



PITEAU ASSOCIATES

GEOTECHNICAL AND
HYDROGEOLOGICAL CONSULTANTS

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Our file: 1456

September 6, 1995

003160

Mr. Dick Arndt, P. Eng.
Chief Engineer
Anvil Range Mining Corporation
P.O. Bag 1000
Faro, Y.T.
Y0B 1K0

Dear Mr. Arndt:

Re: Stability Assessment of the Grum Main Waste Dump

As per your request, Piteau Associates Engineering Ltd. (Piteau) has completed a brief stability assessment of the newly proposed location of the Main Waste Dump. This assessment was conducted as an office study based on our understanding that consideration is being given to extending the waste dump to the west of the currently approved site. Stability analyses were conducted for each lift of the waste dump up to the 1350m elevation, which will allow present mining plans to be accommodated. It is understood that dump construction will be in 30m lifts with the lowest lift at approximately the 1140m elevation. Previous stability and engineering geology assessments of this waste dump were carried out by Piteau Associates in 1992 and summarized in letter reports to Curragh Resources Inc. dated August 14, 1992 and November 10, 1992. Relevant portions of these two studies have been included in this report for the sake of completeness and for the convenience of the reader. During our previous studies, in which an overall slope angle of 1.75 horizontal to 1 vertical (i.e. 30°) was deemed to be feasible, it was assumed that the ultimate dump would not exceed the 1300m elevation. It is our understanding that a more conservative dump design, with an overall slope angle of 2.5 horizontal to 1 vertical, is now under consideration.

ENGINEERING GEOLOGY AND FOUNDATION CONDITIONS

The following discussions are based predominantly on data obtained from the test pitting program conducted on September 23 and 24, 1992 by Piteau and summarized in our report dated November 10, 1992. Logs for eight test pits excavated near the base of the proposed dump by EBA Engineering Consultants Ltd. (EBA) on August 8, 1995 were also reviewed. These logs were found to generally support the results of the earlier test pitting program conducted by Piteau. Locations of all test pits excavated by EBA and Piteau are shown in Fig. 1 and detailed engineering geology logs of these test pits are included in Appendix A.



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Chief Engineer
Anvil Range Mining Corporation

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Physiography

The bulk of the Main Waste Dump will lie on moderate slopes, generally dipping south-southwest relative to the mine grid (see Fig. 1). While topography in the area of the proposed waste dump generally dips from 6° to 10°, with occasional areas dipping up to 12°, some flat areas are also evident. These flat areas may be terraces related to glacial or post-glacial fluvial activity.

The design toe of the Main Waste Dump in both the original and updated designs is located approximately 200m from Vangorda Creek. As discussed in our August 14, 1992 report, it is recommended that the elevation of the dump toe not extend below 1100m-asl, while the upslope portion of the dump foundation could reach elevations as high as 1310m-asl.

Hydrology and Hydrogeology

Grum Creek, which discharges into Vangorda Creek, is the only perennial stream crossing the Main Waste Dump site. Three ephemeral streams also exist in the area; however, very little information is available on these drainage features and they appear to be relatively minor. While accurate flow values are not available for Grum Creek, a visual estimate of about 100 igpm at the 1200m elevation was made during the 1992 test pitting program. An additional 100 igpm was estimated to be discharging as groundwater seepage from the slopes along the creek in this area. However, as Grum Creek has essentially no catchment area at this location since the main Vangorda haulroad and the Grum Pit are immediately upslope, it is likely that most, if not all, of the discharge in Grum Creek originates as groundwater baseflow.

Three test pits located on the flanks of Grum Creek (P25, P26, and GR08) exhibited considerable seepage. Elsewhere, seepage was only observed in Test Pits P14, P18, and GR03, where it appeared as a very minor flow just below the bedrock contact. Test Pit P25, which was excavated in a clayey silt glacial till underlain by a water bearing silty sand with gravel, became flooded over a period of about 24 hours. Seepage into Test Pit P26, which appears to be excavated in saturated fluvial sediments, was minor but steady. Test Pit GR08, which was excavated into a clayey till, was located near pools of water at the surface and water was observed to be seeping from the surface organic layer.

Based on the above, it would appear that the area around Grum Creek is the only significant discharge area in the vicinity of the proposed waste dump site. It is likely that the granular soils exposed in this discharge area belong to the same stratigraphic unit (identified as a 20m thick confined aquifer) as that encountered in drillholes in the Grum Pit. Supporting evidence for this conclusion is discussed in our report of January 1991, entitled "Grum Pit Review and Analysis of Hydrogeological Data and Design of Phase I Dewatering System".



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Chief Engineer
Anvil Range Mining Corporation

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Surficial Soils

Soil conditions encountered in the most recent EBA test pits are generally consistent with those described in our November 1992 report and re-iterated here. Three distinct soil units are apparent in the area. In all test pits, a shallow (0.2 to 0.5m thick) layer of organic material containing silt and sand was encountered. Directly below this layer, either a well to poorly graded, medium dense to dense sand and gravel (possibly fluvial in origin) or a firm to hard, low to medium plasticity sandy silt to clayey silt (glacial till) was typically encountered. Grain size analysis results from Piteau samples in the sand and gravel are presented in Fig. 3. The results of Atterberg limit testing from Piteau samples in the glacial till are presented in Fig. 4. EBA testing results are included with the associated test pit logs in Appendix A.

In terms of general occurrence, the sand and gravel is typically found below the 1180m elevation and in areas proximal to Grum and Vangorda Creeks (see Fig. 1). In many instances, the upper portion of this unit is stained or oxidized, probably in response to groundwater level fluctuations or surface water recharge. Sand and gravel deposits ranged in thickness from 0.3m to greater than 5.5m.

With the exception of Test Pits P15 and P18, and possibly Test Pits P20 and P26 (i.e. where the sand and gravel was not completely penetrated), glacial till is present over nearly all of the site. This material, which typically underlies the other soil units, and also overlies the sand and gravel in some areas (i.e. in P25), ranged in thickness from 0.2m to greater than 6.7m. While very thick till deposits have been encountered in the Grum Pit area, it is not anticipated that deep till deposits are present under the Main Waste Dump site.

Bedrock

Phyllite bedrock was encountered in six of the test pits excavated by Piteau and four of the test pits excavated by EBA, predominantly in the southwestern area of the proposed waste dump and downslope of the waste dump. The bedrock ranged from weathered to fresh, and was generally easily excavatable. Test pits were excavated between 0.1m and 3.7m into the bedrock, where it was encountered. The depth to bedrock in test pits where it was encountered varied between 0.8m and 5.4m. Depths to bedrock of more than about 7 or 8m are not anticipated.

DUMP FOUNDATION STRENGTH PARAMETERS

In 1992, a friction angle of $\phi = 35^\circ$ and zero cohesion was assumed for foundation materials for purposes of the stability analyses, both in the short and long term. These values were adopted



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because the Main Dump was assumed to be founded primarily on coarse grained materials and stiff dense tills, both of which were considered to behave primarily as frictional materials when subjected to dump loading. The relatively thin layer of organic topsoil that is present typically consolidates very rapidly under applied load, and tends to behave as a frictional material. It was also assumed that the rate of advance of the dump would be sufficiently slow to allow excess pore pressures to dissipate in unexpected areas of fine grained material. In addition, the phyllite waste rock to be disposed of in the Main Waste Dump was assumed to behave as a frictional material with a minimum strength of about $\phi = 35^\circ$.

The strength parameters used in the 1992 slope stability assessments were re-evaluated by reviewing the test pit logs prepared by Piteau and the more recent logs by EBA, and were found to be appropriate. Following this evaluation, stability analyses for the proposed dump configurations were then carried out. It is noteworthy that plans to shift the dump to the west, essentially staying out of the Grum Creek drainage, should alleviate concerns that were raised in our November 1992 report regarding the suitability of foundation materials in the Grum Creek area.

RESULTS OF STABILITY ASSESSMENT

Results of stability analyses indicate that, provided the dump is built in 30m high lifts at an overall dump face angle of 2.5 horizontal to 1 vertical, and provided the maximum dump elevation does not exceed the 1350m elevation, the waste dump is expected to be stable, with a Factor of Safety of about 2.0 or greater. As noted above, the stability analyses assume that no significant excess pore pressures will be developed in the foundation, and that the waste rock and foundation soils will behave as frictional materials. It is understood that the Main Waste Dump will be developed from the bottom up. This approach is strongly endorsed by the writer.

To minimize the risk of failure through the dump material, it is recommended that as much of the dump crest as possible be utilized during dumping. A slow rate of crest advance will allow the waste material to consolidate, and any unexpected pore pressures in the foundation soils to dissipate, thus resulting in higher material strengths. If possible, dump advance rates should be limited to no more than 0.5m/day. To minimize infiltration of surface water into the dump, ponding of water should be prevented by maintaining a positive grade on the top of the dump. To minimize erosion and/or saturation of the dump face, water should also be prevented from draining over the dump crest. Regular visual inspections of the dump by mine personnel are recommended.

With regard to the distance that the toe of the dump should be setback from Vangorda Creek, it is understood that a wildlife corridor is planned along the creek. There is also a requirement for a seepage collection ditch downslope of the toe of the dump. Considering these factors and



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that it is of the utmost importance to protect the creek from being impacted by the dump, it is recommended that the toe of the dump should not extend below that illustrated on Fig. 1. This should provide a buffer zone or corridor at least 200m wide between the creek and the dump.

CONCLUSIONS AND RECOMMENDATIONS

Based on the above, it is concluded that foundation conditions are favourable for the Main Waste Dump area, and that the design illustrated on Figs. 1 and 2 is reasonable.

The development of a causeway through the Grum Creek discharge area may require special precautions during construction. Only competent, coarse, free draining waste rock should be used to build such causeways, and it may be prudent to install one or more culverts under the causeway in the area of Grum Creek.

I trust the above is sufficient for your needs at this time. If you have any questions concerning this report, please contact me.

Yours very truly,

PITEAU ASSOCIATES ENGINEERING LTD.

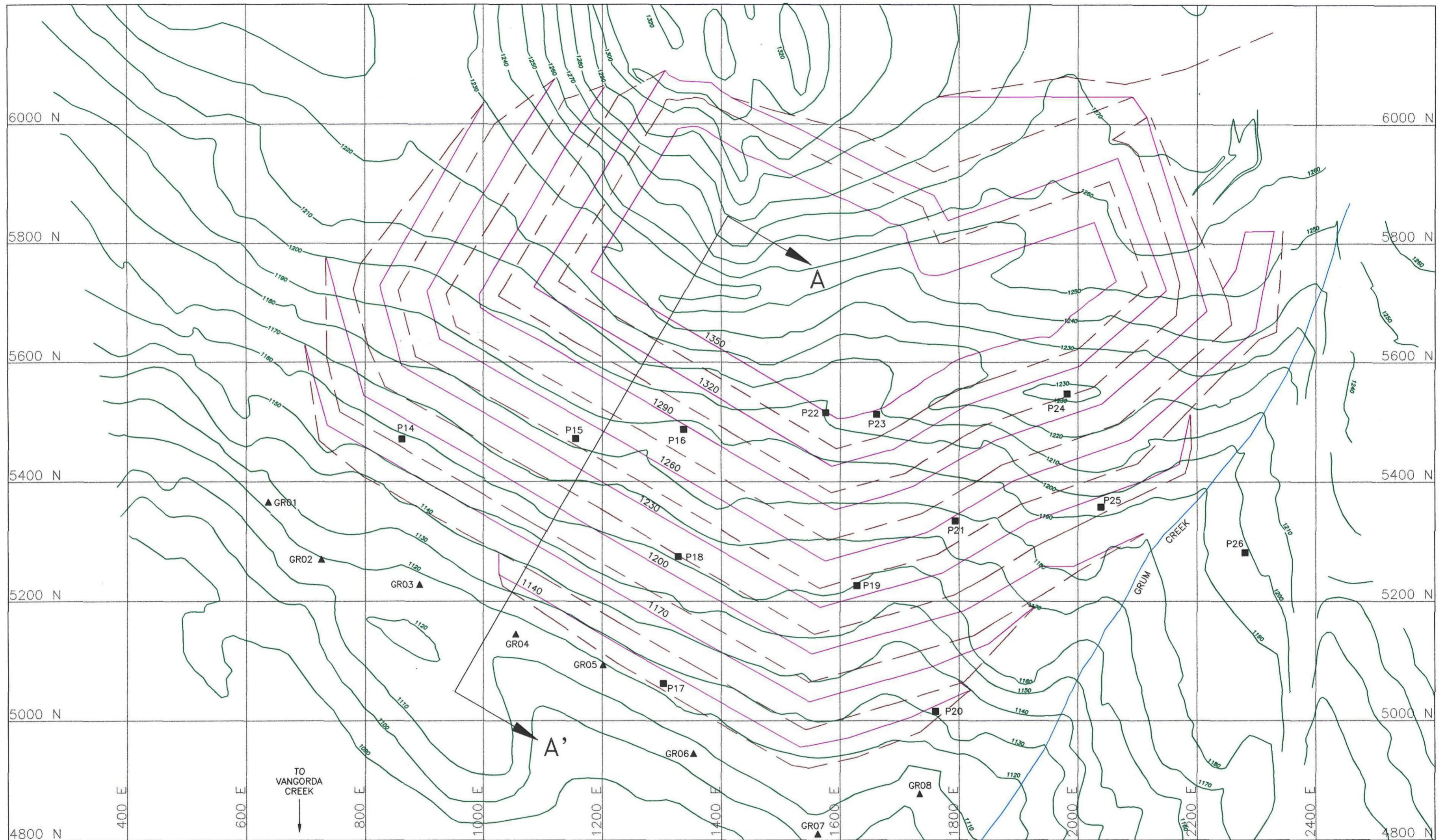
Alan F. Stewart, P.Eng.



AFS/ef

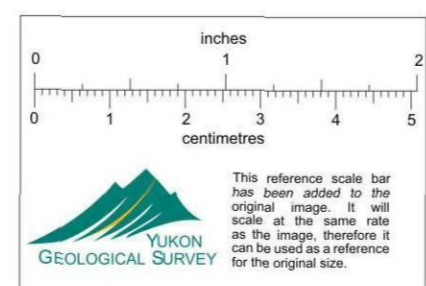
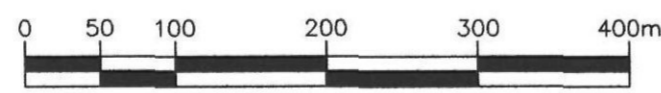
Att.

FIGURES



LEGEND

- WASTE DUMP CREST CONTOURS
- WASTE DUMP TOE CONTOURS
- TOPOGRAPHY ELEVATION
- P17 TEST PIT EXCAVATED BY PITEAU ASSOCIATES
- GR05 TEST PITS EXCAVATED BY EBA
- CREEK
- CROSS SECTION SHOWN IN FIG. 2



NOTE: COORDINATES RELATE TO GRUM MINE GRID.

PREPARED SOLELY FOR THE USE OF OUR CLIENT AND NO REPRESENTATION OF ANY KIND IS MADE TO OTHER PARTIES WITH WHICH PITEAU ASSOCIATES ENGINEERING LTD. HAS NOT ENTERED INTO A CONTRACT.

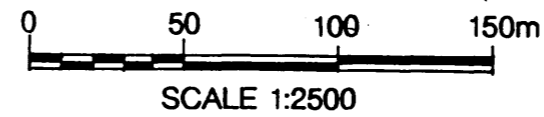
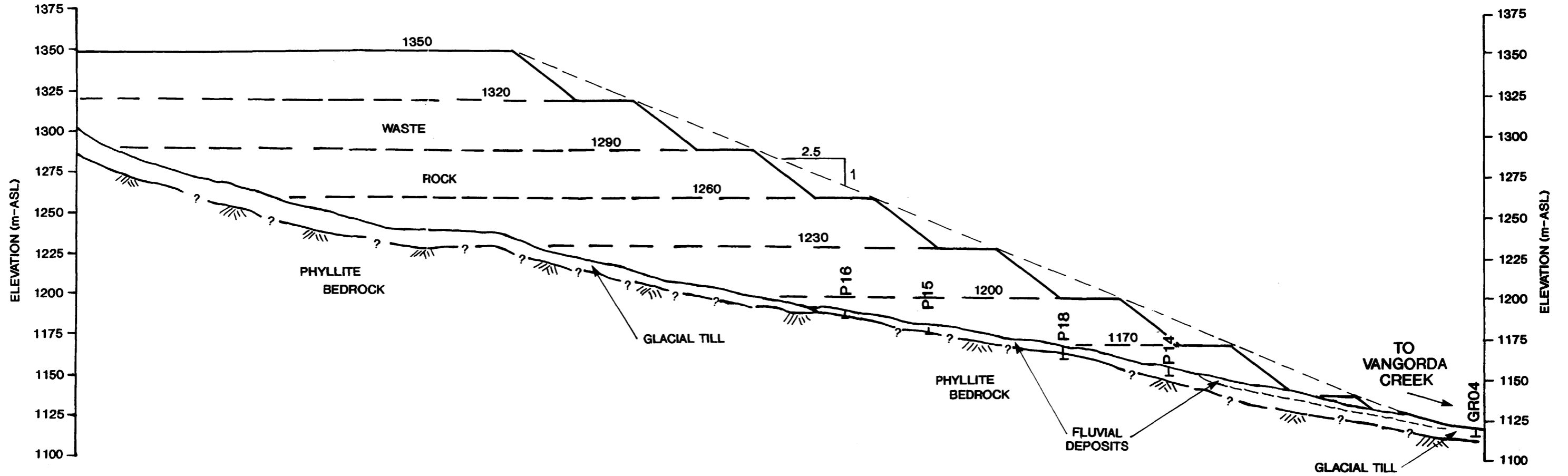
ANVIL RANGE MINING CORPORATION
 GRUM DEPOSIT
 STABILITY ASSESSMENT OF MAIN WASTE DUMP

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 VANCOUVER CALGARY

PLAN OF GRUM WASTE DUMP

BY:	DATE:
AFS/GC	SEP. 95
APPROVED:	FIG:
	1

MAIN WASTE DUMP AREA



NOTES:

1. SEE FIG. 1 FOR SECTION LOCATION AND LEGEND.
2. SEE APENDIX A FOR DETAILED TEST PIT LOGGING INFORMATION.
3. DUMP TO BE CONSTRUCTED FROM BOTTOM UPWARDS IN 30m LIFTS AS SHOWN ABOVE AND DISCUSSED IN THIS REPORT.

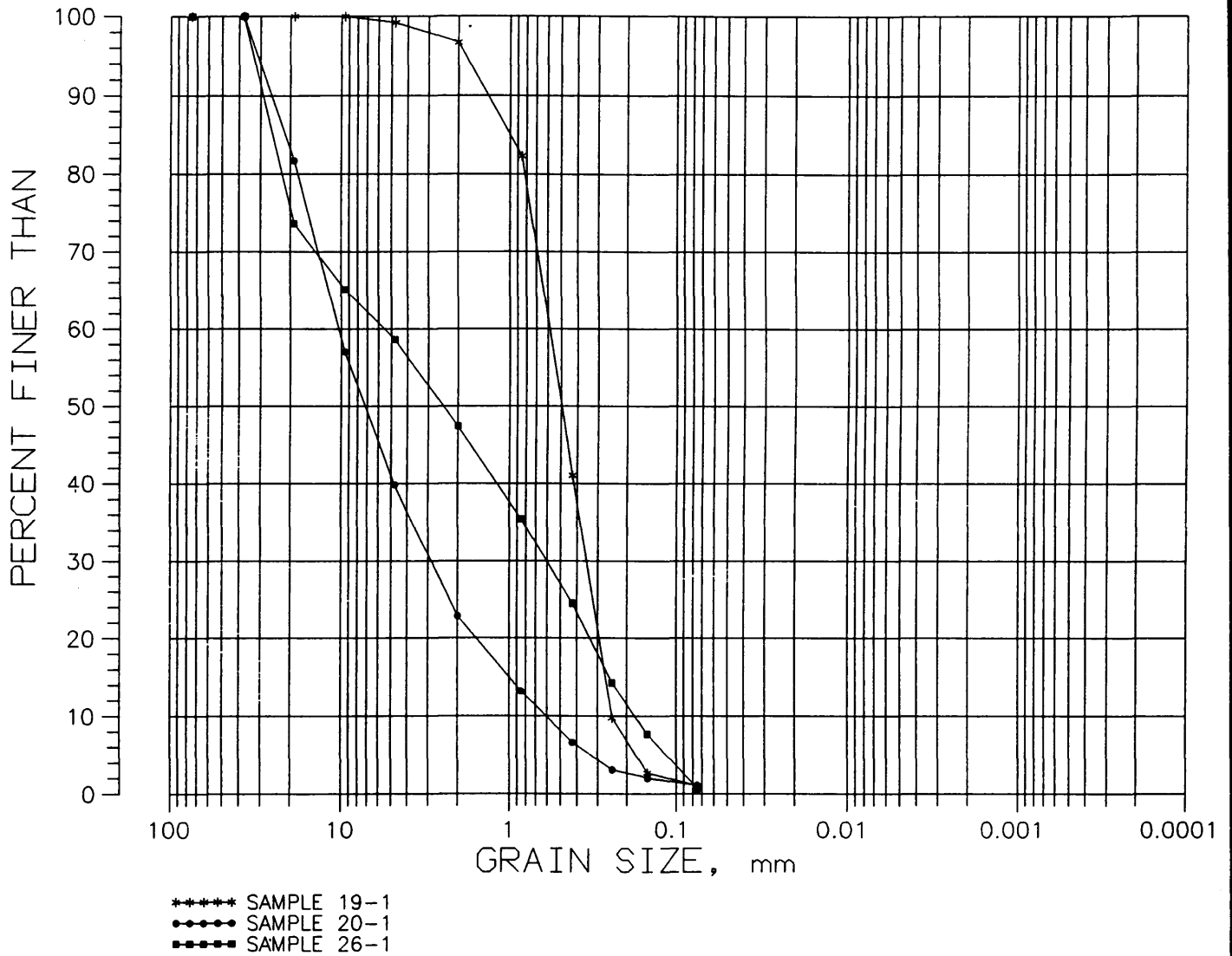
ANVIL RANGE MINING CORPORATION
GRUM DEPOSIT
STABILITY ASSESSMENT OF MAIN WASTE DUMP



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VANCOUVER CALGARY

CROSS SECTION A-A¹

BY: AFS/GC	DATE: SEP. 95
APPROVED:	DWG: 2



MIT Scale	coarse	medium	fine	coarse	medium	fine	fine grained
COBBLE SIZE	GRAVEL SIZE		SAND SIZE			SILT SIZE	CLAY SIZE

NOTE: See Fig. 1 for sample locations

FIG. 3

ANVIL RANGE MINING CORPORATION
 FARO MINE
 STABILITY ASSESSMENT OF MAIN WASTE DUMP



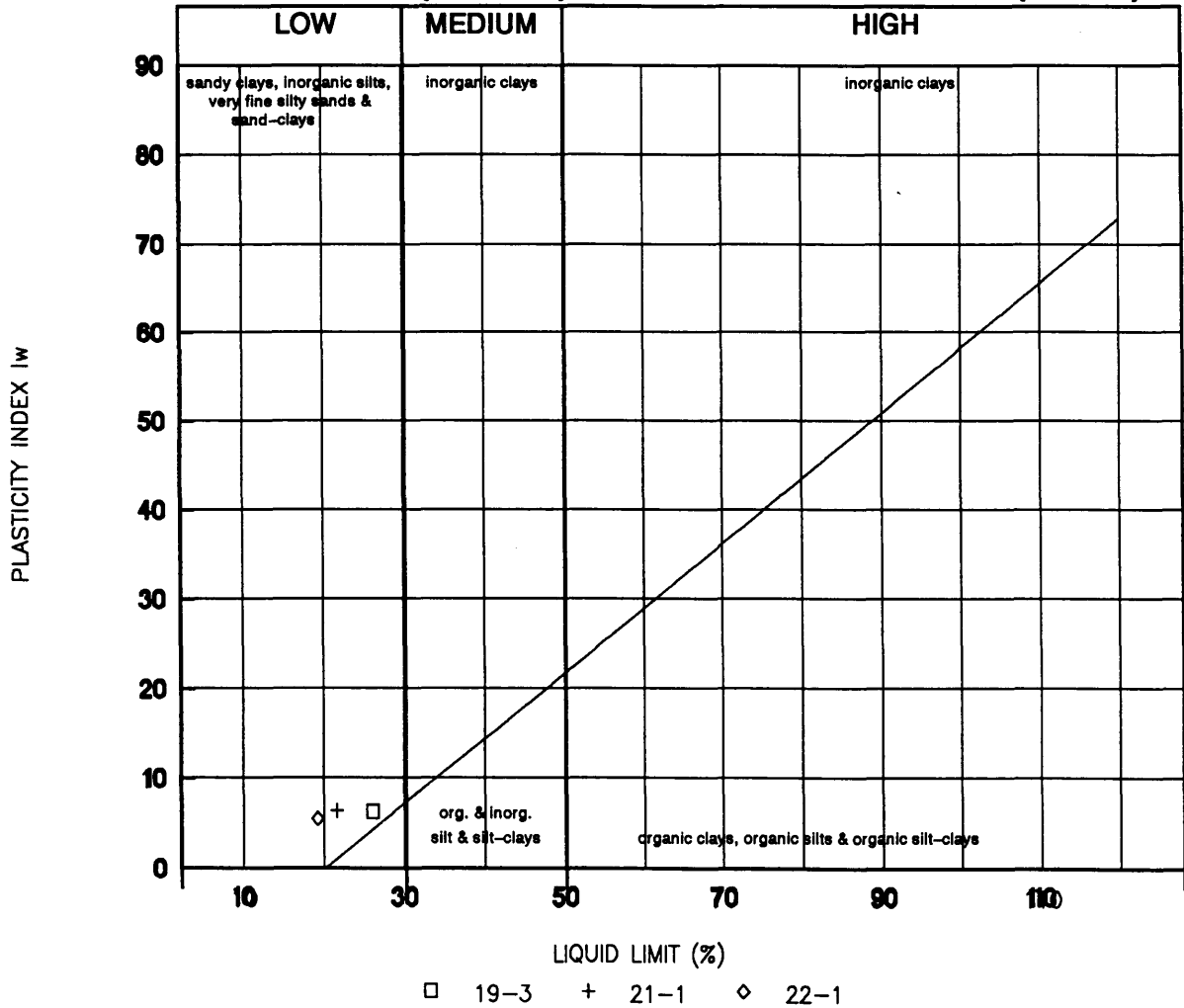
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GRAIN SIZE DISTRIBUTION CURVES

BY: HWN/GC	DATE: SEP. 95
APPROVED:	DWG:

SAMPLE No.	DEPTH (m)	MOISTURE CONTENT (%)	LIQUID LIMIT (%)	PLASTIC LIMIT (%)	PLASTICITY INDEX Iw	SOIL TYPE	UNIFIED CLASS
19-3	5.2	16.4	26.1	19.9	6.2	SILTY CLAY TO SANDY SILT	CL-ML
21-1	3.0	13.6	21.6	15.3	6.3	SILTY CLAY TO SANDY SILT	CL-ML
22-1	4.0	13.6	19.2	13.8	5.4	SILTY CLAY TO SANDY SILT	CL-ML

PLASTICITY (CLAYS) OR COMPRESSIBILITY (SILTS)



NOTE: See Fig. 1 for sample locations

FIG. 4

ANVIL RANGE MINING CORPORATION
 FARO MINE
 STABILITY ASSESSMENT OF MAIN WASTE DUMP



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PLASTICITY CHART

BY: HWN/GC	DATE: SEP. 95
APPROVED:	DWG:

APPENDIX A

TEST PIT LOGS

TEST PITS
EXCAVATED BY PITEAU

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump

Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5472.9 N, 865.9 E

Excavation Method: CAT 235 Backhoe

Elev.: 1158.1 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL-ML		DK. brn. to blk. fine Sandy SILT w/ numerous organics and roots.		
2.0			SM-GM		Brn. to rst. brn./grey s. stiff Sandy SILT w/ tr. to little clay, sand and gravel and occ. cobbles [Till]		P _p =3.0
6.0					PHYLLITE Bedrock (highly weathered surface)		
8.0							
10.0					TD 3.0m? (pit flooded)		
12.0							
14.0							



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LOG OF TEST PIT NO.

P14

BY:	HWN	DATE:	10/15/92
APPROVED:		DWG:	

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump

Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5473.0 N, 1152.5 E

Excavation Method: CAT 235 Backhoe

Elev.: 1182.3 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL-ML		Dk. brn. to blk. fine Sandy SILT w/ abdt. organics and roots.		
2.0			SW-GW		Brn. med dense to dense fine to cgs. SAND and GRAVEL w/ little silt, cobbles and boulders to 50 cm φ.		
4.0					PHYLLITE Bedrock		
6.0							
8.0							
10.0							
12.0					TD 3.2 m		
					Dry		
					Photo 2-4		
14.0							

①



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LOG OF TEST PIT NO.

P15

BY:	DATE:
HWN	10/15/92
APPROVED:	DWG:

JOB NUMBER 72-530A

Date Excavated: 09/24/92

Location: Main Rock Dump

Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5488.7 N, 1334.5 E

Excavation Method: CAT 235 Backhoe

Elev.: 1186.8 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL-ML		DK. brn. to blk. fine Sandy SILT w/ abdt. Organics and roots.		
2.0			ML		Brn. stiff Clayey SILT w/ little sand and gravel, occas. cobbles and boulders to 30 cm Ø. [Till]		P _p = 1.5 - 2.0 W _n = 12.4%
1.0							
4.0							
6.0							
2.0							
8.0					PHYLLITE Bedrock		
3.0							
10.0							
					TD 3.1 m		
					Dry		
12.0							
4.0							
14.0							



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LOG OF TEST PIT NO.

P16

BY:	HWN	DATE:	10/15/92
APPROVED:		DWG:	

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump



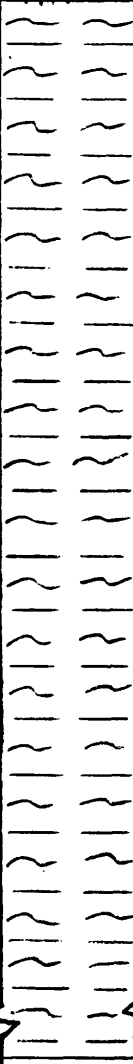
Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5063.9 N, 1303.9 E

Excavation Method: CAT 235 Backhoe

Elev.: 1124.5 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL-ML		DK. brn. to blk. fine Sandy SILT w/ abdt. organics and roots.		
	2.0		SM-ML		Brn. firm to stiff Sandy SILT w/tr. to little clay and gravel. [T:11]		P _p = 0.75-1.5
	1.0				PHYLLITE Bedrock		
	4.0						
	6.0						
2.0							
	8.0						
3.0							
	10.0						
	12.0						
4.0							
4.5					TD 4.5m		Dry



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LOG OF TEST PIT NO. P17

BY: HWN	DATE: 10/15/92
APPROVED:	DWG:

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump

Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5275.5 N, 1326.9 E

Excavation Method: CAT 235 Backhoe

Elev.: 1162.5 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
		OL-ML			DK. brn. to blk. fine Sandy SILT w/ cdbt. Organics and roots.		
4.0		SW-GW			Brn. med dense fine to crs. SAND and GRAVEL w/ tr. silt, occ. to cdbt. cobbles and boulders up to 25 cm φ. - bedding evident		
2.0							
8.0							
4.0					↓ becomes very silty (till?)		
16.0					PHYLLITE Bedrock - slight seepage		
6.0	20.0				TD 5.6 m		
	24.0						
8.0							



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LOG OF TEST PIT NO.

P18

BY: HWN	DATE: 10/15/92
APPROVED:	DWG:

JOB NUMBER 22-530A

Date Excavated: 09/24/92

Location: Main Rock Dump

Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5226.5 N, 1622.0 E

Excavation Method: CAT 235 Backhoe

Elev.: 1160.2 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL-ML		DK. brn. to blk. fine Sandy SILT w/ abdt. organics and roots.		
	4.0		SP-GP		Brn. to rst. brn loose to med. dense fine to crs. SAND and GRAVEL w/ tr. silt, cobbles and boulders to 25 cm φ.		
2.0	8.0		SP		Brn. to gr. loose to med. dense fine to med. SAND w/ trace silt and occ. gravel.	①	G
4.0	12.0		CL-ML		Brn. stiff to v. stiff Silty CLAY to Clayey SILT w/ tr. to little sand, gravel and cobbles. [Till]	②	P _r = 1.5 W _n = 14.5%
	16.0		CL-ML			③	P _r = 3.0 A W _n = 16.4% W _L = 26.1% W _p = 19.9%
6.0	20.0				PHYLLITE Bedrock TD 5.5 m Dry		
	24.0						
8.0							



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LOG OF TEST PIT NO.

P19

BY: HWN	DATE: 10/15/92
APPROVED:	OWG:

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump






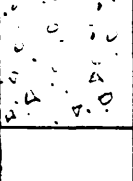
Date Logged: 09/24/92

Coordinates: 5014.1 N, 1761.6 E

Logged By: AFS

Excavation Method: CAT 235 Backhoe

Elev.: 1131.9 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL		DK. brn. to blk ORGANICS		
			SW-GW		Brn. to rst. brn. med dense fine to crs. SAND and GRAVEL w/ some cobbles and boulders to 30 cm ϕ , tr. silt. - bedding evident		
2.0					Gr. to brn. med. dense GRAVEL and SAND w/ little cobbles and tr. silt. - occ. beds of fine sand.		
4.0			GW-SW			(2)	G
							
6.0							
					TD 6.0m		
					Dry		
					Photos 2-6, 7 & 8		
8.0							



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LOG OF TEST PIT NO.

P20

BY:	DATE
HWN	10/16/92
APPROVED:	DWG:

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump

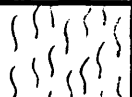


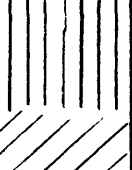
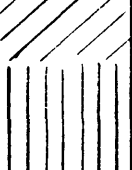

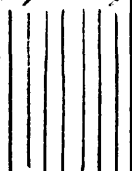
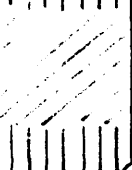



Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5337.2 N, 1796.6 E

Excavation Method: CAT 235 Backhoe

Elev.: 1178.2 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			DL		Brn. to blk. ORGANICS		
2.0			CL-ML		Dk. gr. to brn. stiff Silty CLAY to Sandy SILT w/tr. sand, gravel and cobbles, occ. boulders to 25 cm ϕ . [Till] - lens of brn fine to crs. sand between 1-2 m depth on one side of pit.		
1.0							
4.0							
6.0							
2.0							
8.0							
3.0							
10.0							
12.0							
4.0							
TD = 5.7m					Dry		

$P_f = 1.0 - 2.0$

①

A
 $W_L = 13.6\%$
 $W_U = 21.6\%$
 $W_p = 15.3\%$

Photo 2-9

PITEAU ASSOCIATES
 GEOTECHNICAL CONSULTANTS
 VANCOUVER CALGARY

LOG OF TEST PIT NO. P21

BY: HWN	DATE: 10/16/92
APPROVED:	DWG:

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump





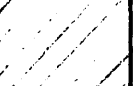
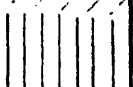

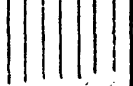



Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5513.8 N, 1568.7 E

Excavation Method: CAT 235 Backhoe

Elev.: 1198.6 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL		Brn. to blk. ORGANICS		
2.0			CL-ML		Dk. gr. stiff to v. stiff Silty CLAY to Sandy SILT w/ little sand and gravel, occ. cobbles and boulders to 50 cm ϕ [T:11] - slight sloughing		
1.0							
4.0							
6.0							
2.0							
8.0							
3.0							
10.0							
12.0							
4.0							
					TD 5.7 m		
					Dry		
							P _p = 2.0 - 3.0 A W _n = 13.6% W _L = 19.2% W _p = 13.3%



PITEAU ASSOCIATES
 GEOTECHNICAL CONSULTANTS
 VANCOUVER CALGARY

LOG OF TEST PIT NO.

P22

BY:	DATE:
HWN	10/16/92
APPROVED:	DWG:

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump

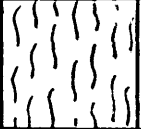


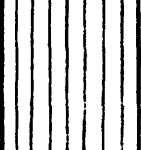

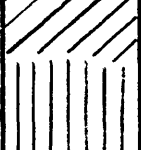
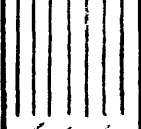




Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5510.8 N, 1656.1 E

Excavation Method: CAT 235 Backhoe

Elev.: 1206.7 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL		Brn. to blk. ORGANICS		
2.0			CL-ML		DK. gr. stiff to v. stiff Silty CLAY to Sandy SILT w/ little sand and gravel, occ. cobbles and boulders to 50 cm ϕ . [Till] - no sloughing		
1.0							
4.0							
6.0							
2.0							
8.0							
3.0							
10.0							
12.0							
4.0							

P_p = 2.5-3.0

Photo 2-10

TD 7.1 m

Dry



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LOG OF TEST PIT NO. P23

BY: HWN	DATE: 10/16/92
APPROVED:	DWG:

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump



Date Logged: 09/24/92

Coordinates: 5548.2 N, 1981.9 E

Logged By: AFS

Excavation Method: CAT 235 Backhoe

Elev.: 1231.6 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL		Brn. to blk. ORGANICS		
2.0			ML		Brn. to gr. v. stiff to hard Clayey SILT w/ little sand, gravel, cobbles and boulders to 50 cm ϕ .		
1.0					[Till]		
4.0							
6.0							Pp 73.0
8.0							
10.0							
12.0							
4.0					TD 5.9m		
					Dry		



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LOG OF TEST PIT NO. P24

BY: HWN DATE: 10/16/92

APPROVED: _____ DWG: _____

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump




Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5361.2 N, 2036.4 E

Excavation Method: CAT 235 Backhoe

Elev.: 1195.8 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL		Brn. to blk. ORGANICS		
2.0			ML		Brn. to gr v. stiff to hard Clayey SILT w/ little sand, gravel, cobbles and boulders to 50 cm ϕ . [Till]		
1.0							
4.0							
6.0							
2.0					Brn. Silty SAND w/ some gravel. ∇ gravel seeping TD=? (pit flooded)		
8.0							
3.0							
10.0							
12.0							
4.0							
14.0							



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 VANCOUVER CALGARY

LOG OF TEST PIT NO. P25

BY: HWN	DATE: 10/16/92
APPROVED:	DWG:

JOB NUMBER 92-530A

Date Excavated: 09/24/92

Location: Main Rock Dump



Date Logged: 09/24/92

Logged By: AFS

Coordinates: 5284.2 N, 2284.2 E

Excavation Method: CAT 235 Backhoe

Elev.: 1199.3 m

DEPTH		SYMBOL	SOIL/ROCK CLASS	TERRAIN CLASS	DESCRIPTION/COMMENTS	SAMPLES	TESTS
m	ft						
			OL		Brn. to blk. ORGANICS.		
2.0			SP-GP		Brn. med dense Silty SAND and GRAVEL, w/ little cobbles and occ. boulders to 40 cm ϕ . Wet.		
1.0					- lenses of sandy silt throughout		
4.0					- pit sloughing steadily		
6.0					← minor seepage		
2.0							
8.0							
3.0							
10.0							
12.0							
4.0							
					TD 5.8 m		
						①	G



PITEAU ASSOCIATES
GEOTECHNICAL CONSULTANTS

VANCOUVER CALGARY

LOG OF TEST PIT NO. P26

BY: HWN	DATE: 10/16/92
APPROVED:	OWG:

**TEST PITS
EXCAVATED BY EBA**

FARD, YUKON

SAMPLE TYPE GRAB NO RECOVERY

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	STANDARD PENETRATION				PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				DEPTH(U)
						10	20	30	40	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60	80	
0.0					ORGANIC ROOT MAT - including some silt and volcanic ash																					0
1.0					SILT (TILL) -- sandy, some cobbles and boulders to 200 mm diameter, damp to moist, olive brown																					2.0
2.0					BEDROCK - phyllite, grey																					5.0
2.5					- weathered for 0.2 m, then hard to excavate																					6.0
3.0					END OF TESTPIT @ 2.5 m - dry on completion - no sloughing																					10.0
4.0																										12.0

EBA Engineering Consultants Ltd.
Whitehorse, Yukon

LOGGED BY: JRT
REVIEWED BY: JRT
Fig. No:

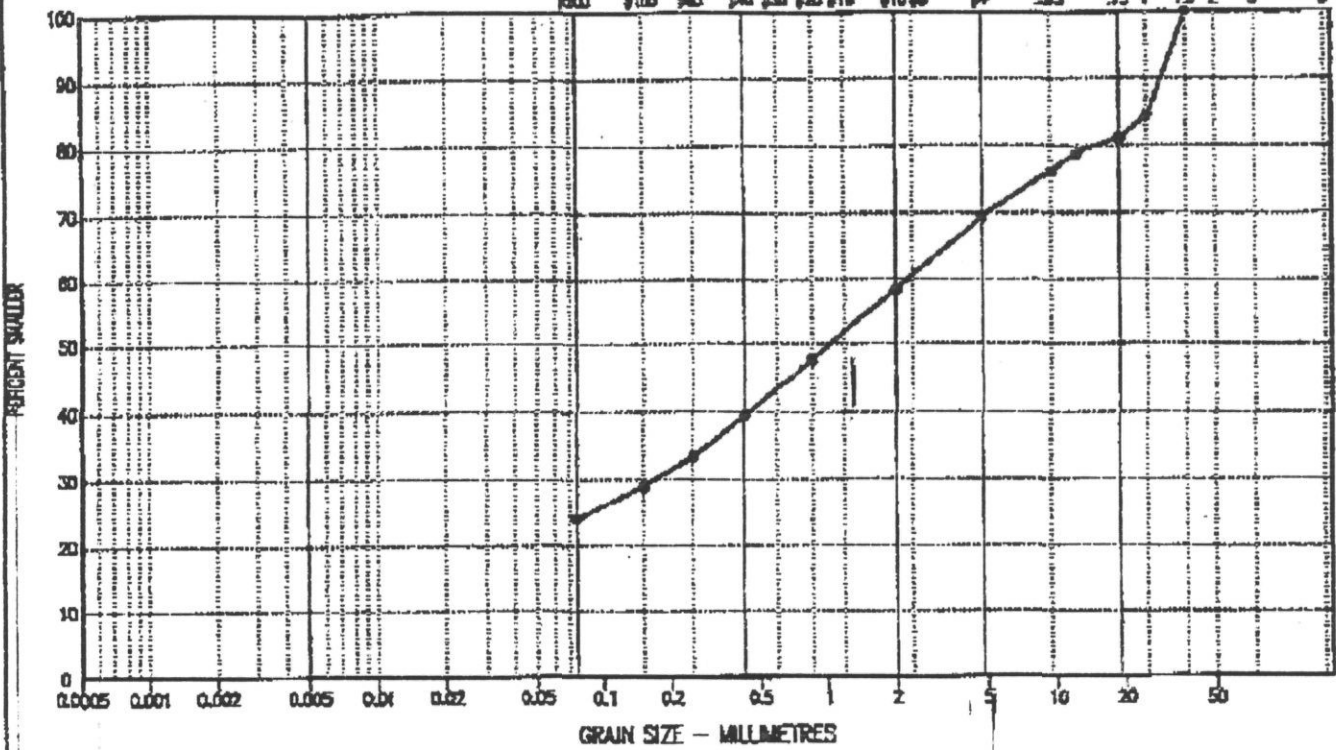
COMPLETION DEPTH: 2.5 m
COMPLETE: 95/08/08
Page 1 of 1

PARTICLE SIZE - ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE

U.S. STANDARD SIEVE SIZES

200 100 60 30 20 10 # 4 20 10 5 3 1



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
—	11944-GR01	1.00 - 1.20	24.0	45.4	30.6	76.4	0.4	SM

Project: D201-95-11944

Date Tested: 95/08/16

BY: JSB

Tested in accordance with ASTM D422 unless otherwise noted.

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SAMPLE TYPE GRAB NO RECOVERY

DEPTH(m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	STANDARD PENETRATION				PERCENT GRAVEL				DEPTH(ft)
						10	20	30	40	20	40	60	80	
0.0					ORGANIC ROOT MAT AND VOLCANIC ASH									0.0
2.0					SILT (TILL) - sandy, some cobbles and boulders to 200 mm diameter, low plastic, damp to moist, olive brown									2.0
4.0					- consistent with depth									4.0
6.0														6.0
8.0														8.0
10.0														10.0
12.0														12.0
14.0														14.0
16.0														16.0
18.0					BEDROCK - phyllite, grey									18.0
2.0					END OF TESTPIT @ 2.9 m									
					- dry on completion									
					- no sloughing									

EBA Engineering Consultants Ltd. Whitehorse, Yukon	LOGGED BY: JRT REVIEWED BY: JRT Fig. No:	COMPLETION DEPTH: 2.9 m COMPLETE: 95/08/08 Page 1 of 1
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SAMPLE TYPE GRAB NO RECOVERY

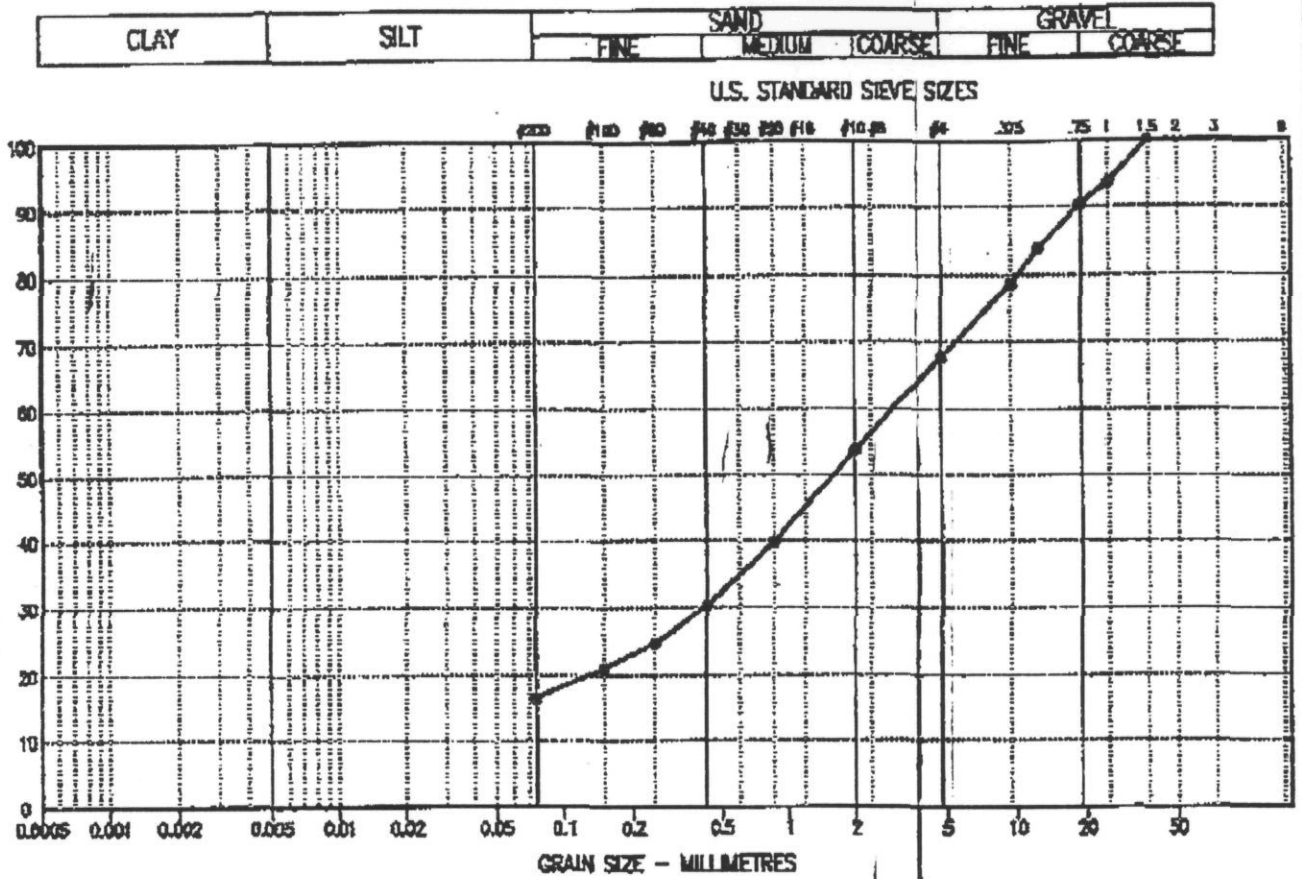
DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	STANDARD PENETRATION				PERCENT GRANEL				DEPTH (ft)					
						10	20	30	40	20	40	60	80		PERCENT SAND	PERCENT SILT OR FINES	PERCENT CLAY		
						PLASTIC ILL. LIQUID													
						10 20 30 40				20 40 60 80									
0.0					ORGANIC ROOT MAT													0.0	
0.5					SAND (TILL) - weathered bedrock fragments near surface, then grading into SILT (TILL) - sandy, some cobbles and boulders to 200 mm diameter, low plastic, moist, olive brown													0.5	
1.0																		1.0	
1.5																		1.5	
2.0					BEDROCK - weathered, phyllite													2.0	
2.5					- more intact, water entering testpit from both sidewalls													2.5	
3.0					END OF TESTPIT @ 3.0 m - water at 2.8 m on completion - no sloughing													3.0	
3.5																		3.5	
4.0																		4.0	
4.5																		4.5	
5.0																		5.0	

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Whitehorse, Yukon

LOGGED BY: JRT
REVIEWED BY: JRT
Fig. No:

COMPLETION DEPTH: 3.0 m
COMPLETE: 95/08/08

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
●	11944-GR03	1.60 - 1.80	16.5	51.2	32.3	71.1	1.2	SM

Project: 0201-95-11944

Date Tested: 95/08/16

BY: JSB

Tested in accordance with ASTM D422 unless otherwise noted.

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SAMPLE TYPE		GRAB <input checked="" type="checkbox"/> NO RECOVERY <input type="checkbox"/>		SOIL DESCRIPTION		STANDARD PENETRATION				PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				DEPTH (m)
DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC			SOIL SYMBOL	10 20 30 40				20 40 60 80				20 40 60 80				20 40 60 80							
							PLASTIC M.C. LIQUID				20 40 60 80				20 40 60 80				20 40 60 80							
							10 20 30 40				20 40 60 80				20 40 60 80				20 40 60 80							
0.0					ORGANIC ROOT MAT																	0.0				
1.0					GRAVEL AND SAND - some cobbles and boulders to 200 mm diameter, trace of silt, damp, olive brown																	1.0				
2.0					SILT (TILL) - sandy, some cobbles and boulders to 200 mm diameter, damp to moist, low plastic, olive brown																	2.0				
3.0																						3.0				
4.0																						4.0				
5.0					- darker colour and moister with depth																	5.0				
6.0					END OF TESTPIT @ 4.0 m - dry on completion - no sloughing																	6.0				
7.0																						7.0				
8.0																						8.0				
9.0																						9.0				
10.0																						10.0				

EBA Engineering Consultants Ltd.
Whitehorse, Yukon

LOGGED BY: JRT
REVIEWED BY: JRT
Fig. No:

COMPLETION DEPTH: 4.0 m
COMPLETE: 95/08/08
Page 1 of 1

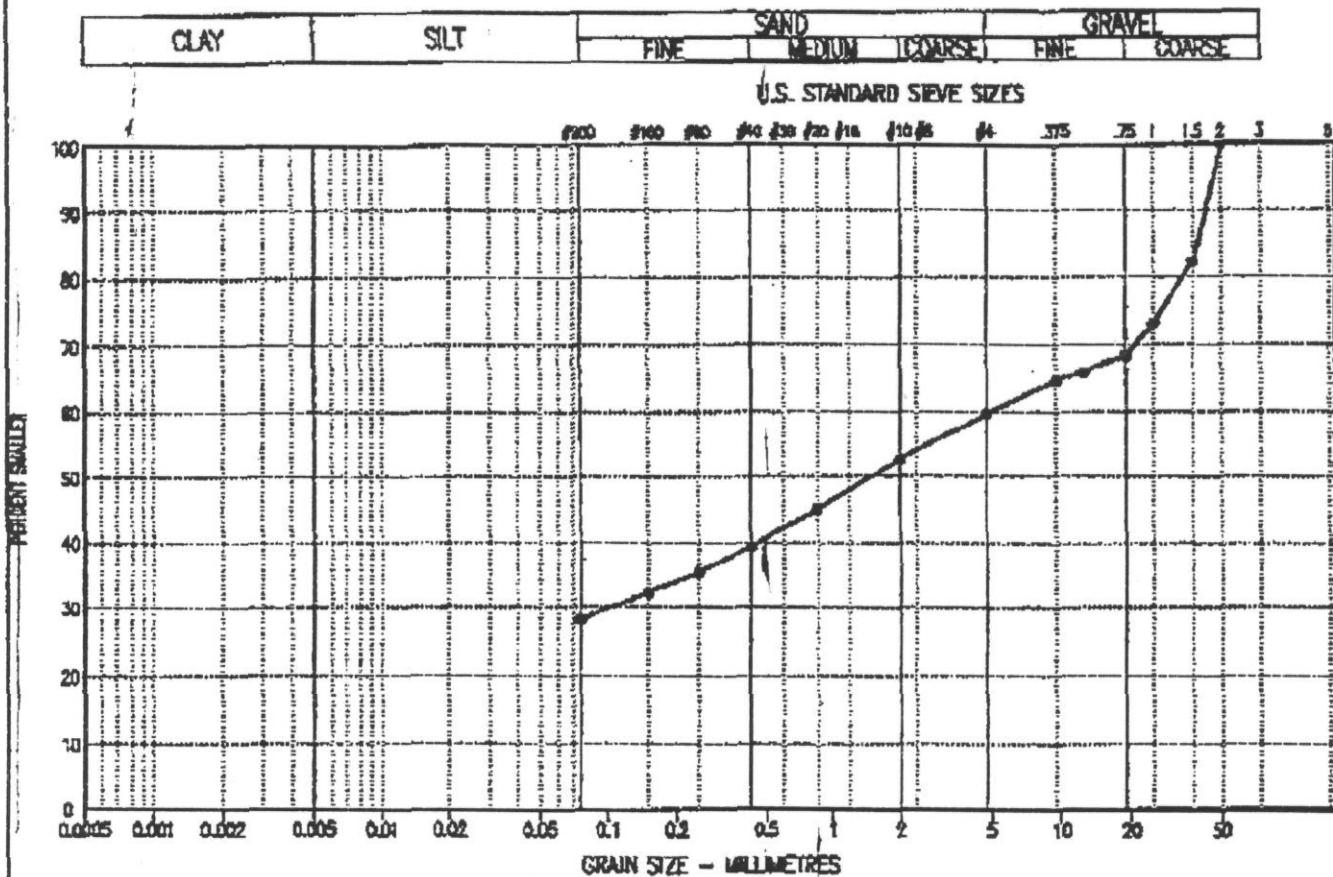
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DEPTH(m)	SAMPLE TYPE	SAMPLE NO	USC					FLUIDITY				PERCENT SAND					PERCENT SILT OR FINES				PERCENT CLAY					
				PLASTIC		M.C.		LIQUID		20		40		60			80		20		40		60		80	
				10	20	30	40	10	20	30	40	10	20	30	40		10	20	30	40	10	20	30	40	10	20
0.0				ORGANIC ROOT MAT AND VOLCANIC ASH																				0.0		
1.0				SILT (TILL) — sandy, some cobbles and boulders to 200 mm diameter, damp to moist, low plastic, olive brown																				2.5		
2.0				— some boulders to 600 mm diameter below 2.0 m depth																				4.0		
3.0				END OF TESTPIT @ 3.4 m — dry on completion — no sloughing																				6.0		
4.0																							8.0			
5.0																							10.0			
6.0																							12.0			
7.0																							14.0			
8.0																							16.0			
9.0																							18.0			

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Whitehorse, Yukon

LOGGED BY: JRT
REVIEWED BY: JRT
Fig. No:

COMPLETION DEPTH: 3.4 m
COMPLETE: 95/08/08

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
—●—	11944-GRO5	2.60 - 2.80	28.1	31.5	40.4	190.4	0.1	GM

Project: 0201-95-11944

Date Tested: 95/08/16

BY: JSB

Tested in accordance with ASTM D422 unless otherwise noted.

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TOE OF GRUM WASTE DUMP-ANVIL RANGE MINE		CLIENT: ANVIL RANGE MINING CORPORATION		TEST PIT NO: 11944-GRO6																								
WEST OF GRUM CREEK		EXCAVATOR: CAT 235 B		PROJECT NO: 0201-95-11944																								
FARO, YUKON																												
SAMPLE TYPE <input checked="" type="checkbox"/> GRAB <input type="checkbox"/> NO RECOVERY																												
DEPTH(m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION			STANDARD PENETRATION				PERCENT GRAVEL				PERCENT SAND				PERCENT SILT OR FINES				PERCENT CLAY				DEPTH(ft)
					10	20	30	40	20	40	60	80	20	40	60	80	20	40	60	80	20	40	60	80				
0.0					ORGANIC ROOT MAT																					0.0		
0.5					SILT (TILL) - sandy, some cobbles and boulders to 200 mm diameter, damp to moist, low plastic, olive brown																					1.5		
1.0		1			BEDROCK - platy grey phyllite - easy to excavate																					3.0		
2.0																										6.0		
3.0		2			END OF TESTPIT @ 3.0 m - dry on completion - some phyllite sloughing																					10.0		
4.0																										12.0		
5.0																										16.0		

EBA Engineering Consultants Ltd.
Whitehorse, Yukon

LOGGED BY: JRT
REVIEWED BY: JRT
Fig. No:

COMPLETION DEPTH: 3.0 m
COMPLETE: 95/08/08

SAMPLE TYPE		GRA#	<input checked="" type="checkbox"/> NO RECOVERY	SOIL DESCRIPTION				STANDARD PENETRATION				PERCENT GRAVEL				DEPTH (ft)			
DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC					SOIL SYMBOL	PLASTIC		M.C.		LIQUID		20		40	60	80
					10		20		30		20		40		60		80		
					10		20		30		20		40		60		80		
					10		20		30		20		40		60		80		
					10		20		30		20		40		60		80		
0.0					ORGANIC ROOT MAT - volcanic ash														0.0
0.5					SAND - trace of gravel, medium grained, gravel to 30 mm diameter, damp, mottled grey and brown														0.5
1.0					- uniform with depth														1.0
2.0		1																	2.0
3.0																			3.0
4.0																			4.0
5.0																			5.0
6.0																			6.0
7.0																			7.0
8.0																			8.0
9.0																			9.0
10.0																			10.0
11.0																			11.0
12.0																			12.0
13.0																			13.0
14.0																			14.0
15.0																			15.0
16.0																			16.0
17.0																			17.0
18.0																			18.0
19.0																			19.0
20.0																			20.0
21.0																			21.0
22.0																			22.0

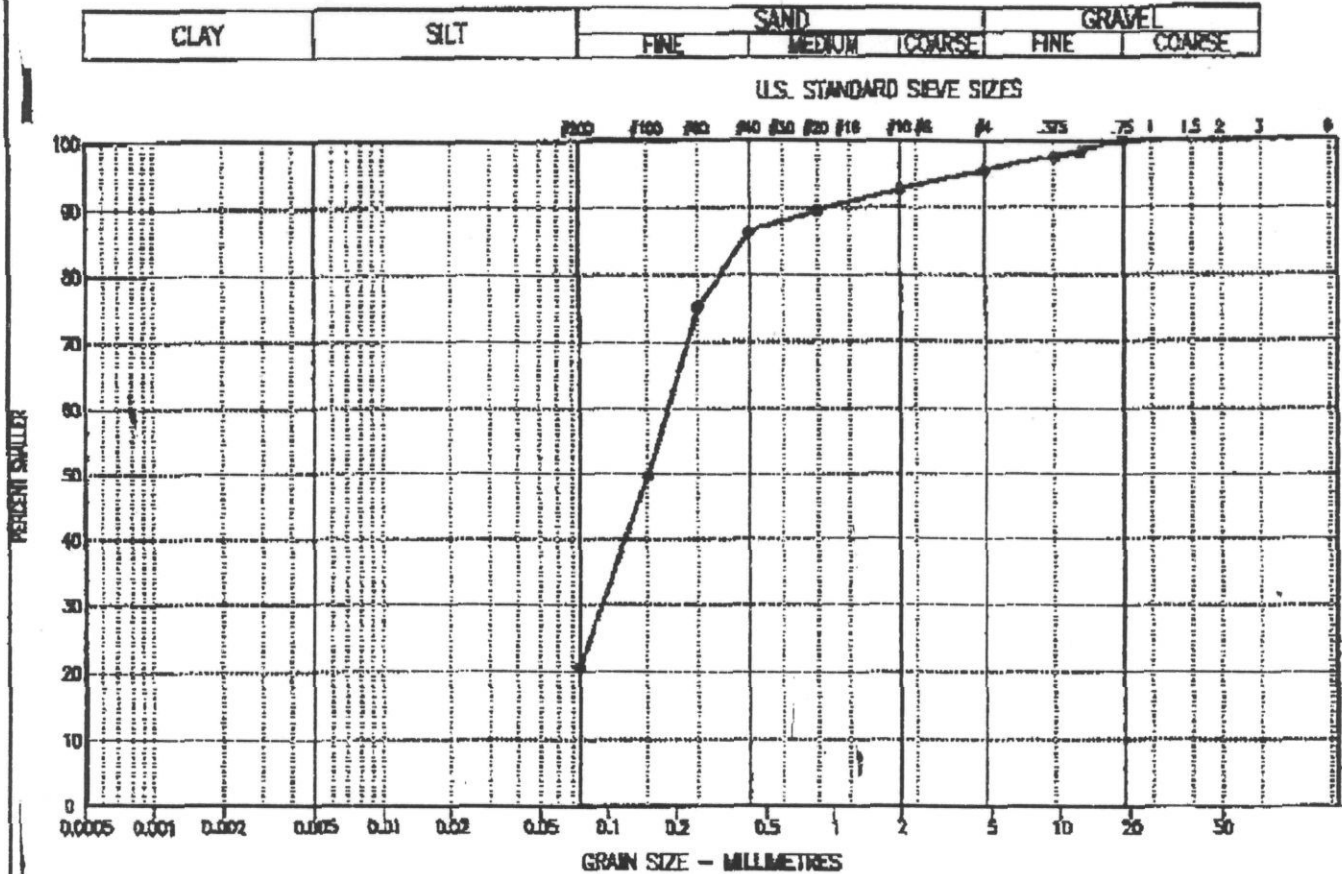
SILT (TLL) - sandy, some cobbles and boulders to 200 mm diameter, damp to moist, low plastic, olive brown

END OF TESTPIT @ 5.0 m
 - dry on completion
 - no sloughing

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 Whitehorse, Yukon

LOGGED BY: JRT	COMPLETION DEPTH: 5.0 m
REMOVED BY: JRT	COMPLETE: 95/08/08
Fig. No:	Page 1 of 1

PARTICLE SIZE - ANALYSIS OF SOILS



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
	11944-GR07	2.00 - 2.20	20.5	74.9	4.6	5.2	1.4	SM

Project: 0201-95-11944

Date Tested: 95/08/16

By: JSB

Tested in accordance with ASTM D422 unless otherwise noted.

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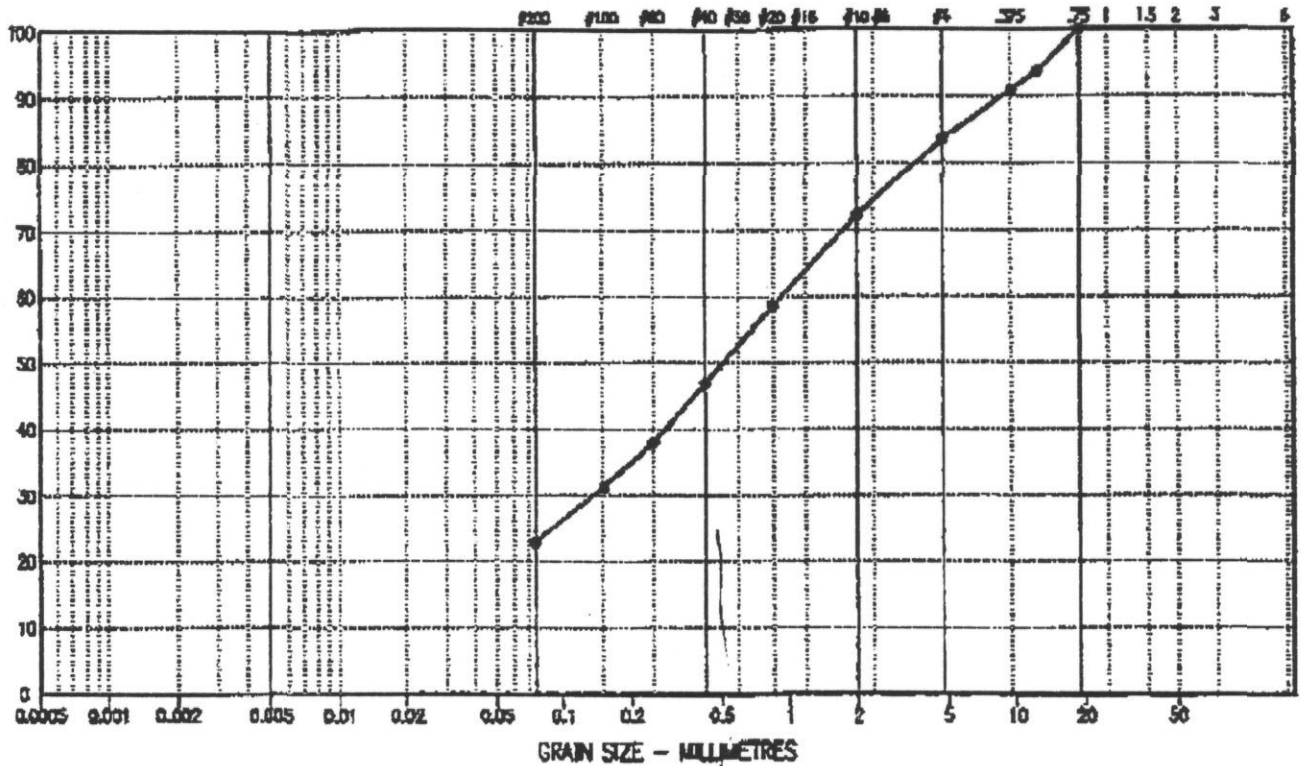
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PARTICLE SIZE - ANALYSIS OF SOILS

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE

U.S. STANDARD SIEVE SIZES



SYMBOL	BOREHOLE NUMBER	DEPTH (m)	DESCRIPTION			Cu	Cc	U.S.C
			CLAY & SILT %	SAND %	GRAVEL %			
	11944-GR07	3.50 - 3.70	22.8	60.9	16.3	29.5	0.6	SM

Project: 0201-95-11944

Date Tested: 95/08/16

BY: JSB

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SAMPLE TYPE <input checked="" type="checkbox"/> GRAB <input checked="" type="checkbox"/> NO RECOVERY														
DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL SYMBOL	SOIL DESCRIPTION	STANDARD PENETRATION				PERCENT GRANELS				DEPTH (ft)
						10	20	30	40	20	40	60	80	
						PLASTIC M.C. LIQUID 10 20 30 40				PERCENT SAND 20 40 60 80				
										PERCENT SILT OR FINES 20 40 60 80				
										PERCENT CLAY 20 40 60 80				
0.0					PEAT AND ORGANICS - wet (pools of water at surface)									0.0
1.0					SAND (TILL) - clayey, trace of sand, numerous cobbles and boulders throughout, medium plastic, moist to wet, dark grey to black									3.0
2.0					- 75 mm thick wet sand lens									6.0
3.0					- consistent with depth									9.0
4.0					END OF TESTPIT @ 4.2 m									12.0
5.0					- water seeping from organics and wet sand lens - sides sloughing - testpit backfilled									15.0
6.0														18.0

PARTICLE SIZE - ANALYSIS OF SOILS

