

May 4, 2021

Government of Yukon – Community Services
Land Development Branch C-14
PO Box 2703
Whitehorse, YT Y1A 2C6

ISSUED FOR USE
FILE: 704 ENG.WARC03981-01
Via Email: Dylan.Adams-Chute@yukon.ca

Attention: Mr. Dylan Adams-Chute – Project Manager

Subject: Geotechnical Evaluation – Airport Industrial Subdivision
Teslin, Yukon

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by the Government of Yukon – Community Services – Land Development Branch to complete a geotechnical evaluation for the proposed Airport Industrial Subdivision in Teslin Yukon.

Authorization to proceed with this project was provided by Mr. Dylan Adams-Chute, Project Manager, Government of Yukon – Community Services – Land Development Branch in the form of a signed contract (C00059210).

This desk-top level assessment and report summarizes geotechnical conditions noted from previously completed projects for the subject site and the surrounding areas.

2.0 GEOTECHNICAL INFORMATION FROM PREVIOUS EVALUATIONS

Geotechnical data used for this evaluation is from the following sources:

- Surficial geology mapping from Sheet 105 C/SE of the 1980 Soils and Surficial Geology – Southern Lakes Project.
- 2017 Geotechnical Evaluation – Airport Connector Road – Teslin Yukon: This project was completed by Chilkoote Geological Engineers Ltd. of Whitehorse, Yukon and included observations and geotechnical data from 11 site specific testpits.
- Testhole data from numerous EBA/Tetra Tech projects was compiled during the 2015 Teslin Periphery West Feasibility Study completed for Urban Systems (Tetra Tech EBA Inc. File W14103470-01). Reviewed was data from the 1995 Airport East Subdivision Sewer Extension project; the 1997 Airport West Subdivision project; the 2004 Teslin Airport Subsurface Investigation project; and the 2004 Teslin Forcemain Route project. Data from the 20 testholes advanced on these projects verify consistency of the soil conditions throughout the polygon presented on the surficial geology mapping compiled by S.R. Morison and R.W. Klassen in 1997 and 1980.

3.0 SITE DESCRIPTION & GEOTECHNICAL CONDITIONS

3.1 Proposed Development

This evaluation is based on the Phase 1 and 2 conceptual designs developed by 3 Pikas. On the south side (down-gradient side) of the connector road, the Phase 1 concept includes 7 TTC lots within the TTC C-3B land selection and 2 YG lots located east of C-3B. The concept plan for Phase 2 includes 3 TTC lots on the north side of the connector road (still within C-3B) and 2 YG lots to the east (outside C-3B). Lot sizes are somewhat variable, ranging from 1.2 Ha to 1.7 Ha, with an average lot size of approximately 1.3 Ha. Figure 1, attached, presents the current lot configuration.

3.2 Site Conditions & Terrain

Aside from the connector road dissecting the site, the study area is currently undeveloped with mature stands of white spruce, lodgepole pine and aspen, along with black spruce and willows in poorly drained areas. Site reconnaissance by Tetra Tech in 2014 and work completed by Chilkoote Geological Engineers in 2017 noted a wet, poorly drained area where the bioswale shown on the 3 Pikas conceptual designs is located. This wet area may encroach into the YG lot located in the south east corner of the subject site.

Grades were determined using Lidar data supplied by YG and used by 3 Pikas to develop the Phase 1 and 2 conceptual designs. The study area is located on a south facing slope. Lots on the down-gradient side of the connector road have slopes between 4% and 9%. The up-gradient lots (north side of the connector road) are a little steeper (between 7% and 11%).

3.3 Subsurface Conditions

3.3.1 Soil Conditions

Soil conditions presented on the surficial geology mapping for this site suggest the presence of morainal till soils with pockets of fine grained glaciolacustrine soils. Since the study area (as presented on the current concept plans – see Figure 1) is on an even, south facing slope, it is considered to be moderately well drained, with the exception of the proposed bioswale portion at the east end where both the projects completed by EBA-Tetra Tech in 2015 and Chilkoote Geological Engineers in 2017 noted wet, poorly drained soils along the connector road and the southeast portion of the site.

Testhole logs and laboratory testing data from the Chilkoote Geological Engineers report are site specific so they have been attached to this report following Figure 1. In general, heavy moss ground cover and organics were noted (throughout much of the site, it was at least 300 mm thick). Underlying the organics, silty sand or sandy silt till soils with cobble and boulder sized pieces were observed.

3.3.2 Groundwater

In the southeast quadrant of the Chilkoote Geological Engineers study area, shallow groundwater was encountered in TP01 and TP08 (running along the interface with the till soils below the surficial organics).

3.3.3 Seasonal Frost and Permafrost

Seasonal frost penetration will likely be between 2 m and 3 m on the individual lots once the moss and organic cover is removed. Areas of the lots where snow is allowed to accumulate will see less seasonal frost penetration.

Heavy moss ground cover and high moisture contents are often indicative of areas with underlying permafrost. Similar conditions were encountered in the 1995 Airport East Subdivision project where permafrost was encountered along Drean Street.

3.3.4 Bedrock

Bedrock exposures have been noted along the backslope of the connector road. The locations of the exposures are presented on Figure 1.

4.0 DEVELOPMENT CHALLENGES AND RECOMMENDATIONS

Initial correspondence suggested that there were potential development issues, including steeper slopes requiring pregrading; the presence of bedrock limiting access to specific lots; and the presence of groundwater and wet unstable soils. These concerns are discussed below.

4.1 Pregrading

Initially, pregrading of the entire subdivision was considered so that there would be no issues with locating a building site and having yard space to accommodate optimal land use. However, upon review of the contour information provided by 3 Pikas and presented on Figure 1, it is felt that since the slopes are gentle (most of the lots have average slopes of between 3.5% and 7% on the down gradient Phase 1 side, and between 7.5% and 10% on the up-gradient Phase 2 side), pregrading of the entire Industrial Subdivision site will not be necessary.

Therefore, pregrading on the individual lots will include the removal of tree cover, moss, and organic soil down to a stable mineral soil interface (till) to allow foundation construction, driveway construction and preparation of parking lot, equipment storage, and lay-down areas. The removal of the moss and organics will result in a fairly large volume of material so TTC and YG should discuss an appropriate site for stockpiling the grubbing and stripping. This material can then be used as insulating cover over absorption fields.

Additional pregrading may be required to satisfy site specific lot development plans. All material placed (native or imported) during pregrading must be compacted to at least 95% of Standard Proctor maximum dry density (SPMDD) and in areas where structures are proposed, it is suggested that material be compacted to 98% SPMDD within the top meter of pregrade elevation. As well, Tetra Tech assumes that future developers and builders will complete any additional site-specific earthworks and compaction as required by the applicable construction codes and standards.

4.2 Bedrock

Bedrock was identified as a concern; however, the outcrops noted along the frontage of the two Phase 2 lots (one at each end of Phase 2) does not suggest that the bedrock is extensive. The presence of bedrock should have minimal impact on Industrial Subdivision development and if encountered during pregrading or lot development, a large excavator with a rock hammer will likely be able to ensure the design grades are achieved.

Shallow bedrock may limit the type of foundation system used for structures (for instance, a thickened monolithic slab-on-grade may be easier to construct than a strip and spread footing system at depth). As well, the presence of bedrock may limit potential for on-site sewage disposal system construction.

4.3 Wet, Unstable or Permafrost Soils Effecting Foundations

In general, the till soils throughout the site are considered adequate for building foundation construction and as a driveway/parking area subgrade material. There should not be any lots on the TTC or YG sections of the development where an adequate building site cannot be identified. The wet soils in the southeast corner of the YG end of the site should be avoided when choosing a building site but there should be stable areas up closer to the connector road that would be more conducive for foundation construction. At the far west end (on the TTC Phase 1 lot), groundwater was not encountered but the underlying soils had fairly high moisture contents. For foundations in this area, engineered fill construction may be required.

If permafrost soils are encountered during lot development, additional engineering input is strongly recommended to mitigate the risk of damage to building foundations and other site infrastructure.

If areas are identified as unstable during lot development (soft, unstable areas should be apparent after grubbing and stripping is complete), additional site preparation work may be required, including the subcut of excessively wet soil, the placement of a non-woven geotextile over the base of the excavation, and subsequent backfill with imported granular materials.

All imported granular materials (crushed basecourse and pit run gravel) must meet the gradation limits presented in the table below. If non-compliant materials are proposed, a sample can be submitted to Tetra Tech for testing, and an opinion regarding suitability for use will be provided.

Imported Gravel – Specified Gradation Limits

20 mm CRUSHED BASECOURSE AGGREGATE		200 mm Pit Run	
Particle Size (mm)	% Passing by Mass	Particle Size (mm)	% Passing by Mass
20.000	100	200.000	100
12.500	64 – 100	80.000	75 - 100
5.000	36 – 72	25.000	55 - 100
1.250	12 – 42	12.500	42 - 84
0.315	4 – 22	5.000	26 - 65
0.080	3 - 6	1.250	11 - 47
		0.315	3 - 30
		0.080	0 - 8

4.4 On-Site Sewage Disposal System Construction

The presence of sand or silt till soils throughout the subdivision site may limit (but not eliminate) the potential for on-site sewage disposal system construction. Experience with constructing absorption beds in till soils suggests that if the absorption field is constructed within the top metre, acceptable percolation rates can be realized. Of course, additional insulation and/or soil cover will be necessary to protect the absorption field from freezing.

It is understood that numerous systems in Teslin have had performance issues. It is recommended that individual lot owners get their systems engineered so that the risk of system failure is reduced.

4.5 Foundations

Foundations, including strip and spread footings or thickened monolithic slab-on-grade foundation systems are considered feasible. Large shop structures may require additional geotechnical assessment to develop bearing resistances and an appropriate seismic site classification to forward the structural design.

The underlying till soils supporting the structures are considered frost susceptible, therefore, perimeter insulation in addition to current building code minimums may be required.

It is important that the underlying soils not become saturated due to poor roof runoff and surface water management. The finished elevation of all structures should be at least 300 mm above surrounding site grades to ensure drainage away from the foundation elements and swales may have to be constructed up-gradient of permanent structures.

Roof runoff must be directed into properly maintained rain gutters, down-spouts, and splash pads. Please note, a high percentage of building damage assessments completed by this office involve foundation damage caused by frost heave caused by a lack of perimeter insulation or because of poorly maintained rain gutters and/or down-spouts that don't direct water away from the structure's foundation.

4.5.1 Concrete

Tetra Tech recommends that all concrete be designed, mixed, placed, and tested in accordance with the most recent edition of the Canadian Standards Association (CSA) Standard CAN/CSA-A23.1 and A23.2. According to these standards, concrete should be designed to at least satisfy the minimum durability requirements as defined by the exposure class.

The exposure class of the concrete is dependent on the presence or lack of chlorides, sulphates, freezing and thawing conditions, and the soil saturation. Based on the aforementioned conditions, the governing exposure classes will include F-2 exposure class concrete for foundations (a minimum compressive strength of 25 MPa with 4% to 7% entrained air) and for all exterior concrete, including entrance aprons and slabs supporting fuel tanks, etc., a C-2 exposure class (which corresponds to a minimum compressive strength of 32 MPa and has 5% to 8% entrained air) is recommended.

If shoulder season (early spring or late fall) construction is considered, cold weather concrete placement procedures will be required. In this case, Tetra Tech should be contacted and given the opportunity to review the contractor's proposed cold weather concrete placement procedures.

5.0 LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the Government of Yukon and their agents. Tetra Tech Canada Inc. does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than the Government of Yukon, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user. Use of this document is subject to the Limitations on the Use of this Document attached in the Appendix B.

6.0 CLOSURE

We trust this document meets your present requirements. If you have any questions or comments, please contact the undersigned.

Respectfully submitted,
Tetra Tech Canada Inc.

FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01

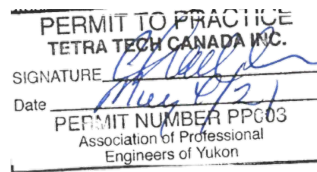


FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01
FILE: 704 ENG.WARC03981-01

Prepared by:
Myles Plaunt, CET
Senior Engineering Technologist, Arctic Region
Direct Line: 867.668.9217
Myles.Plaunt@tetrattech.com

Reviewed by:
Chad Cowan, P.Eng.
Geotechnical Manager, Yukon, Arctic Group
Direct Line: 867.668.9214
Chad.Cowan@tetrattech.com

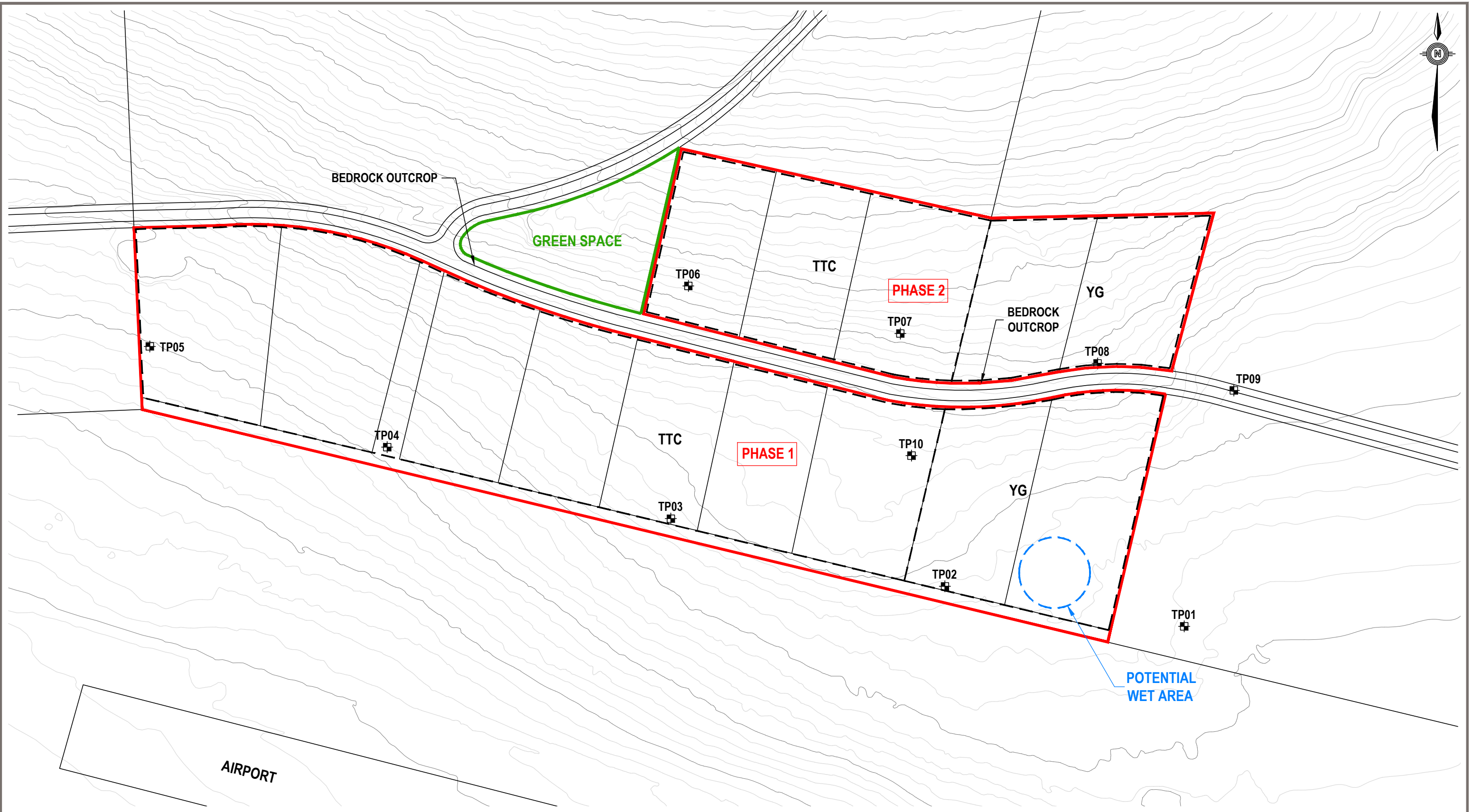
/cr



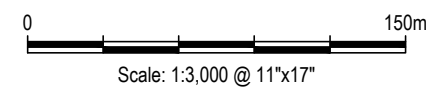
FIGURES

- Figure 1 Site Plan Showing the Location of Chilkoot Geological Testpits
- Figure 2 Testpit Logs From The 2017 Chilkoot Geological Engineers Geotechnical Evaluation

Q:\WhitehorseData\0201\drawings\Teslin\ENG\WARC03981-01 Teslin Airport Industrial Subdivision\ENG\WARC03981-01 Fig.1-RO.dwg [FIGURE 1] May 06, 2021 - 2:07:10 pm (BY: BUCHAN, CAMERON)



LEGEND
 + - GEOTECHNICAL TESTPIT LOCATION



CLIENT
Yukon
 Government
 Department of Community Services



**AIRPORT INDUSTRIAL SUBDIVISION PROJECT
 TESLIN, YUKON**

**SITE PLAN SHOWING CHILKOOT
 GEOLOGICAL TESTHOLE LOCATIONS**

PROJECT NO. ENG.WARC03981-01	DWN CB	CKD MCP	REV 0
OFFICE EBA-WHSE	DATE May 6, 2021		

Figure 1

CHILKOOT GEOLOGICAL ENGINEERS LTD.

5B Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot.eng@gmail.com



TEST PIT SOIL LOG

Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated : Oct. 5, 2017

Elevation : 100.0 meters
TP Termination Depth: 1.9 meters
Instrumentation: NA
Weather: Partly Cloudy +4 to +11 C

TEST PIT

2-17

Sheet 1 of 1

Elev. (m)	Depth		Stratigraphic Description	Relative Density	Relative Moisture	Field Sample					Laboratory Results (%)				USCS/NRC Depth (m)	Symbol	Elev. (m)	
	ft	m				Type	Number	Temperature (degrees C)	Moisture %	Plasticity (Liquid Limit)	SPT 'N'	PL	MC	LL				Gravel
100.0	0.05	0.05	ORGANICS and ORGANIC SILT (50 mm) w/ rootlets, black	soft	moist	X	4	NA	NA	NA	NA	9.7					ORG	100.0
99.95				compact	damp	X											SM	99.95
99.75	0.25	0.25	SILTY GRAVELLY SAND		damp	X	5	NA	NA	NA	NA	4.7	3.3	23.7	65.0			99.75
99.5			- poorly graded, fine to medium grained, reddish-brown															
99.5	0.5	0.5	- w/ fractured platy rock in size to 150 mm			X	6	NA	NA	NA	NA	4.2						99.5
99.0			SILTY GRAVELLY SAND (TILL)															
99.0	1.0	1.0	- poorly graded, fine to medium grained, beige-brown															99.0
98.7	1.3	1.3	- as above but odd silt clump	compact	damp													98.7
98.5	1.5	1.5	- trace oxidation															98.5
98.5	1.5	1.5	GRAVELLY SILTY SAND (TILL)	dense	damp		7	NA	NA	NA	NA	5.0						98.5
98.5			- poorly graded, fine to medium grained, dark grey-brown															
98.5			- odd sub-rounded cobble															
98.5			- hard digging @ 1.5 m															
98.1	1.9	1.9	End of TP @ 1.9 m				8	NA	NA	NA	NA	5.1	18.9	25.3	60.8			98.1
98.0			- No groundwater or seepage zones															98.0
98.0			- No sloughage															98.0

Excavated By : Flag Hill Woodworks

Excavator Type : Kubota kx057

Bucket Type : Digging

Water Level(s)

During Excavation After Excavation
 At End of Excavation

Logged By : T.Dhara, P.Eng.

Date : Oct. 5, 2017

Data Entry By : T.Dhara, P.Eng.

Date : Nov 25-Dec 3, 2017

Reviewed By:

Date : Dec. 5, 2017

CHILKOOT GEOLOGICAL ENGINEERS LTD.

5B Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot.eng@gmail.com



TEST PIT SOIL LOG

Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated : Oct. 5, 2017

Elevation : 100.0 meters
TP Termination Depth: 1.3 meters
Instrumentation: NA
Weather: Partly Cloudy +4 to +11 C

TEST PIT

3-17

Sheet 1 of 1

Elev. (m)	Depth		Stratigraphic Description	Relative Density	Relative Moisture	Field Sample					Laboratory Results (%)				USCS/NRC Depth (m)	Symbol	Elev. (m)
	ft	m				Type	Number	Temperature (Degrees C)	Moisture %	Penetration (kg/cm ²)	SPT N	PL	MC	LL			
100.0		0.10	ORGANICS & MOSS (100 mm) - w/ rootlets, black	soft	moist											100	ORG
99.9		0.5	SILTY SAND w/ fractured rock in size to 150 mm, poorly graded, fine to medium grained, reddish-brown	compact	damp	9	NA	NA	NA	NA	9.0					99.9	SM
99.75		0.25	SILTY SANDY GRAVEL (TILL) w/ rootlets to 0.4 m - poorly graded, fine to medium grained, beige-brown - as above but no rootlets	compact	damp	10	NA	NA	NA	NA	3.8					99.75	
99.5		1.5	- as above but fractured and sub-rounded cobbles - odd boulder in size to 300 mm - dark grey-brown	compact	damp	11	NA	NA	NA	NA	3.8	10.0	3.1	80.0		99.5	TILL (GM)
99.2		0.80	End of TP @ 1.3 m - No groundwater or seepage zones - No sloughage	dense	damp	12	NA	NA	NA	NA	4.4					99.2	TILL (GP)
99.0		1.0														99.0	
98.7		1.30														98.7	
98.5																98.5	
98.0																98.0	
97.5																97.5	

Excavated By : Flag Hill Woodworks

Excavator Type : Kubota kx057

Bucket Type : Digging

Water Level(s)

During Excavation After Excavation
 At End of Excavation

Logged By : T. Dhara, P. Eng.
Date : Oct. 5, 2017

Data Entry By : T. Dhara, P. Eng.
Date : Nov. 25-Dec. 3, 2017

Reviewed By :
Date : Dec. 5, 2017

CHILKOOT GEOLOGICAL ENGINEERS LTD.

5B Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot.eng@gmail.com



TEST PIT SOIL LOG

Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated : Oct 5, 2017

Elevation : 100.0 meters
TP Termination Depth: 1.8 meters
Instrumentation: NA
Weather: Partly Cloudy +4 to +11 C

TEST PIT

4-17

Sheet 1 of 1

Elev. (m)	Depth		Stratigraphic Description	Relative Density	Relative Moisture	Field Sample						Laboratory Results (%)				USCS/NRC Depth (m)	Symbol	Elev. (m)	
	ft	m				Type	Number	Temperature (degrees C)	Recovery %	Penetration (kg/cm ²)	DPT W	20	40	60	80				
100.0	0.10	0.10	ORGANICS & ORGANIC SILT (100 mm) w/ rootlets, black	soft	moist												ORG	100.0	
99.9	0.20	0.20	SANDY GRAVEL some SILT - poorly graded, reddish brown - w/ platy rock in size to 300 mm	compact	dry dump	X	13	NA	NA	NA	NA	NA	11.3					GP	99.9
99.8	0.20	0.20	SANDY GRAVEL some SILT - poorly graded, reddish brown - w/ platy rock in size to 300 mm	compact	dry dump	X	14	NA	NA	NA	NA	NA	4.1						99.8
99.5	0.5	0.5	SILTY SAND some GRAVEL (TILL) - poorly graded, fine to medium grained, beige-brown - w/ fractured rock in size to 0.7 m		dry dump	X	15	NA	NA	NA	NA	NA	3.0					TILL (SM)	99.5
99.3	0.70	0.70	GRAVELLY SILTY SAND (TILL) - poorly graded, fine to medium grained, dark grey-brown - harder digging - odd sub-rounded cobble - odd boulder in size to 400 mm	dense	dry dump														99.3
99.0	1.0	1.0	- as above																99.0
98.5	1.5	1.5	- as above																98.5
98.3	1.80	1.80	- as above																98.3
98.2	1.80	1.80	End of TP @ 1.8 m - No groundwater or seepage zones - No sloughage																98.2
98.0																			98.0
97.5																			97.5

Excavated By : Flag Hill Woodworks

Excavator Type : Kubota kx057

Bucket Type : Digging

Water Level(s)
 ▽ During Excavation ▽ After Excavation
 ▽ At End of Excavation

Logged By : T. Dhara, P.Eng
Date : Oct. 5, 2017

Data Entry By : T. Dhara, P.Eng.
Date : Nov. 25-Dec. 3, 2017

Reviewed By :
Date : Dec. 5, 2017

CHILKOOT GEOLOGICAL ENGINEERS LTD.

58 Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot.eng@gmail.com



TEST PIT SOIL LOG

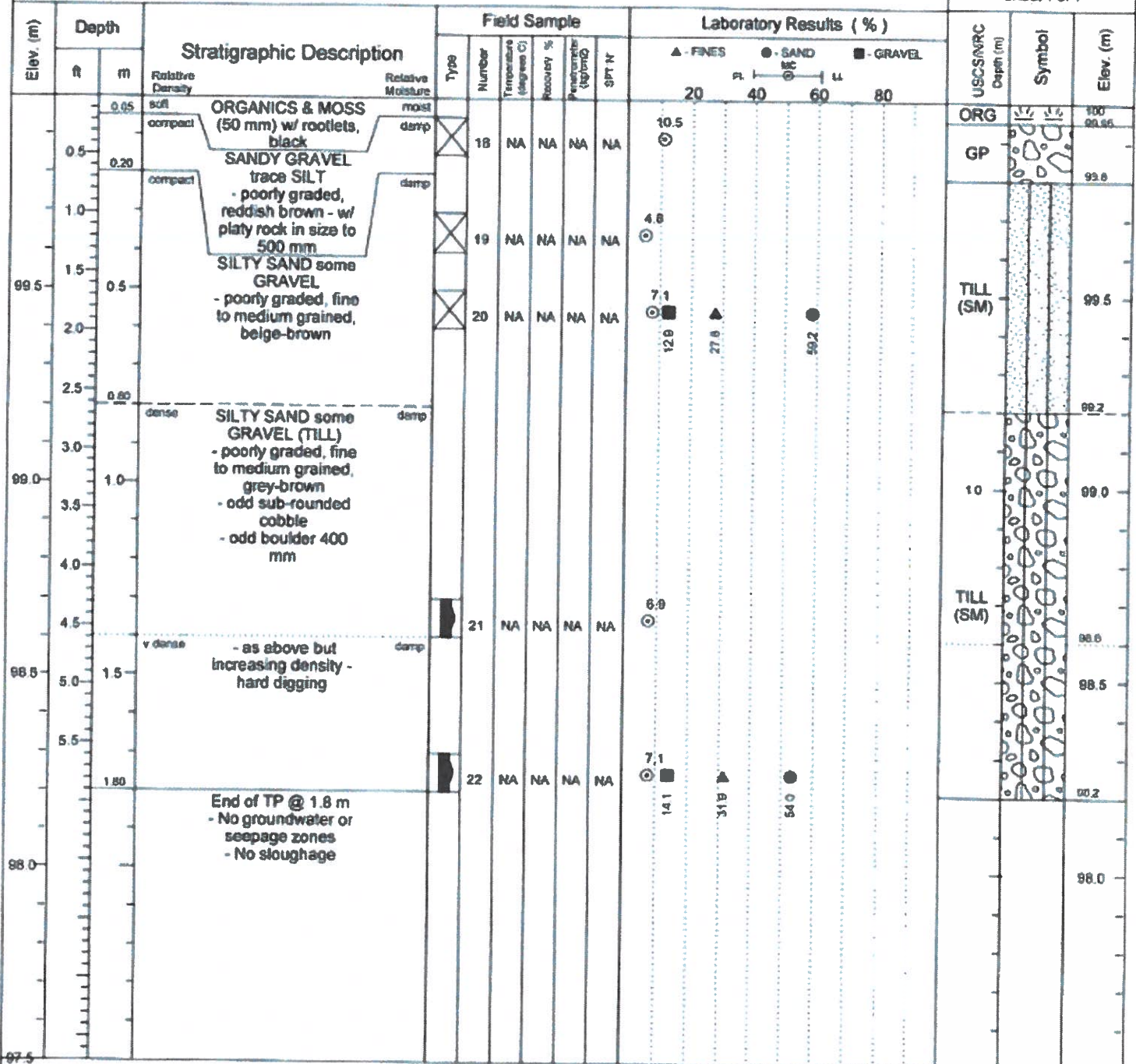
Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated : Oct.5, 2017

Elevation : 100.0 meters
TP Termination Depth: 1.8 meters
Instrumentation: NA
Weather: Partly Cloudy +4 to +11 C

TEST PIT

5-17

Sheet 1 of 1



Excavated By : Flag Hill Woodworks

Excavator Type : Kubota kx057

Bucket Type : Digging

Water Level(s)

During Excavation After Excavation
 At End of Excavation

Logged By : T. Dhara, P. Eng.
Date : Oct.5, 2017

Data Entry By : T. Dhara, P. Eng.
Date : Nov.25-Dec.3, 2017

Reviewed By :
Date : Dec.5, 2017

CHILKOOT GEOLOGICAL ENGINEERS LTD.

5B Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot_eng@gmail.com



TEST PIT SOIL LOG

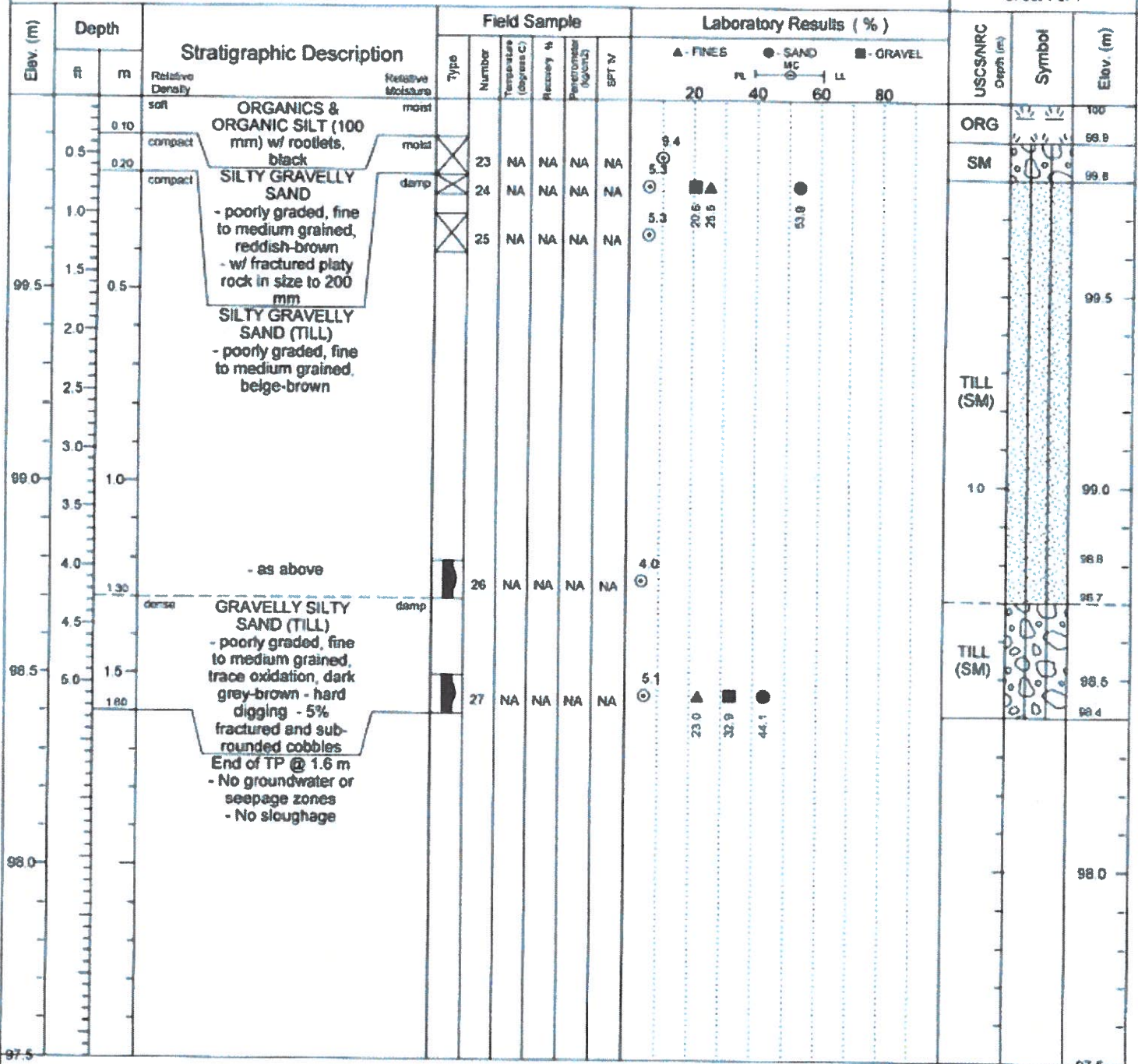
Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated : Oct.5, 2017

Elevation : 100.0 meters
TP Termination Depth: 1.6 meters
Instrumentation: NA
Weather: Partly Cloudy +4 to +11 C

TEST PIT

6-17

Sheet 1 of 1



Excavated By : Flag Hill Woodworks

Excavator Type : Kubota kx057

Bucket Type : Digging

Water Level(s)

During Excavation After Excavation
 At End of Excavation

Logged By : T.Dhara, P.Eng
Date : Oct.5, 2017

Data Entry By : T.Dhara, P.Eng
Date : Nov.25-Dec.3, 2017

Reviewed By :
Date : Dec.5, 2017

CHILKOOT GEOLOGICAL ENGINEERS LTD.

58 Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot_eng@gmail.com



TEST PIT SOIL LOG

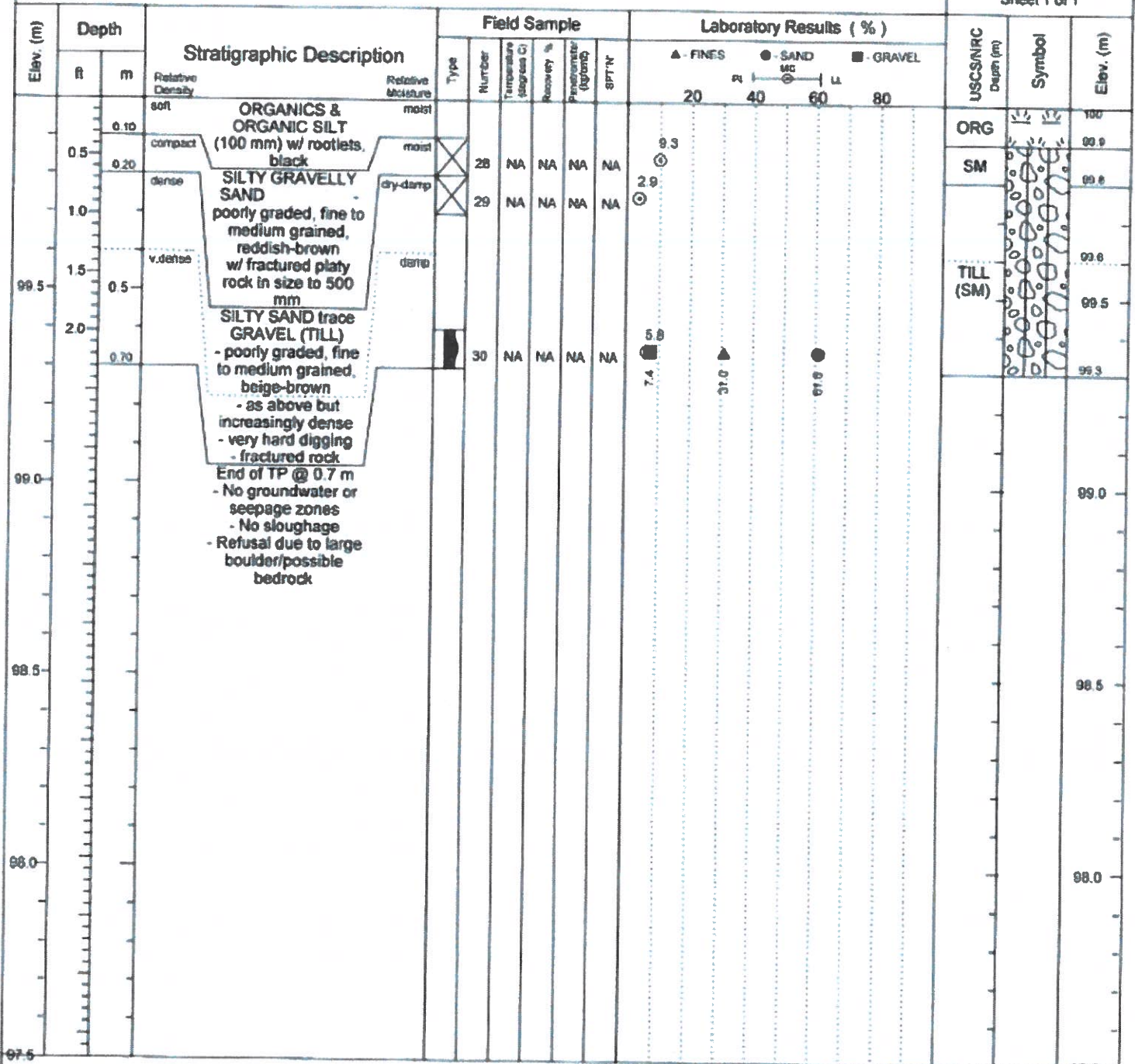
Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated: Oct. 6, 2017

Elevation : 100.0 meters
TP Termination Depth: 0.7 meters
Instrumentation: NA
Weather: Partly Cloudy 0 to +9 C

TEST PIT

7-17

Sheet 1 of 1



Excavated By : Flag Hill Woodworks

Excavator Type : Kubota kx057

Bucket Type : Digging

Water Level(s)
 During Excavation After Excavation
 At End of Excavation

Logged By : T.Dhara, P.Eng.
Date : Oct.6, 2017

Data Entry By : T.Dhara, P.Eng.
Date : Nov.25-Dec.3, 2017

Reviewed By:
Date : Dec.5, 2017

CHILKOOT GEOLOGICAL ENGINEERS LTD.

5B Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot.eng@gmail.com



TEST PIT SOIL LOG

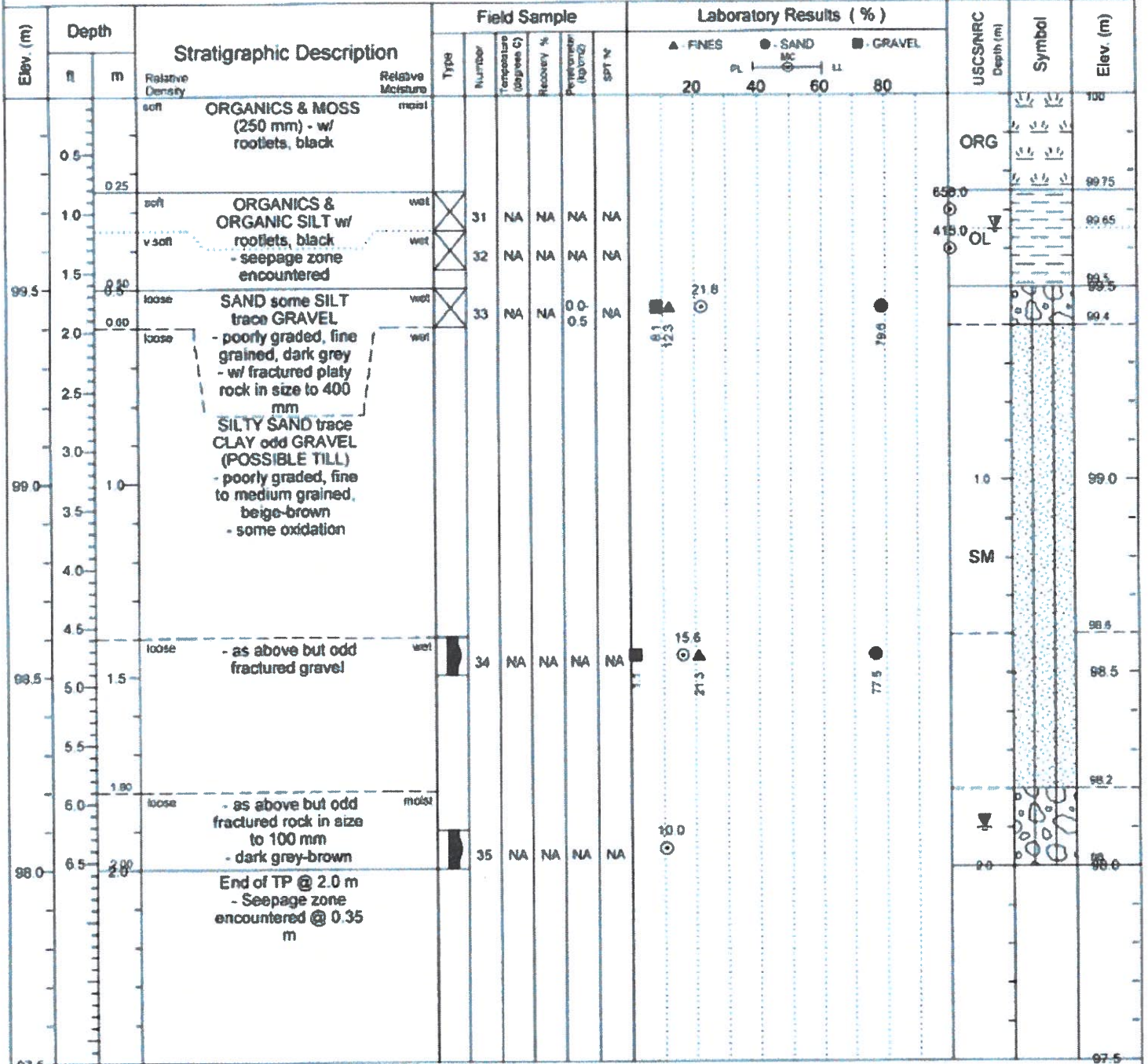
Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated : Oct.6, 2017

Elevation : 100.0 meters
TP Termination Depth: 2 meters
Instrumentation: NA
Weather: Partly Cloudy 0 to +9 C

TEST PIT

8-17

Sheet 1 of 1



Excavated By : Flag Hill Woodworks

Excavator Type : Kubota kx057

Bucket Type : Digging

Water Level(s)

During Excavation After Excavation

At End of Excavation

Logged By : T.Dhara, P.Eng.

Date : Oct.6, 2017

Data Entry By : T.Dhara, P.Eng.

Date : Nov.25-Dec.3, 2017

Reviewed By:

Date : Dec.5, 2017

CHILKOOT GEOLOGICAL ENGINEERS LTD.

5B Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot.eng@gmail.com



TEST PIT SOIL LOG

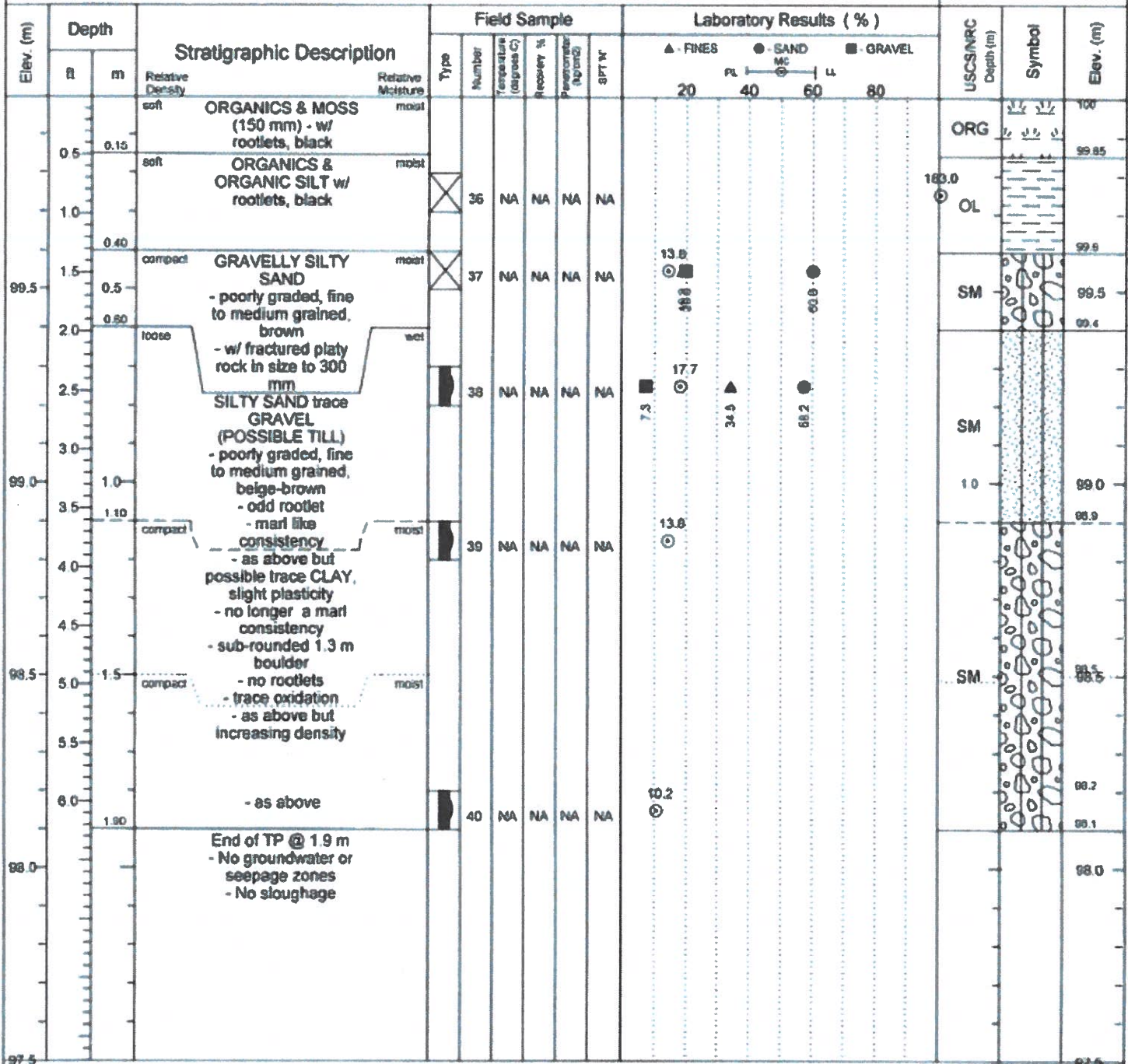
Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated: Oct.6, 2017

Elevation : 100.0 meters
TP Termination Depth: 1.9 meters
Instrumentation: NA
Weather: Partly Cloudy 0 to +9 C

TEST PIT

9-17

Sheet 1 of 1



Excavated By : Flag Hill Woodworks

Excavator Type : Kubota lx057

Bucket Type : Digging

Water Level(s)

During Excavation After Excavation
 At End of Excavation

Logged By : T.Dhara, P.Eng.
Date : Oct.6, 2017

Data Entry By : T.Dhara, P.Eng.
Date : Nov.25-Dec.3, 2017

Reviewed By :
Date : Dec.5, 2017

CHILKOOT GEOLOGICAL ENGINEERS LTD.

5B Bennett Road, Whitehorse, Yukon
(867) 335-5804 chilkoot.eng@gmail.com



TEST PIT SOIL LOG

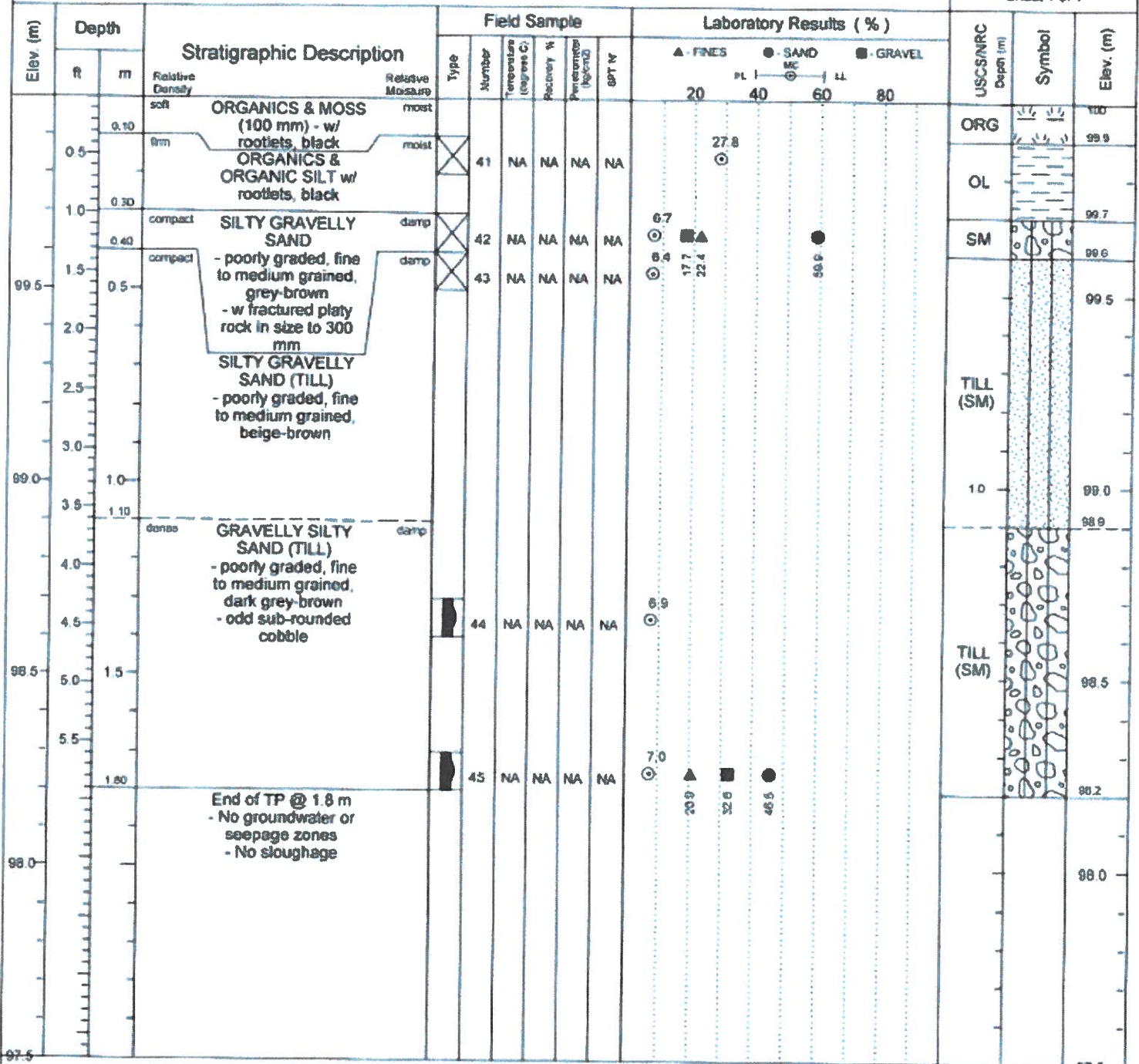
Client : Village of Teslin
Location : Teslin, Yukon
Project : Geotechnical Evaluation - Airport Connector Road
Date Excavated : Oct.6, 2017

Elevation : 100.0 meters
TP Termination Depth: 1.8 meters
Instrumentation: NA
Weather: Partly Cloudy 0 to +9 C

TEST PIT

10-17

Sheet 1 of 1



Excavated By : Flag Hill Woodworks

Excavator Type : Kubota kx057

Bucket Type : Digging

Water Level(s)

During Excavation After Excavation
 At End of Excavation

Logged By : T. Dhara, P. Eng.
 Date : Oct.6, 2017

Data Entry By : T. Dhara, P. Eng.
 Date : Nov.25-Dec.3, 2017

Reviewed By: TD
 Date : Dec.5, 2017

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE USE OF THIS DOCUMENT

LIMITATIONS ON USE OF THIS DOCUMENT

GEOTECHNICAL – YUKON GOVERNMENT

1.1 USE OF DOCUMENT AND OWNERSHIP

This document pertains to a specific site, a specific development, and a specific scope of work. The document may include plans, drawings, profiles and other supporting documents that collectively constitute the document (the "Professional Document").

The Professional Document is intended for the use of TETRA TECH's Client, its officers, employees, agents, representatives, successors and assigns (the "Client") as specifically identified in the TETRA TECH Services Agreement or other Contractual Agreement entered into with the Client (either of which is termed the "Contract" herein). TETRA TECH does not accept any responsibility for the accuracy of any of the data, analyses, recommendations or other contents of the Professional Document when it is used or relied upon by any party other than the Client, unless authorized in writing by TETRA TECH. Any changes to the conclusions, opinions, and recommendations presented in TETRA TECH's Professional Document must be authorized by TETRA TECH.

1.2 ALTERNATIVE DOCUMENT FORMAT

Where TETRA TECH submits electronic file and/or hard copy versions of the Professional Document or any drawings or other project-related documents and deliverables (collectively termed TETRA TECH's "Instruments of Professional Service"), only the signed and/or sealed versions shall be considered final. The original signed and/or sealed electronic file and/or hard copy version archived by TETRA TECH shall be deemed to be the original. TETRA TECH will archive a protected digital copy of the original signed and/or sealed version for a period of 10 years.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems, as per agreed project deliverable formats. TETRA TECH makes no representation about the compatibility of these files with the Client's future software and hardware systems.

1.3 STANDARD OF CARE

Services performed by TETRA TECH for the Professional Document have been conducted in accordance with the Contract, in a manner consistent with the level of skill ordinarily exercised by members of the profession currently practicing under similar conditions in the jurisdiction in which the services are provided. Professional judgment has been applied in developing the conclusions and/or recommendations provided in this Professional Document.

If any error or omission is detected by the Client or an Authorized Party, the error or omission must be brought to the attention of TETRA TECH within a reasonable time.

1.4 DISCLOSURE OF INFORMATION BY CLIENT

The Client acknowledges that it has fully cooperated with TETRA TECH with respect to the provision of all available information on the past, present, and proposed conditions on the site, including historical information respecting the use of the site.

1.5 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of this Professional Document, TETRA TECH may have relied on information provided by third parties other than the Client.

While TETRA TECH endeavours to verify the accuracy of such information, and subject to the standard of care herein, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information even where inaccurate or unreliable information impacts any recommendations, design or other deliverables and causes the Client or an Authorized Party loss or damage, except where TETRA TECH has subcontracted for such information.

1.6 GENERAL LIMITATIONS OF DOCUMENT

This Professional Document is based solely on the conditions presented and the data available to TETRA TECH at the time the data were collected in the field or gathered from available databases.

The Client, and any Authorized Party, acknowledges that the Professional Document is based on limited data and that the conclusions, opinions, and recommendations contained in the Professional Document are the result of the application of professional judgment to such limited data.

The Professional Document is not applicable to any other sites, nor should it be relied upon for types of development other than those to which it refers. Any variation from the site conditions present, or variation in assumed conditions which might form the basis of design or recommendations as outlined in this report, at or on the development proposed as of the date of the Professional Document requires a supplementary exploration, investigation, and assessment.

TETRA TECH is neither qualified to make, nor is it making, any recommendations with respect to the purchase, sale, investment or development of the property, the decisions on which are the sole responsibility of the Client.

1.7 NOTIFICATION OF AUTHORITIES

In certain instances, the discovery of hazardous substances or conditions and materials may require that regulatory agencies and other persons be informed and the Client agrees that notification to such bodies or persons as required may be done by TETRA TECH in its reasonably exercised discretion.

1.8 ENVIRONMENTAL AND REGULATORY ISSUES

Unless stipulated in the report, TETRA TECH has not been retained to explore, address or consider and has not explored, addressed or considered any environmental or regulatory issues associated with development on the subject site.

1.9 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems, methods and standards employed in professional geotechnical practice. This report contains descriptions of the systems and methods used. Where deviations from the system or method prevail, they are specifically mentioned.

Classification and identification of geological units are judgmental in nature as to both type and condition. TETRA TECH does not warrant conditions represented herein as exact, but infers accuracy only to the extent that is common in practice.

Where subsurface conditions encountered during development are different from those described in this report, qualified geotechnical personnel should revisit the site and review recommendations in light of the actual conditions encountered.

1.10 LOGS OF TESTHOLES

The testhole logs are a compilation of conditions and classification of soils and rocks as obtained from field observations and laboratory testing of selected samples. Soil and rock zones have been interpreted. Change from one geological zone to the other, indicated on the logs as a distinct line, can be, in fact, transitional. The extent of transition is interpretive. Any circumstance which requires precise definition of soil or rock zone transition elevations may require further investigation and review.

1.11 STRATIGRAPHIC AND GEOLOGICAL INFORMATION

The stratigraphic and geological information indicated on drawings contained in this report are inferred from logs of test holes and/or soil/rock exposures. Stratigraphy is known only at the locations of the test hole or exposure. Actual geology and stratigraphy between test holes and/or exposures may vary from that shown on these drawings. Natural variations in geological conditions are inherent and are a function of the historical environment. TETRA TECH does not represent the conditions illustrated as exact but recognizes that variations will exist. Where knowledge of more precise locations of geological units is necessary, additional exploration and review may be necessary.

1.12 PROTECTION OF EXPOSED GROUND

Excavation and construction operations expose geological materials to climatic elements (freeze/thaw, wet/dry) and/or mechanical disturbance which can cause severe deterioration. Unless otherwise specifically indicated in this report, the walls and floors of excavations must be protected from the elements, particularly moisture, desiccation, frost action and construction traffic.

1.13 SUPPORT OF ADJACENT GROUND AND STRUCTURES

Unless otherwise specifically advised, support of ground and structures adjacent to the anticipated construction and preservation of adjacent ground and structures from the adverse impact of construction activity is required.

1.14 INFLUENCE OF CONSTRUCTION ACTIVITY

Construction activity can impact structural performance of adjacent buildings and other installations. The influence of all anticipated construction activities should be considered by the contractor, owner, architect and prime engineer in consultation with a geotechnical engineer when the final design and construction techniques, and construction sequence are known.

1.15 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, and the potential of adverse circumstances arising from construction activity, observations during site preparation, excavation and construction should be carried out by a geotechnical engineer. These observations may then serve as the basis for confirmation and/or alteration of geotechnical recommendations or design guidelines presented herein.

1.16 DRAINAGE SYSTEMS

Where temporary or permanent drainage systems are installed within or around a structure, the systems which will be installed must protect the structure from loss of ground due to internal erosion and must be designed so as to assure continued satisfactory performance of the drains. Specific design detail of such systems should be developed or reviewed by the geotechnical engineer. Unless otherwise specified, it is a condition of this report that effective temporary and permanent drainage systems are required and that they must be considered in relation to project purpose and function.

1.17 DESIGN PARAMETERS

Bearing capacities for Limit States or Allowable Stress Design, strength/stiffness properties and similar geotechnical design parameters quoted in this report relate to a specific soil or rock type and condition. Construction activity and environmental circumstances can materially change the condition of soil or rock. The elevation at which a soil or rock type occurs is variable. It is a requirement of this report that structural elements be founded in and/or upon geological materials of the type and in the condition used in this report. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions considered in this report in fact exist at the site.

1.18 SAMPLES

TETRA TECH will retain all soil and rock samples for 30 days after this report is issued. Further storage or transfer of samples can be made at the Client's expense upon written request, otherwise samples will be discarded.

1.19 APPLICABLE CODES, STANDARDS, GUIDELINES & BEST PRACTICE

This document has been prepared based on the applicable codes, standards, guidelines or best practice as identified in the report. Some mandated codes, standards and guidelines (such as ASTM, AASHTO Bridge Design/Construction Codes, Canadian Highway Bridge Design Code, National/Provincial Building Codes) are routinely updated and corrections made. TETRA TECH cannot predict nor be held liable for any such future changes, amendments, errors or omissions in these documents that may have a bearing on the assessment, design or analyses included in this report.