TRANSPORTATION
ORIGINAL REPORT
Yukon
PLEASE RETURN
GEOTECHNICAL

GEOTECHNICAL EVALUATION
PROPOSED VISITOR RECEPTION CENTRE
WHITEHORSE, YUKON

Submitted to:
GOVERNMENT OF YUKON
GOVERNMENT SERVICES

0201-10476
NOVEMBER, 1990

eba

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1.0 INTRODUCTION

A geotechnical evaluation of subsurface soil conditions has been completed by EBA Engineering Consultants Ltd. (EBA), at the site of the proposed Whitehorse Visitor Reception Centre (VRC) Building. The site is located on the east side of the Alaska Highway by the Airport, immediately south of the Yukon Transportation Museum.

It is understood that development at the site will comprise a one storey structure with no basement. An access will need to be constructed from the Alaska Highway, and the building will require a large parking area.

The investigation was authorized in early October, 1990 by Mr. K. Klein, Project Manager, Yukon Department of Government Services. This report summarizes the results of the field and laboratory testing program, and presents engineering recommendations pertaining to foundations and other geotechnical aspects of site development.

2.0 SITE EVALUATION

2.1 Background Information

The VRC site consists of two distinct areas. The proposed vehicle parking area is situated on natural ground at the location of an abandoned baseball diamond. The building site is immediately south of this, separated by a thin buffer of trees.

At the time of the investigation the building site was vacant, and had recently been levelled by YTG Highways equipment. This particular site has been a general "dumping area" for numerous years, and is covered in miscellaneous fill from airport construction projects. The fill has been end dumped from trucks, and flattened on several occasions.

2.2 Site Investigation

Six boreholes were drilled at the site on October 15, 1990. The borings ranged in depth from 3.0 m to 12.0 m, with dynamic cone penetration tests conducted to a depth of 18 m in two holes at the building site. The locations of the boreholes are shown on the Site Plan, presented as Drawing No. 10476-A-01, Appendix A. All holes were drilled with an ATV-mounted CME 750 drill rig equipped with both hollow stem and solid flight augers.

Sampling consisted of taking disturbed samples from the auger cuttings, and from the split-spoon drive sampler used to perform the Standard Penetration Test (SPT). The SPT tests were completed in the two deep boreholes at regular intervals, to evaluate in situ soil consistency for foundation design purposes.

Logging of the boreholes, classification of soil samples, and supervision of drilling operations was carried out by an EBA engineering technologist.

2.3 Laboratory Testing

All soil samples were returned to EBA's Whitehorse laboratory for basic classification testing. Natural moisture contents were determined for all samples, and selected samples were tested for grain size characteristics. The results of the basic classification testing are presented on the borehole logs, where applicable, and on the grain size curves in Appendix A.

3.0 SITE CONDITIONS

3.1 Stratigraphy

The subsurface stratigraphy has been determined on the basis of observations and testing from the six boreholes drilled at the site. Detailed borehole logs which outline stratigraphy at each borehole location are included in Appendix A.

3.1.1 Building Site (BH's 10476-01 to 10476-03)

The building site consists of about 3.3 m of loose SAND AND SILT fill, containing a trace of gravel, and numerous pieces of debris such as wire, pipe, asphalt chunks and wood. This overlies a thin layer of natural ORGANICS and SAND, over SILT to the maximum depth of borehole penetration. The SILT stratum is a pro-glacial lacustrine deposit which extends to significant depths along the Yukon River valley in this area.

3.1.2 Parking Area (BH's 10476-04 to 10476-06)

The parking area is underlain by natural silty SAND for at least 1.5 m, as determined from the three holes drilled. The lacustrine SILT was encountered below this in all holes.

3.2 Groundwater

The groundwater table was encountered in one of the boreholes under the building, at about 7.5 m depth, or about 4.0 m below the natural ground surface. This is generally consistent with other groundwater elevations in the area.

3.3 Surface Drainage

The ditch along the Alaska Highway in front of the building site was noted to contain water, at the time of drilling. Also, the parking area is over 2.0 m lower than the building site, and just above the ditch elevation. Spring flooding may occur in the parking area if the design elevation is not raised above the existing elevation.

4.0 RECOMMENDATIONS

4.1 Building Foundations

It has been assumed that the building will be constructed without a basement, and the foundation recommendations have been prepared accordingly. Two foundation alternatives are presented--concrete footings on an engineered pad, or driven steel piles through the fill into natural soils below. The control of frost heave is a significant design consideration for any foundation at the site.

4.1.1 Concrete Footings on Engineered Pad

This foundation consists of subcutting all fill materials within the building envelope, placing a woven geotextile fabric, then backfilling and compacting frost stable fill up to the design elevation. Footings or a thickened slab may then be constructed for the building foundation.

It should be noted that if this foundation option is considered, then it would be practical to install a heated basement under the building. This would save backfill costs, minimize the potential for frost heave, and provide extra storage room.

(i) Subcut and waste all fill and organics within the building envelope plus 2.0 m on all sides. The excavation is estimated to average about 3.5 m in depth.

The removal of soil must take place with a large backhoe from the pad surface, otherwise, unacceptable softening of the subgrade will occur.

(ii) Place a woven geotextile (Nilex P500 or approved alternate) on the prepared subgrade.

(iii) Backfill the excavation with non-frost susceptible (NFS) gravel conforming to the following specifications.

C.G.S.B. Sieve Designation (um)	Weight Passing (%)
80,000	100
25,000	60 - 100
12,000	40 - 90
5,000	20 - 65
1,250	9 - 35
315	5 - 23
80	4 - 8

This fill must be placed in maximum lift thicknesses of 200 mm and compacted to at least 98 percent Standard Proctor maximum dry density (ASTM D698).

(iv) Footings placed on top of the granular pad may be designed on the basis of a static net bearing pressure of 192 kPa (4000 psf).

(v) Minimum footing widths of 500 and 900 mm are recommended for strip and spread footings, respectively.

(vi) Footings should be cast onto a clean, undisturbed surface of the gravel backfill. No loose or disturbed material should be allowed to remain on the bearing surface of the footing excavation. If an acceptable surface cannot be prepared using mechanical equipment, hand cleaning will be required. Care should be taken to ensure that all cobbles greater than 75 mm in diameter are removed from the bearing surface. In addition, at these coarse-grained soil locations, extra steel should be added to the footing to span localized stress concentrations.

(vii) Footing excavations must be protected from both wetting and drying, and the inflow of surface or groundwater at all times. The natural moisture content of the soil must be maintained. Footings should neither be cast directly onto or over frozen soil, nor should the soil beneath or adjacent to the footings be allowed to freeze, subsequent to footing installation.

(vii) Footing excavations should be observed by EBA to ensure that the bases are properly prepared. furthermore, inspections are necessary to confirm uniformity of soil conditions and to ensure that the dimensioning is in accordance with the foundation drawings.

4.1.2 Driven Steel Piles

Driven steel H or pipe piles would eliminate the need for significant subcut and backfill on site. Piles would support the anticipated building loads and at the same time provide anchorage against frost heave forces.

Steel H or pipe piles may be spaced on the basis of the following allowable loads. Due to the sensitive nature of the subgrade, and corresponding reduction in capacities due to pile grouping, single piles only are recommended under each bearing point. The foundation system must consist of all H piles or all pipe piles, not a combination of both. Pile capacities are based primarily on friction, therefore a "set" has not been specified.

Allowable Capacities for
Driven Steel H Piles
Whitehorse Visitor Reception Centre

Size	Length (m)	Allowable Capacity (kN)
HP200 (53.6 kg/m)	12	48.6
	15	63.0
	18	77.4
HP 250 (62.5 kg/m)	12	62.8
	15	80.8
	18	98.8

Allowable Capacities for
Concrete Filled Steel Pipe Piles
Whitehorse Visitor Reception Centre

Outside Diameter (mm)	Length (m)	Allowable Capacity (kN)
219 (11.9 mm wall)	12	55.0
	15	63.3
	18	71.6
273 (11.9 mm wall)	12	77. 8
	15	88.1
	18	98.4

The pipe piles must be driven closed end and filled with concrete, after achieving the desired depth.

4.1.2.1 Frost Jacking Considerations

It has been assumed that the building will be heated all year. Therefore, frost protection measures will only be required for the exterior piles.

All exterior piles must be placed in a pre-drilled hole, 500 mm in diameter, 2.0 m deep. A "guide" must be constructed to centre the piles in the hole, and after installation, the hole backfilled with NFS gravel as specified in Section 4.1.1. Teflon tape or other pile coating to reduce the frost heave potential should also be incorporated into the design for frost heave resistance.

Perimeter foundation insulation as discussed in Section 4.4 will also be required.

4.1.2.2 Pile Installation and Inspection

The piles may be installed with either a diesel hammer or a vibratory hammer. The driving hammer selection should be reviewed by the geotechnical consultant prior to driving piles. Pile installation will likely be fairly rapid, as the silt stratum will not offer much resistance. If pipe piles are selected, they should be inspected after driving to ensure that no damage has been done to the tip. After approval, the piles must be filled with concrete having a slump of 125 mm to 175 mm.

During the pile driving operations, the pile length and penetration performance should be monitored by representatives of EBA Engineering Consultants Ltd., to ensure that the specifications are being adhered to.

Prior to installing the foundation system, it may be worthwhile to drive several test piles. This data would be used to determine the optimum pile driving hammer and pile tip configuration.

4.1.2.3 Pile Load Test

The pile capacities presented herein should be confirmed by a pile load test, as there is no information available concerning the performance of friction piles in this area. One (or preferably two) piles should be selected at the outset of construction to be load tested to failure. The piles would then be discarded. It would be necessary for EBA to assist with the preparation of the test specifications and to supervise the actual load tests.

An advantage to pile load testing is that pile capacities may be increased, thus reducing the number, length or size of pile, resulting in decreased foundation costs.

4.2 Earthquake Considerations

Whitehorse is within seismic zone 4 (ground acceleration) according to the National Building Code of Canada (1990). This is the area where ground accelerations from 0.16 to 0.23 g have a 10% probability of exceedance in 50 years. For earthquake loading design purposes, the foundation factor as defined in the National Building Code of Canada is considered to be 1.3. In the event of short term dynamic earthquake loading, the allowable bearing pressure for strip and spread footings may be increased to 288 kPa.

4.3 Concrete Floor Slab

A slab on grade is only feasible if the engineered pad foundation is selected. If driven piles are to be used, a structural slab must then be incorporated into the pile load design.

4.4 Frost Heave/Insulation Requirements

If the engineered pad foundation option is selected, frost have should not be a problem, as there will be at least 3.0 m of NFS fill below the foundation.

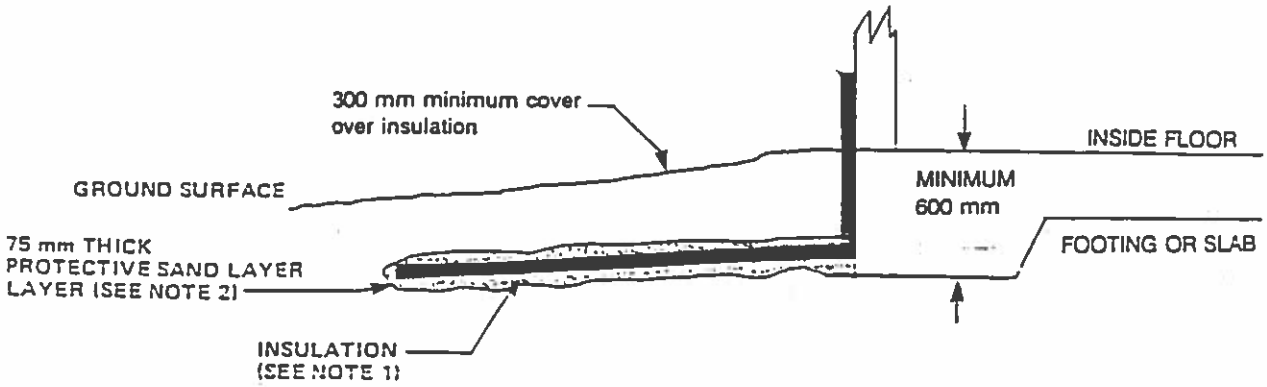
For the pile foundations, exterior perimeter insulation is recommended. This should consist of DOW HI or SM board insulation, extending at least 0.3 m above grade, and at least 1.2 m out from the sides of the building. Details are shown on Figure 1.

4.5 Site Drainage

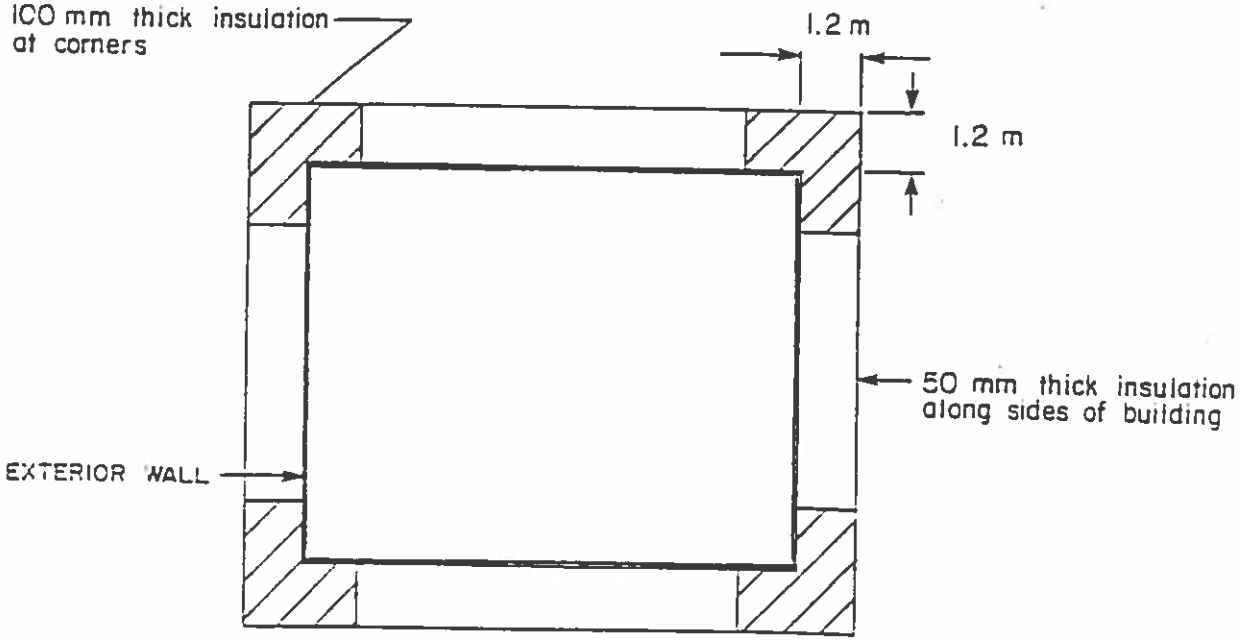
In all areas, final site grading should enhance positive drainage and direct water away from the building. Ponding adjacent to the building must be prevented, as infiltration adjacent to the foundation elements and/or beneath the floor slab could have detrimental effects on the performance of these structural elements. Runoff from the roof of the proposed building should be directed onto splash pads, and away from the building. This is particularly important during late fall, immediately prior to freeze-up.

4.6 Parking

Prior to the construction of the pavement structure, all deleterious materials should be removed. After stripping, the surface of the subgrade should be compacted to 98 percent of Standard Proctor maximum dry density using heavy vibratory compactors. This may involve scarifying and moisture conditioning to obtain the optimum moisture content. If fill is required to achieve the desired subgrade elevation, this material should consist of clean, well-graded gravel, free of deleterious debris meeting the gradation requirement as outlined in Section 4.1.1. This fill should be placed in 200 mm lifts and compacted to 98 percent of Standard Proctor maximum dry density.



PROFILE VIEW



PLAN VIEW

NOTES:
1. The insulation should be moisture resistant and suitable for burial (i.e. Dow Chemical HI or SM series styrofoam or polyurethane).
2. A minimum bedding thickness of 75 mm of the fine to medium sand should be placed above and below the insulation for protection.
3. Not to scale.

N.T.S.

EBA Engineering Consultants Ltd.	PROJECT: WHITEHORSE VISITOR RECEPTION CENTRE
CLIENT: GOVERNMENT OF YUKON GOVERNMENT SERVICES	TITLE: GENERAL FOUNDATION INSULATION DETAILS
DATE / DWN / CHKD	DWG NO. 0201-10476

FIGURE 1

Pavement structures proposed for the parking/loading areas are presented below. It is assumed that heavy vehicle (trucks, garbage disposal vehicles and containers, etc.) will not use the car parking area.

Class	Thickness of Asphaltic Concrete	Thickness of Crushed Gravel Basecourse
Car Parking	60 mm	150 mm
Truck lanes/ loading areas	100 mm	200 mm

4.7 Concrete

It is recommended that all concrete have a minimum "28 day" compressive strength of 25 MPa with an entrained air content of 5% to 7%. Although not specifically tested at this site, similar soils tested on adjacent sites did not contain significant soluble sulphate contents, therefore Type 10 Normal Portland cement may be used.

5.0 INSPECTION

Where backfilling and compaction is required it is recommended that compaction testing be conducted by a qualified geotechnical engineer or his/her representative. This is especially important for the floor slab, pavement areas, structural fills and where service trenches cross pavement areas.

6.0 CLOSURE

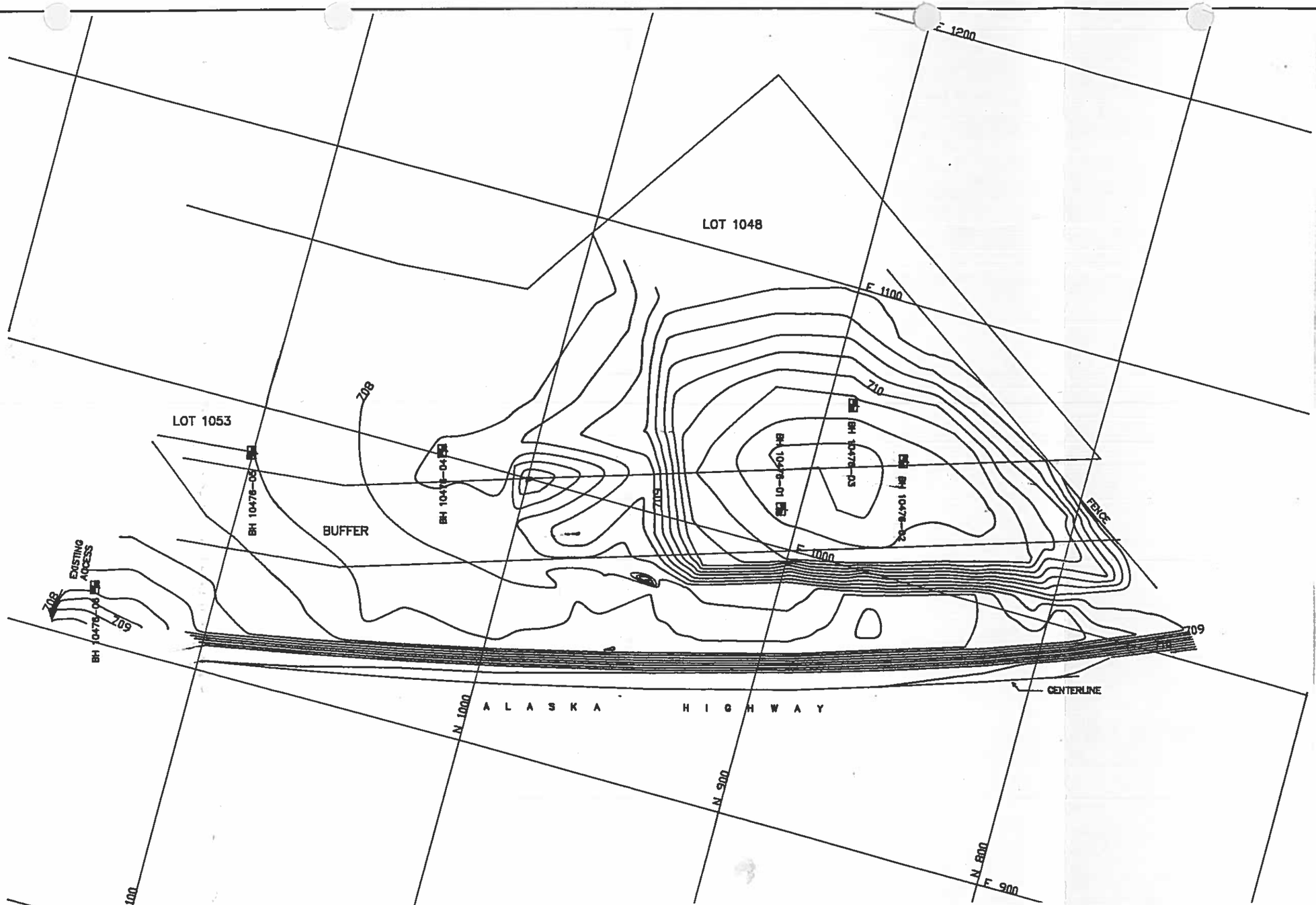
The information and recommendations presented herein are based on a geotechnical evaluation of the data obtained from six boreholes drilled at the proposed site. The conditions reported herein are believed to be representative of the site. However, if different conditions are encountered during subsequent phases of the site development, we request that EBA be notified so that our recommendation can be re-evaluated on the basis of these new findings.

This report has been prepared for the Government of Yukon, for use in foundation design and other geotechnically affected aspects of the site development for the Whitehorse Visitor Reception Centre. Further information regarding the use of this report is presented in the General Conditions in Appendix A.

Respectfully submitted,
EBA Engineering Consultants Ltd.

J.R.Trimble, P.Eng.
Project Director
Office Manager

JRT/was



ORIGINAL DRAWING SUPPLIED BY YUKON ENGINEERING SERVICES

EBA Engineering Consultants Ltd.

CLIENT GOVERNMENT OF YUKON
DEPARTMENT OF GOVERNMENT SERVICES
PROPERTY MANAGEMENT BRANCH

PROJECT SITE PLAN AND BOREHOLE LOCATIONS

TITLE PROPOSED VISITOR RECEPTION CENTRE
WHITEHORSE, YUKON

DATE 1990-11-05	DWN.	CHKD.	FILE NO. 0201-10476	0201-10476-A-01

VISITOR RECEPTION CENTRE	CLIENT: YTG–DEPT OF GOVERNMENT SERVICES	BOREHOLE No. 10476–01
GEOTECHNICAL INVESTIGATION	DRILL RIG:CME 750 c/w HOLLOW STEM AUGERS	Project No: 0201–10476
WHITEHORSE, YUKON	UTM ZONE: 8 N6730189.00 E495752.00	ELEVATION 710.60 (m)

SAMPLE TYPE ■ GRAB SAMPLE ⊘ NO RECOVERY ⊠ STANDARD PEN. ▤ CONE PENETRAT. ▯ 75 mm CRREL ▯ 100 mm CRREL

DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL/ROCK DESCRIPTION
0.0	■	1	SM	SAND AND SILT(FILL)(SM)–some gravel to gravelly, gravel is angular, up to 75 mm, damp, compact (est.), light olive brown to medium brown with depth
				– fill is variable
				– finer below 1.7 m
				– loose and finer between 2.2 and 3.0
				– some wood fibres in cuttings
3.0	⊠	3	SM/SP	SAND(SM/SP)–some to trace of silt, trace of organics, sand is medium to coarse grained, moist to wet, compact, grey
4.0				
5.0	⊠	4	ML	SILT(ML)–some clay to clayey, trace of fine sand, wet becoming very wet, with depth, firm to soft, dark olive
6.0	⊠	5	ML	
7.0				
8.0	⊠	6	ML	– water table measured at 7.5 m upon completion
9.0	⊠	7	ML	– become grey below 9.0 m
10.0				
11.0	⊠	8	ML	
12.0	⊠	9	ML	– drilled with hollow stem auger to 12.0 m
13.0				– cone from 12.0 to 18.0 m (driven)
14.0				
15.0				
16.0				
17.0				
18.0				END OF BOREHOLE AT 18.0 m
19.0				
20.0				

■ STANDARD PENETRATION ■ 20 40 60 80
▲ CONE PENETRATION TEST ▲ 10 20 30 40
PLASTIC M.C. LIQUID 20 40 60 80

■ PERCENT GRAVEL ■ 20 40 60 80
● PERCENT SAND ● 20 40 50 80
▲ PERCENT FINES ▲ 20 40 60 80
◆ PERCENT CLAY ◆ 20 40 60 80

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0, 22.0, 24.0, 26.0, 28.0, 30.0, 32.0, 34.0, 36.0, 38.0, 40.0, 42.0, 44.0, 46.0, 48.0, 50.0, 52.0, 54.0, 56.0, 58.0, 60.0, 62.0, 64.0

EBA Engineering Consultants Ltd.
Whitehorse, Yukon

COMPLETION DEPTH 18.0 m		COMPLETE 90/10/15
LOGGED BY MCP	DWG NO.	Page 1 of 1

VISITOR RECEPTION CENTRE	CLIENT: YTG–DEPT OF GOVERNMENT SERVICES	BOREHOLE No. 10476-02
GEOTECHNICAL INVESTIGATION	DRILL RIG: CME 750 SOLID SHAFT AUGERS	Project No: 0201-10476
WHITEHORSE, YUKON	UTM ZONE: 8 N6730149.00 E495781.00	ELEVATION 710.70 (m)

SAMPLE TYPE ■ GRAB SAMPLE ⊘ NO RECOVERY ⊠ STANDARD PEN. ▤ CONE PENETRAT. ▯ 75 mm CRREL ▮ 100 mm CRREL

DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL/ROCK DESCRIPTION
0.0		1	SM	SAND(FILL)(SM)–some gravel to gravelly, trace of clay, gravel is angular to 75 mm, damp, compact (est.), light olive brown
1.0				– sandier below 1.0 m
2.0		2	SM/SP	SAND(FILL)(SM/SP)–some fine gravel, trace of silt, damp, compact (est.), dark orangey brown
3.0				– becomes siltier, wet and grey at 3.0 m (FILL LINE)
4.0		3	ML	SILT(ML)–some clay to clayey, trace of fine grained sand, wet, soft, dark olive
5.0				– switched from solid shaft auger to cone penetration testing at 6.0 m
6.0				
7.0				
8.0				
9.0				
10.0				
11.0				
12.0				
13.0				
14.0				
15.0				
16.0				
17.0				
18.0				END OF BOREHOLE AT 18.0 m
19.0				
20.0				

■ STANDARD PENETRATION ■ (20 40 60 80)
▲ CONE PENETRATION TEST ▲ (10 20 30 40)
PLASTIC M.C. LIQUID (20 40 60 80)

■ PERCENT GRAVEL ■ (20 40 60 80)
● PERCENT SAND ● (20 40 60 80)
▲ PERCENT FINES ▲ (20 40 60 80)
◆ PERCENT CLAY ◆ (20 40 60 80)

DEPTH (ft): 0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0 24.0 26.0 28.0 30.0 32.0 34.0 36.0 38.0 40.0 42.0 44.0 46.0 48.0 50.0 52.0 54.0 56.0 58.0 60.0 62.0 64.0

EBA Engineering Consultants Ltd. Whitehorse, Yukon	COMPLETION DEPTH 18.0 m	COMPLETE 90/10/15
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VISITOR RECEPTION CENTRE	CLIENT: YTG–DEPT OF GOVERNMENT SERVICES	BOREHOLE No. 10476–03
GEOTECHNICAL INVESTIGATION	DRILL RIG: CME 750 SOLID SHAFT AUGERS	Project No: 0201–10476
WHITEHORSE, YUKON	UTM ZONE: 8 N6730173.00 E495796.00	ELEVATION 710.40 (m)

SAMPLE TYPE ■ GRAB SAMPLE ⊘ NO RECOVERY ⊠ STANDARD PEN. ▤ 75 mm SPOON ▯▯ 75 mm CRREL ▯▯ 100 mm CRREL

DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL/ROCK DESCRIPTION
0.0				SAND AND SILT(FILL)(SM)–gravelly, trace of clay, damp, compact (est.), light olive brown
1.0				
	■	1	SM/SP	SAND(FILL(SM/SP)–trace to some gravel, trace of silt, sand is fine grained, gravel is fine grained and subrounded, damp, loose (est.), dark brown
2.0				
				– siltier below 2.7 m
3.0	■	2	ML	SILT(ML)–some medium to fine grained sand, some organic silt inclusions at interface with fill, moist, olive grey
4.0	■	3	ML	SILT(ML)–some clay, trace of fine grained sand, moist to wet, olive brown
5.0				
				END OF BOREHOLE AT 5.3 m
6.0				
7.0				

■ STANDARD PENETRATION ■ 20 40 60 80

PLASTIC M.C. LIQUID 20 40 60 80

■ PERCENT GRAVEL ■ 20 40 60 80

● PERCENT SAND ● 20 40 60 80

▲ PERCENT FINES ▲ 20 40 60 80

DEPTH (ft) 0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0

EBA Engineering Consultants Ltd.
Whitehorse, Yukon

COMPLETION DEPTH 5.3 m		COMPLETE 90/10/15
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VISITOR RECEPTION CENTRE	CLIENT: YTG–DEPT OF GOVERNMENT SERVICES	BOREHOLE No. 10476–04
GEOTECHNICAL INVESTIGATION	DRILL RIG: CME 750 SOLID SHAFT AUGERS	Project No: 0201–10476
WHITEHORSE, YUKON	UTM ZONE: 8 N6730316.00 E495740.00	ELEVATION 708.30 (m)

SAMPLE TYPE: GRAB SAMPLE | NO RECOVERY | STANDARD PEN. | 75 mm SPOON | 75 mm CRREL | 100 mm CRREL

DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL/ROCK DESCRIPTION
0.0				
		1	SM	SAND(SM)–silty, trace to some gravel, fine to medium sand, fine grained, subrounded gravel, dry to damp, loose (est.), brown – volcanic ash inclusions at 0.3 m – becomes orangey brown below 0.4 m
1.0				– becomes moist to wet and olive brown below 0.9 m
		2	SM	
2.0				
		3	ML	SILT(ML)–some clay to clayey, trace of fine sand, wet, soft, olive brown
3.0				END OF BOREHOLE AT 3.0 m
4.0				
5.0				
6.0				
7.0				

STANDARD PENETRATION 20 40 60 80

PLASTIC M.C. LIQUID 20 40 60 80

PERCENT GRAVEL 20 40 60 80

PERCENT SAND 20 40 60 80

PERCENT FINES 20 40 60 80

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0, 22.0

EBA Engineering Consultants Ltd. Whitehorse, Yukon	COMPLETION DEPTH 3.0 m	COMPLETE 90/10/15
	LOGGED BY MCP	DWG NO.
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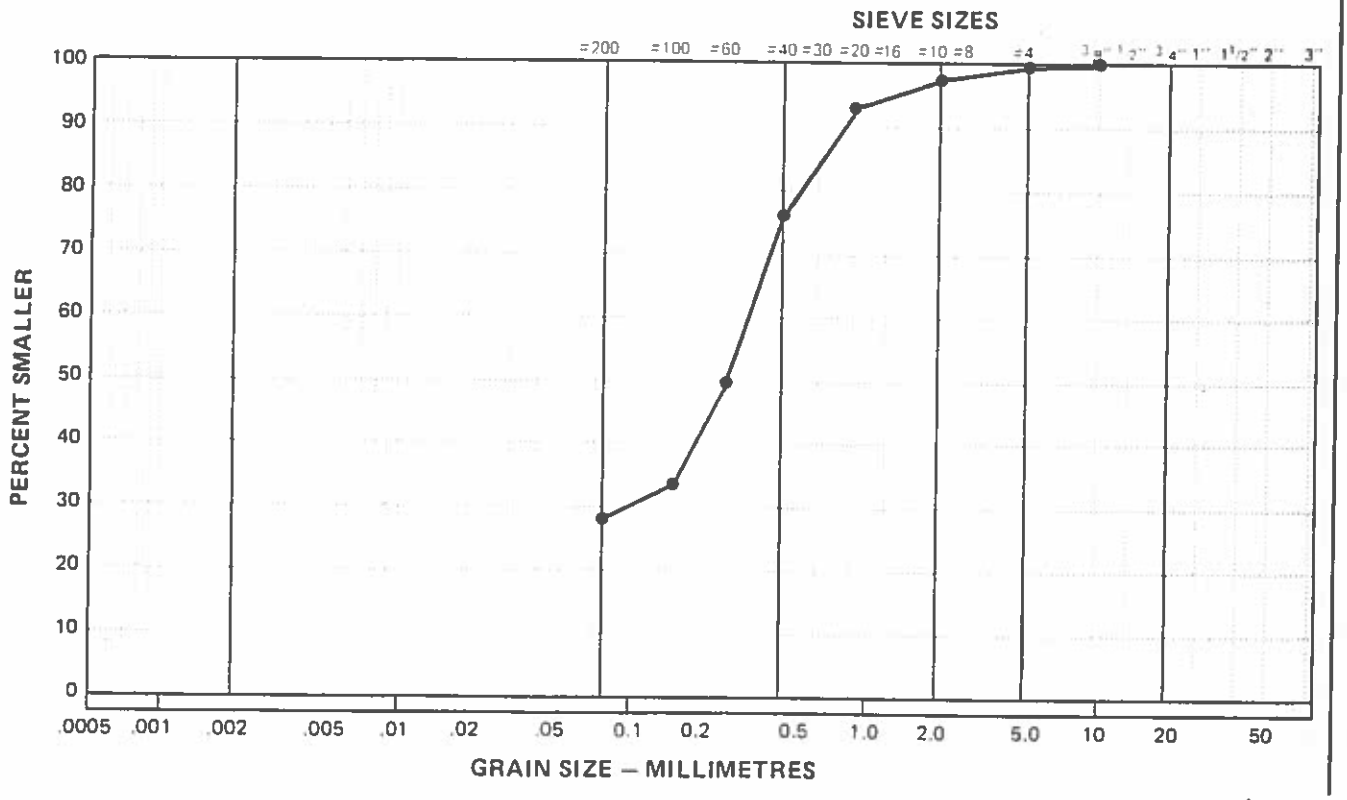
EBA Engineering Consultants Ltd.

PARTICLE - SIZE ANALYSIS OF SOILS

Project: Visitor Reception Centre
Whitehorse, Yukon
Project Number: 0201-10476
Date Tested: 1990-10-16
Borehole Number: 10476-04
Depth: 0.5 m
Soil Description: SAND(SM)-silty, medium to fine grained
Cu:
Cc:
Natural Moisture Content: 6.2 %
Remarks:

SIEVE	PERCENTAGE PASSING
3"	
1 1/2"	
1"	
3/4"	
1/2"	
3/8"	100
No. 4	99
No. 10	97
No. 20	93
No. 40	76
No. 60	50
No. 100	34
No. 200	28

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Tested in accordance with ASTM D422 unless otherwise noted.

VISITOR RECEPTION CENTRE	CLIENT: YTG–DEPT OF GOVERNMENT SERVICES	BOREHOLE No. 10476–05
GEOTECHNICAL INVESTIGATION	DRILL RIG: CME 750 SOLID SHAFT AUGERS	Project No: 0201–10476
WHITEHORSE, YUKON	UTM ZONE: 8 N6730383.00 E495721.00	ELEVATION 707.70 (m)

SAMPLE TYPE: GRAB SAMPLE | NO RECOVERY | STANDARD PEN. | 75 mm SPOON | 75 mm CRREL | 100 mm CRREL

DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL/ROCK DESCRIPTION
0.0				
		1	SM/SP	SAND(SM/SP)(POSSIBLY FILL)–trace of silt, trace of fine gravel, damp, loost (est.), olive brown with some rusty brown mottling
1.0		2	SM/SP	
2.0				SILT(ML)–some clay, trace of fine sand, moist, firm to soft (est.), olive brown
3.0		3	ML	
4.0				END OF BOREHOLE AT 3.8 m
5.0				
6.0				
7.0				

STANDARD PENETRATION 20 40 60 80

PLASTIC M.C. LIQUID 20 40 60 80

PERCENT GRAVEL 20 40 60 80

PERCENT SAND 20 40 60 80

PERCENT FINES 20 40 60 80

DEPTH (ft): 0.0, 2.0, 4.0, 6.0, 8.0, 10.0, 12.0, 14.0, 16.0, 18.0, 20.0, 22.0

EBA Engineering Consultants Ltd. Whitehorse, Yukon	COMPLETION DEPTH 3.8 m	COMPLETE 90/10/15
	LOGGED BY MCP	DWG NO.
		Page 1 of 1

VISITOR RECEPTION CENTRE	CLIENT: YTG–DEPT OF GOVERNMENT SERVICES	BOREHOLE No. 10476–06
GEOTECHNICAL INVESTIGATION	DRILL RIG: CME 750 SOLID SHAFT AUGERS	Project No: 0201–10476
WHITEHORSE, YUKON	UTM ZONE: 8 N6730426.00 E495658.00	ELEVATION 708.40 (m)

SAMPLE TYPE ■ GRAB SAMPLE ⊘ NO RECOVERY ⊠ STANDARD PEN. ▤ 75 mm SPOON ▯ 75 mm CRREL ▮ 100 mm CRREL

DEPTH (m)	SAMPLE TYPE	SAMPLE NO	USC	SOIL/ROCK DESCRIPTION
0.0				SAND AND GRAVEL(SP)(FILL)–trace of silt, damp, compact (est.), greyish brown
1.0	■	1	SP	SAND(SP)–trace of silt, fine to medium grained, damp, loost(est.), olive brown
				– becomes moist and olive grey at 1.5 m
2.0	■	2	SP	
3.0				SILT(ML)–some clay to clayey, trace of fine sand, moist to wet, soft to firm (est.), olive brown
4.0				END OF BOREHOLE AT 3.8 m
5.0				
6.0				
7.0				

■ STANDARD PENETRATION ■ 20 40 60 80

PLASTIC M.C. LIQUID 20 40 60 80

■ PERCENT GRAVEL ■ 20 40 60 80

● PERCENT SAND ● 20 40 60 80

▲ PERCENT FINES ▲ 20 40 60 80

DEPTH (ft) 0.0 2.0 4.0 6.0 8.0 10.0 12.0 14.0 16.0 18.0 20.0 22.0

EBA Engineering Consultants Ltd. Whitehorse, Yukon	COMPLETION DEPTH 3.8 m	COMPLETE 90/10/15
	LOGGED BY MCP	DWG NO.
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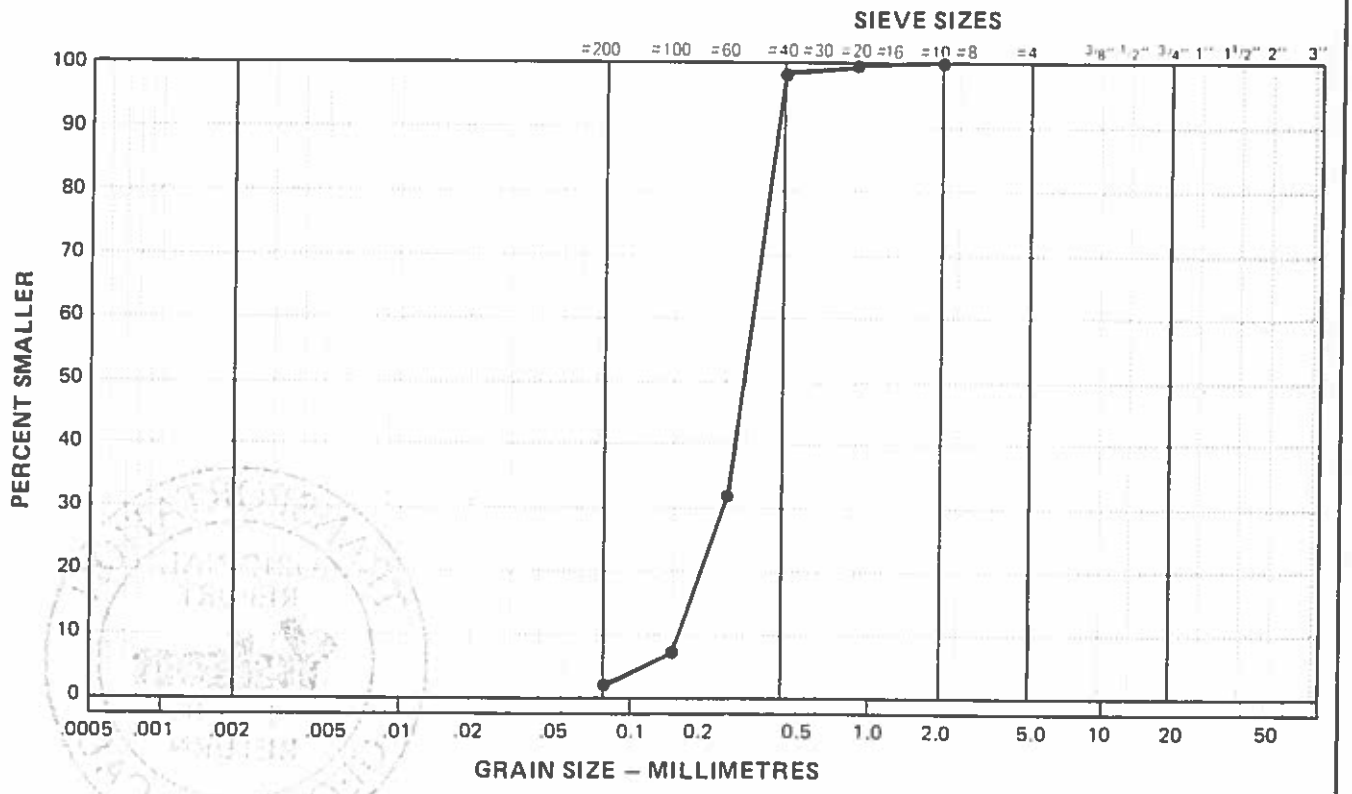
PARTICLE - SIZE ANALYSIS OF SOILS

Project: Visitor Reception Centre
Whitehorse, Yukon
Project Number: 0201-10476
Date Tested: 1990-10-16
Borehole Number: 10476-06
Depth: 0.9 m
Soil Description: SAND(SP)-trace of silt, medium grained sand
Cu: 1.8
Cc: 1.2
Natural Moisture Content: 6.8 %
Remarks:

SIEVE	PERCENTAGE PASSING
3"	
1 1/2"	
1"	
3/4"	
1/2"	
3/8"	
No. 4	
No. 10	100
No. 20	99
No. 40	98
No. 60	32
No. 100	7
No. 200	3

CLAY	SILT	SAND			GRAVEL	
		FINE	MEDIUM	COARSE	FINE	COARSE



Tested in accordance with ASTM D422 unless otherwise noted.