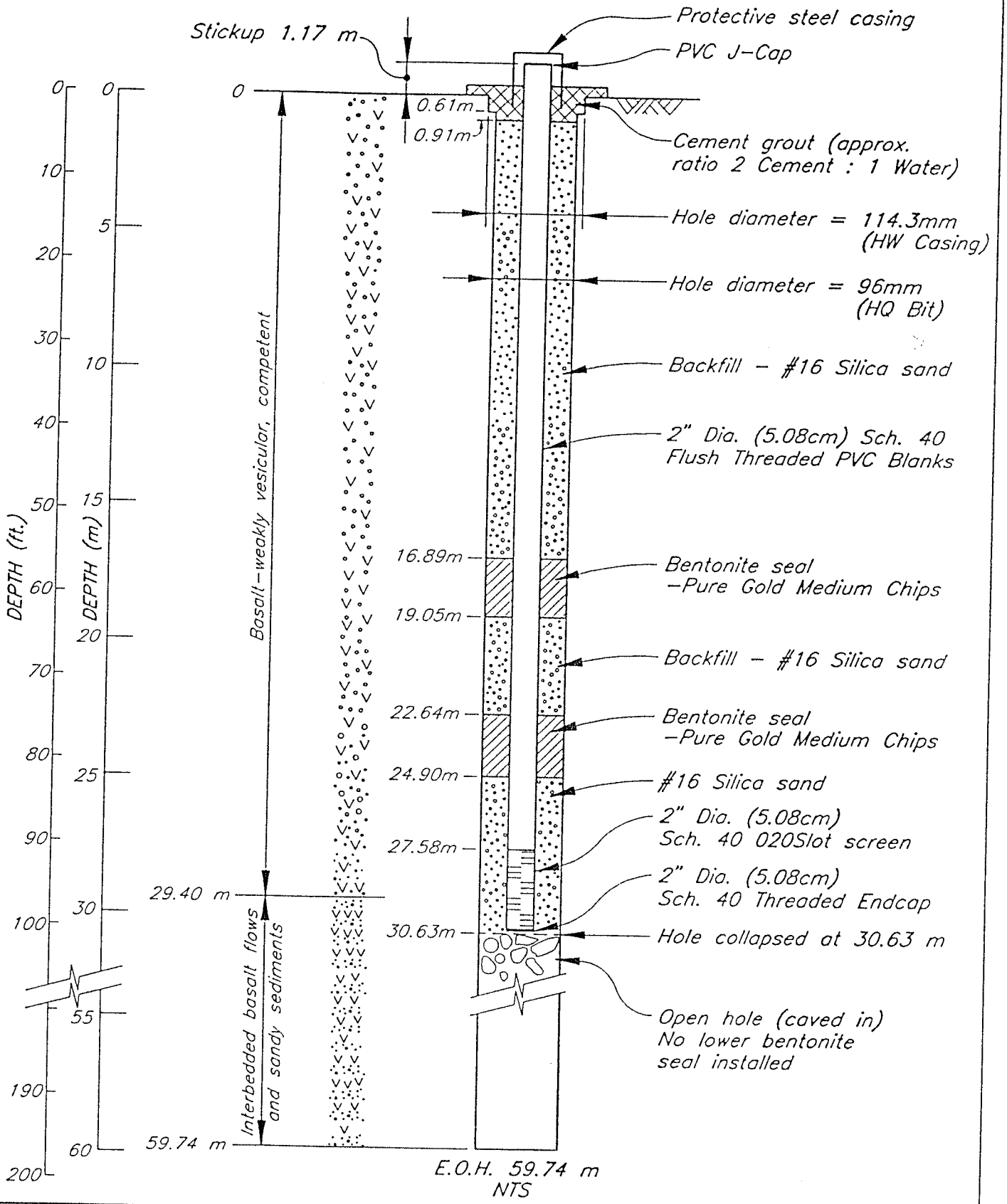
KNIGHT PIESOLD LTD.
CONSULTING ENGINEERS

GROUNDWATER MONITORING WELL COMPLETION DETAILS

1733.A3

PROJECT *FISH LAKE*
LOCATION N: _____ E: _____
COMPLETION DATE *Oct. 19, 1992*

PROJECT No. *1733*
HOLE No. *KP92-4*
GROUND ELEVATION *5075 ft.*



KNIGHT PIESOLD LTD. CONSULTING ENGINEERS	GROUNDWATER MONITORING WELL COMPLETION DETAILS	1733.A5
PROJECT *FISH LAKE* LOCATION N: _____ E: _____ COMPLETION DATE *Oct. 20, 1992*		PROJECT No. *1733* HOLE No. *KP92-5* GROUND ELEVATION *5000 ft.*