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ISSUED FOR USE FILE: 704-ENG.WARC03386-45 Via Email: kevin.fisher@gov.yk.ca

Government of Yukon Department of Community Services Rural Land Development – Land Development Branch Box 2703 Whitehorse, YT Y1A 2C6

Attention: Mr Kevin Fisher, Program Manager

Subject: Site Development Suitability Mayo, Yukon

1.0 INTRODUCTION

Tetra Tech Canada Inc. (Tetra Tech) was retained by Kevin Fisher, Program Manager for the Government of Yukon (YG), Community Services, Rural Land Development, Land Development Branch to complete a geotechnical assessment of eight sites within the Village of Mayo and a single site located in the Airport Subdivision located north of the village. The sites include:

- Lot 5; Block 2; 21592 LTO;
- Lot 22; Block 9; 21592 LTO;
- Lots 3 to 7; Block 11; 21592 LTO;
- Lot 16; Block 12; 21592 LTO;
- Lots 27 to 30; Block 12; 21592 LTO;
- Lot 31; Block 25; 62158 LTO;
- Lot 4; Block 33; 24315 LTO;
- Lots 4 to 8; Block 25; 24315 LTO; and
- Lot 1004, Quad 105 M/12; 64596 LTO (Airport Subdivision).

To meet the objectives of this project, the following tasks have been completed:

- In-house project files were recovered and reviewed to establish geotechnical conditions throughout the Village
 of Mayo and the Airport Subdivision area.
- The depositional history of the Mayo area was established using the map entitled "Surficial Geology of the Village of Mayo – NTS 105 M/12, Yukon – File 2011-3".
- Based in-house information, a summary of geotechnical conditions is presented.
- Potential for residential development is discussed along with constraints for foundation construction and on-site sewage disposal system design and construction (specifically for Lot 1004 in the Airport Subdivision).

2.0 SITE CONDITIONS

2.1 Surficial Geology

The surficial geology of the Mayo area is quite complex. The area has been affected by a combination of valley glaciation and fluvial action related to the Mayo and Stewart River channels. Glacial sediments have been found to extend to depths in excess of two hundred metres (as determined by water well drilling throughout the Village of Mayo).

Near the surface, glacial melt water deposited glaciolacustrine silt and clay in temporary pro-glacial lakes. Fluvial deposition of coarse granular outwash deposits is also common. Adjacent to the Mayo and Stewart River channels, soil deposition is further complicated by erosion of glacial sediments and deposition of river gravels throughout post-glacial river floodplains.

For additional information that details the depositional history and surficial geology of the Mayo area, refer to the "*Northern Climate Exchange, March 2011. Mayo Landscape Hazards: Geological Mapping for Climate Change Adaptation Planning*" which is available from Northern Climate Exchange c/o Yukon Research Centre, Yukon College, Whitehorse.

2.2 Soil Conditions

The soil stratigraphy is relatively consistent throughout the Mayo town site with silty surficial soils overlying granular sediments which are underlain by fine grained glaciolacustrine soils. However, the thickness of each of the soil units is extremely variable.

2.3 Bedrock

No bedrock has been encountered during the completion of any of the current and historic geotechnical evaluations completed within the Mayo town site. As mentioned above, the community water well was developed just above the bedrock surface at approximately 240 m (800').

2.4 Groundwater

The presence and depth to groundwater was quite random during the evaluations completed throughout Mayo. The presence of groundwater may be related to seasonal water level fluctuations in areas close to the Mayo and Stewart



Rivers; the depth to the underlying permafrost where ice rich soils have melted out, leaving groundwater perched on frozen glaciolacustrine soils; or it may be encountered at shallow depths in channels within the floodplain deposits.

2.5 Permafrost

Also documented in the Mayo Landscape Hazards document is a good overview of the permafrost conditions within the Mayo town site and throughout the Mayo area. The testhole logs presented in the separately submitted Mayo Testhole Database detail the permafrost conditions at specific locations spanning the last 45 years.

In general, if the root mat and tree cover are undisturbed, permafrost can be expected at shallow depths in the coarse-grained sediments that define the floodplains deposits. The permafrost extends into the fine grained glaciolacustrine soils that continue to significant depth. The permafrost encountered in the coarse-grained sediments are typically not ice rich while significant visible ice contents (stratified ice contents of more than 70%) have been noted in the underlying fine-grained soils.

Throughout the Mayo town site and the Airport Subdivision where development has included building site construction, roadway construction, deep utilities construction and on-site sewage disposal system installation much of the permafrost that existed within the coarse-grained soils has melted but it is generally accepted that there is still potential for ice rich permafrost to exist in the underlying fine-grained soils.

Determining the rate of permafrost degradation beneath roadways in Mayo has not been addressed as it would entail the drilling of numerous deep boreholes, the recovery of permafrost core to assess ice content, and the installation of thermistors to monitor ground temperatures. This program would be quite expensive and to be successful, on-going data collection and interpretation would be necessary.

2.6 Site Specific Geotechnical Conditions

The locations of all testholes advanced throughout Mayo are presented on the Mayo Site Plan (accompanying this report). Attached to this report are the testhole logs used to complete this evaluation. The following sections present a list of testholes considered indicative of conditions throughout the various sites and a summary of the anticipated conditions in the vicinity of the lots that are being considered for residential development.

2.6.1 Lot 5; Block 2

Testhole logs reviewed include 1200073-TP05 and 10506-BH02. In this area of Mayo, the surficial silts are quite thick, ranging from 3.0 m to 3.5 m. No permafrost was noted in the top 4.0 m (Lot 5 in uncleared so there is potential that permafrost exists on that site). Groundwater was encountered at 3.2 m to 3.5 m.

2.6.2 Lot 22; Block 9

Testhole logs reviewed include ENG.WARC03340-TP17-01 and TP17-02; 1200073-TP-04 and 10605-BH01 and BH02. Throughout this area, silty sands are interbedded with sand and gravel. No permafrost was encountered in the near surface soils in any of the five testholes. Groundwater was encountered at 4.6 m and 2.7 m at 2nd Avenue and Center Street (Binet House Restoration) respectively.



2.6.3 Lots 3 to 7; Block 11, Lot 16; Block 12, Lot 27 to 30; Block 12 & Lot 31; Block 25

Four potential development areas are located in the First Avenue and Duncan Street area of Mayo. Testhole logs reviewed included 10506-BH01; W14103567-24-BH17-01, BH17-02 & BH17-05; and E-1021-BH7. Gravel fill was noted along roadways and was underlain by silty sand interbedded with silt or gravel. Groundwater was only encountered in the force main wet well borehole drilled on the dyke in 1991 (at a depth of 5.6 m). It is interesting to note that no permafrost was encountered in the recent testholes advanced along roadways but in borehole E-1021-BH7 (drilled in 1975), ice rich permafrost was encountered in the granular surficial sediments.

2.6.4 Lot 4; Block 33

Borehole logs E-1021-BH4 and -BH5 were reviewed for this lot. Below the organic root mat, granular surficial soils were noted with siltier sediments below 4.5 m and 5.5 m. No groundwater was encountered, and permafrost was observed below 4.2 m in both boreholes. These boreholes were drilled in 1975 at the site of the Mayo curling rink and the site was not cleared at the time of drilling.

2.6.5 Lot 4 to 8; Block 25

Three testholes logs were reviewed for this site. E-1021-BH4 and -BH5 were drilled in 1975 (at the Mayo Curling Rink site) and W14101489-TP04 was excavated in 2010 for Phase 2 of the Urban Infill Project. Below the finegrained surficial soils, granular soils were noted to between 4.0 m and 5.0 m. No groundwater was encountered but permafrost was encountered in all three testholes at depths ranging from 2.5 m to 4.0 m.

2.6.6 Lot 1004; Quad 105 M/12

To evaluate this lot, testholes 10626-BH01 and -BH02; 14107-TP01; 1200104-TP01, -TP02 and -TP03 were reviewed. The Airport Subdivision is located along a plain with glaciofluvial sediments below the near surface silts and organics. These granular soils extend to at least 3.5 m. No permafrost was encountered in any of the testholes included in this evaluation but anecdotal information and personal knowledge amongst personnel in this office confirm that foundations issues due to permafrost degradation has been documented.

Shallow groundwater was noted in 4 of the 6 testholes. Recent photos of an environmental excavation along the highway at the west end of the subdivision had groundwater seepage at approximately 1.5 m.

3.0 DEVELOPMENT FEASIBILITY AND FOUNDATION CONSTRUCTION

It is acknowledged that problems with foundations affected by the degradation of ice-rich permafrost has been encountered throughout both the Village of Mayo and the Airport Subdivision. It can be assumed that the construction of residential structures is feasible for all sites being considered, but steps must be taken to minimize the potential for and the effects of melting permafrost.

3.1.1 Preferred Foundation System

Engineers and scientists are now of the opinion that the degradation of permafrost, especially in the "discontinuous permafrost portion of northern regions", is inevitable. Therefore, specific to the Mayo town site and the Airport Subdivision, this office is of the opinion that in areas where deep utilities and foundations have been in place for numerous years, the potential for settlement from permafrost degradation will become minimal but in areas that have been recently cleared; the potential for settlement is much greater. Keep in mind, the rate of permafrost thaw at depth has not been determined (as mentioned in Section 2.5).



The challenge for residential; housing on undeveloped lots is to minimize differential settlement while the near surface permafrost melts out. It is recommended that all foundation construction follow the following steps:

- Preclearing of the building sites is key but better yet, clearing the entire lot would be preferable since any tree cover may shade the building site and slow permafrost degradation. If this can be accomplished one or even two years in advance of foundation construction, there is a better chance that all near surface, ice rich permafrost will have degraded.
- In most cases, there will be fine grained surficial soils which are very frost susceptible. It is recommended that these soils be excavated down to thaw stable granular soils. Once exposed, the construction of an engineered fill can bring the building site back to grade. The depth to the granular soils is variable throughout the Village of Mayo so it is recommended that a testpit or two be excavated to determine what the sub-cut depth will be.
- The engineered fill should be non-frost susceptible granular material(s) placed in 200 mm thick lifts, moisture conditioned and compacted to 98% of standard proctor maximum dry density. The engineered fill should extend at least 0.2 m above existing ground elevations so that surface water and roof run-off is directed away from the foundation. Granular soils for engineered fill construction should meet the gradation limits presented in Table 1, below.
- Even with the engineered fill, builders have to be respectful of the fine-grained permafrost soils at depth. Therefore, it is recommended that an adjustable foundation system be constructed to support the residential structures. There are a few options such as space frame foundations but for ease of construction and maintenance, a timber crib foundation supported by PWF pads works well in areas such as Mayo and Dawson City. Below the flooring system, there should be a clear crawlspace and it is very important to ensure that air flow is not interrupted. Skirting around the elevated foundation is acceptable to keep animals out the clear crawlspace, but the skirting much ensure a minimum of 50% air flow.

80 mm Pit	Run Gravel	20 mm Crushed Surface Course							
Particle Size (mm)	% Passing by Mass	Particle Size (mm)	% Passing by Mass						
80.000	100	-	-						
25.000	55-100	20.000	100						
12.500	42-84	12.500	64-100						
5.000	26-65	5.000	36-72						
1.250	11-47	1.250	12-42						
0.315	3-30	0.315	4-22						
0.080	0-8	0.080	3-6						

Table 1: Recommended Granular Material Specifications

4.0 LOT 1004 LOT DEVELOPMENT

4.1 On-Site Sewage Disposal System Potential

The glaciofluvial soils underlying this site are considered acceptable for on-site sewage disposal system design and construction. However, the following should be considered:

• The underlying glaciofluvial soils may have a percolation rate of less than 5 minutes/25 mm. This will necessitate the requirement to install a 600 mm thick sand filter in order to ensure treatment along with disposal.

- The presence of shallow groundwater throughout much of this subdivision may result in the construction of a shallow absorption field and possibly a pump-up system.
- Absorption field, shallow absorption trench, and chamber systems are all considered appropriate for the study area.
- All systems must be designed and installed in accordance with the Yukon Government's Environmental Health Guidelines. This includes site specific permitting, percolation testing, design and construction, as well as the as-built documentation to support approval. Due to possible shallow groundwater issues, it may be preferable to have this system engineered by a consultant such as Tetra Tech.

4.2 Lot 1004 Foundations

The presence of shallow groundwater and permafrost will somewhat limit foundation options. However, if lots are pre-cleared; the surficial silty soils are removed, and an engineered fill is constructed to support a timber crib foundation that can be levelled as necessary, long term settlements can be controlled.

5.0 RECOMMENDATIONS FOR ADDITIONAL GEOTECHNICAL WORK

After clearing of the infill lots has been completed, it is advisable that testpits be excavated to assess permafrost conditions and determine acceptable subexcavation depths.

As mentioned above, it would also be preferable to have the septic system for Lot 1004 designed by an engineering firm familiar with on-site sewage disposal system design. This design work will require testpitting and percolation testing at the proposed absorption field location.

6.0 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. (Tetra Tech) 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 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. Tetra Tech's General Conditions are provided in Appendix A of this report.



7.0 CLOSURE

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

Respectfully submitted, Tetra Tech Canada Inc.

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	SIGNATURE
-	PERMIT NUMBER PP003 Association of Professional Engineers of Yukon



ATTACHMENTS

General Location Maps (Yukon Lands Viewer)

Testhole Logs Used For Geotechnical Evaluation Purposes







LOT 5; BLOCK 2 TESTHOLES



	6		Borehole No: 02												
	3	Stanley Associates	Project: Sewage F	orcemain/wet Well Construction	on		Proje	ct No: (0201-10506	;					
		Engineering	Location: Between	Dyke And Roadway			1.190								
			Mayo, Yukon	· · · · · · · · · · · · · · · · · · ·				102							
o Depth (m)	Method	Soil Description	•	Ground Ice Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	20 Plastic Limit 20	SPT (N) 40 60 Moisture Content 40 60	80 Liquid Limit 80	o Depth (ft)			
Ē		SILT - some fine sand, frequent root fibres, dark brown,	wet, soft	Unfrozen								1			
- - - - - - - - - - - -	auger	SILT (ML) - sandy, trace of clay, wet, soft (est.), grey				1		40.2		•		2 2 4 4 4			
- 2	Hollow stem	- (Gravel - 0%; Sand - 23%; Silt - 65%; Clay - 12%)				2		23.1	•			8 8 10 10 10 10 10 10 10 10 10 10 10 10 10			
4		SAND - gravelly, some to trace silt, subrounded to angu medium sand, light brown, saturated, compact - water table at 3.3 m	lar gravel, coarse to		X	3	21	5.8	•						
5 6 7 8 9 10 10												որովորդություն 16-րդություն 20-րդություն 21-րդություն 22-րդություն 22-րդություն 22-րդություն 23-րդություն 24-րդություն 24-րդություն 25-րդություն 26-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդություն 20-րդությու 20-րդությու 20-րդու 20-րդությու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20-րդու 20- 20-ր 20- 20- 20- 20- 20- 20- 20- 20- 20- 20-			
12			Contractor:				Compl	letion D	Depth: 4.1 m	 I		-1			
			Drilling Rig Type: CME 75			Start Date: 1991 May 8									
	C		Logged By: CRH				Completion Date: 1991 May 8								
			Reviewed By: JRT MCP				Page 1 of 1								

	Na-Cho Nvak Dun First		Testpit No: TP05								
	51	-Cho Nyak Dun First	Project: Geotechnical Site Evalu	lations	Proie	ct No:	1200073				
		Nation	Location: Proposed Admin. Build	ding NND C-22B							
			Mayo, Yukon								
Depth (m)	Method	Soil Descriptio	n	Ground Ice Description	Sample Type	Moisture Content (%)	Plastic M Limit (Aoisture Content	Liquid Limit	Depth (ft)	
-		ORGANIC ROOT MAT		Unfrozen	-	-	20 4				
1	Excavator	SILT - some sand, fine grained, soft, wet, grey				33	•	6		2	
- 3		- water table at 3.5 m GRAVEL - sandy, trace of silt, well graded gravel, coars grey and brown END OF TESTPIT 4.0 m	e sand, loose to compact, saturated,			33.4 5.4	•			8-111-11-11-11-11-11-11-11-11-11-11-11-1	
		- sloughing below 3.5 m								14-11-11-11-11-11-11-11-11-11-11-11-11-1	
			Contractor:		Compl	etion [Depth: 4 m				
7	1.	TETRA TECH	Drilling Rig Type: CAT 325 L		Start Date: 2004 January 14						
L	6	'J	Logged By: JSB			Completion Date: 2004 January 14					
	<u> </u>		eviewed By: JRT Page 1 of 1								

LOT 22; BLOCK 9 TESTHOLES

			Testpit No: TP17-02									
	Γ	I.A. Jacobsen Civil	Project: Mayo Legion Wash House (Geotechnical Evaluation	Project No:	ENG.WARC03340-01						
E	1g	ineering Consultants	Location: 1st Avenue									
			Mayo, Yukon		UTM: 45558	4 E; 7051765 N; Z 8						
Depth (m)	Method	Soil Descriptio	on	Ground Ic Descriptio	U Ö oisture Content (%)	Plastic Moisture Liquid	Depth (ft)					
0					Σ							
-		ORGANIC ROOT MAT - grass covered, (150 mm thick)		Unfrozen								
	Excavation	SAND - silty, moist, compact (estimated), medium to da	rk grey, fine sand									
- 3	╞	END OF TESTPIT (3.0 metres)					10-					
			Contractor: Walters Construction 8.			Donth: 2 m	11- 12- 13- 14- 15- 16-					
			Contractor: Walters Construction & In	ioustrial Corp.	Completion E	Depth: 3 m						
		TETRA TECH	Unining Kig Type: CAT 425 Kubber T	ITEO BACKNOE	Start Date: 2017 September 19							
			Reviewed By: MCP	Page 1 of 1								

	N	A Jacobson Civil	Testpit No: TP17-01									
.			Project: Mayo Legion Wash House	Geotechnical Evaluation	Project No: I	ENG.WARC03340-01						
Er	19	ineering Consultants	Location: 1st Avenue									
			Mayo, Yukon		UTM: 45559	2 E; 7051760 N; Z 8						
					nt (%)							
(m) Depth	Method	Soil Descriptio	n	Ground Ic Descriptio	Moisture Conte	Plastic Moisture Liquid Limit Content Limit	Depth (ft)					
0		OPCANIC DOOT MAT, speed award (450 4hish)				20 40 60 80						
-		CRGANIC ROOT WAT - grass covered, (150 mm trick)		Unfrozen								
	Excavation	SAND - sity, moist, compact (estimated), medium to da	rk grey, hne sand				2 3 3 4 5 6 7 8 8					
- 												
-		LIND OF TESTETT (J.U Melles)					10-					
-												
-												
-							12-					
_												
- 4							13-					
-												
-							14-					
-							II					
-							15-					
-												
- 5							16-					
3			Contractor: Walters Construction & In	ndustrial Corp.	Completion E	Depth: 3 m						
	,		Drilling Rig Type: CAT 425 Rubber T	ired Backhoe	Start Date: 20	017 September 19						
	C		Logged By: JB		Completion D	Date: 2017 September 19						
-			Reviewed By: MCP		Page 1 of 1							

		Che Nuels Due First	Testpit No:										
	a	-Cho Nyak Dun First	Project: Geotechnical Evaluation)	Projec	ct No:	1200073						
		Nation	Location: New NNDFN Admin. B	Building	L,								
			Mayo, Yukon										
epth (m)	ethod	Soil		Ground Ice	le Type	Content (%)				spth ft)			
0	Ŭ	Description	n	Description	Samp	Moisture	Plastic Limit 20	Moisture Content 40 60	Liquid Limit 	0			
		GRAVEL AND SAND - trace of silt, rootlets throughout, medium to coarse sand, compact, damp, reddish bro - trace of silt below 0.3 m - colour changes to medium grey	weil graded subrounded gravel, wn	Unfrozen		2.6	•			1			
		SAND - trace of gravel, trace of silt, medium to coarse g	rained, compact, damp, medium grey			3.5	•			4			
- 2	Excavator	GRAVEL - sandy, trace of silt, well graded gravel, coars	e sand, compact, dry, medium grey				2 	a s		6			
- 3								5		9 10 11			
		- (Gravel - 60%; Sand - 39%; Silt & Clay - 2%)				3.2	•			12			
F ⁴		END OF TESTPIT 4.0 m											
E		- major sloughing throughout								14			
F										15			
L .													
- 5										16-			
										17-			
-										19-1			
6										20			
-										21			
F										22			
-7										23			
-										24-			
/.5			Contractor:		Compl	etion I	Depth· 4 r	n					
		TETRATECH	Drilling Rig Type: CAT 320 L		Start D	Date: 2	004 Octo	ber 7					
	C		Logged By: JSB		Completion Date: 2004 October 7								
			Reviewed By: JRT	Page 1 of 1									

			Borehole No: 01										
		N.A. Jacobsen	Project: Binet Hou	se Restoration			Proje	ct No: (0201-1062	5			
			Location: Second	Ave. And Centre St.			11.0,0						
			Mavo, Yukon					0.5	· · · · · · · · · · · · · · · · · · ·				
Depth (m)	Method	Soil Description	<u></u>	Ground Ice Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	20 Plastic Limit	SPT (N) 40 60 Moisture Content	80 Liquid Limit	Depth (ft)	
0	╞	SILT - some fine sand, occasional roots, moist, dark bro	wn loose	Unfrozon					20	40 60	80	0	
1		 SAND - silty, fine grained, uniform, light brown, compac - (Gravel - 0%; Sand - 77.3%; Silt & Clay - 22.7%) - dry to damp to 1.2 m - damp to moist below 1.2 m SAND - some gravel, trace of silt, fine and coarse subro to moist, compact to loose, light brown 	t unded gravel, damp		X	1 2	21	5.8	•			10000000000000000000000000000000000000	
3		- becomes more gravelly with depth			X	3	37	3.6	•			10 11 12	
5	Hollow stem auger	- very easy smooth drilling from 4.6 m - less gravel below 4.6 m			X	4	40	2.3	•	•		ոպոսրակարարություն 14 ¥ 16 18 18 18 18 20 18 20 19 10 10 10 10 10 10 10 10 10 10 10 10 10	
8		- trace of gravel from 7.6 to 9.1 m			X	6	12	14.3	D			22 24 24 26 26 26	
9		SILT - some fine sand, occasional silty sand seams, occ gravel, dark grey, soft, saturated - non plastic - smooth, easy to moderate drilling below 8.7 m SAND - gravely, trace silt, angular fine gravel, coarse an sand, grey, saturated, dense to compact	asional rounded fine		Χ	7	21	18.9	•			ուրակակակակակակակակակ	
11		END OF BOREHOLE 10.7 m - water table at 4.6 m - no permafrost encountered			Χ	8	35	9	•			րուրուկուղուղուղուղուղուղուղուղուղուղուղուղուղո	
			Contractor:				Compl	etion D	Depth: 10.7	'n		1	
		TETRA TECH	Drilling Rig Type: C	ME 75			Start D	Date: 19	991 May 8				
	C		Logged By: CRH				Completion Date: 1991 May 8						
			Reviewed By: JRT	viewed By: JRT MCP Page 1 of 1									

			Boreho	ole No: 02						199 1		
		N.A. Jacobsen	Project: Binet Hou	se Restoration			Projec	ct No:	0201-10625			
			Location: Second	Avenue And Centre Street			Tiojo		0201-10020			
			Mayo, Yukon						*	_		
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Moistur Limit Conter 20 40 6	V) 80 re Liquid nt Limit 50 80	Depth (ft)	
Ē		SILT - some fine sand, some organics, frequent roots, v	vet, dark brown, soft	Unfrozen				-				
	rger	SILT AND SAND - fine, soft, moist, grey with rusty brow	<i>n</i> mottling		X	1	8	29.8	•		2 2 4 4 4 4 4 4 4	
2 	Hollow stem a	 GRAVEL - sandy, some silt, rounded, coarse and fine g sand, moist, brown, loose to compact - (Gravel - 59.9%; Sand - 24.1%; Silt & Clay - 16%) - less silt with depth - water at 2.7 m 	ravel, fine grained		X	2	23	5.4 7.6	•			
4		 sand becomes coarse with depth trace silt, trace gravel by 4.0 m easy drilling with some rough sections 			X	4 5		7.8 15	•		12 12 14 14 14	
5 6 7 10 10 10 11		END OF BOREHOLE 4.6 m									ակագացակացությունը 16 18 20 20 20 20 20 20 20 20 20 20 20 20 20	
)	Contractor:				Compl	letion [Depth: 4.6 m			
	ł	TETRATECH	Unilling Rig Type: C	ME /5			Start Date: 1991 May 8					
Ľ			Logged By: CKH				Completion Date: 1991 May 8					
			I Reviewed By: JR1				rage 1	1071				

LOTS 3 TO 7; BLOCK 9...LOT 16; BLOCK 12 LOTS 27 TO 30; BLOCK 12 AND LOT 31; BLOCK 25 TESTHOLES



		Staplay Accession	Boreho	ole No: 01									
		Stanley Associates	Project: Sewage F	orcemain/wet Well Construction	on		Proje	ct No: (0201-1	10506			
		Engineering	Location: Lift Static	on On Dyke			1.00			~			
			Mayo, Yukon										
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	2 Plas Lim 2	stic Ma Calit Calit Calit Calit	PT (N)) 60 Disture Dontent) 60	80 Liquid Limit 80	Depth (ft)
ŧ		GRAVEL (FILL) - sandy, some silt, coarse to fine gravel fine grained, damp, loose to compact, brown	up to 50 mm, sand is	29. 404.5 COLUMN									
L L L L L L L					X	1	10	4.7 8.2	•				2 1 4
2				Possible seasonal frost to 1.8 m		3		4.5	•				6
		- (Gravel - 45%; Sand - 35%; Silt - 20%; Clay - 0%)				4	19	9.5	•		385		8
3		SAND - trace of silt, fine, grey, moist, loose to compact - occasional silty sand inclusions - occasional coarse gravel - easy drilling SILT - sandy fine slightly plastic, wet to moist, grey with	h brown mottling										10 10 12
4		- water table at 5.6 m	n brown motuling			5	8	30.2		•	s		14
Ē	Ider	- very easy drilling											
5	stem au	SAND (SM) - silty, sand is medium to fine, occasional fit coarse sand seams, saturated, loose to very loose, g	ne gravel, occasional rey										16
6	Hollow	- gravel present below 6.1 m but drilling remains very	easy		X	6	8	13.7					20
7		- sand becomes will graded with some fine gravel			X	7	35	23		• •			24
- 8													20 mmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmmm
		- drilling easy to 9.1 m											30 4 32
- 10 - - -		- (Gravel - 0%; Sand - 78%; Silt & Clay - 22%)				8 9		11.5	•				34
- 11		END OF BOREHOLE 10.7 m											36-
12													38 38
			Contractor:				Comp	letion [Depth:	10.7 m			
		TETRA TECH	Drilling Rig Type: C	ME 75			Start Date: 1991 May 8						
			Logged By: CRH				Comp	letion [Date: 1	991 Ma	ay 8		
			Reviewed By: JRT MCP Page 1 of 1										

			Borehole	No: BH17-	0	1									
	Y	ukon Government	Project: Mayo Undergroun	nd Utility Upgrades		Project No: W14103567-24									
			Location: First Ave. and D	uncan Ave.							2				
			Мауо, ҮТ			UTM:	45565	4 E; 70517	71 N; Z 8	NAD83					
			·			er	t (%)								
Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Numb	Moisture Content	Plastic Limit	Moisture Content	Liquid Limit 	Depth (ft)				
		SAND and GRAVEL (FILL) - trace silt, well graded, frozi	en, greyish brown	Seasonally Frozen			-								
		SILT - some clay, some sand, trace gravel, frozen, dark - no visible gravel	greyish brown								2 1				
						SA01	31.2	•			3				
-											4				
-		- firm (est) damp brown		Unfrozen	-						6-				
2				Chirozoff		SA02	21.9	•		····	7-				
-	er										8				
Ę	n aug	- moist, soft (est.), medium plastic, dark grey							· · ·		9				
- 3	ster					SA03	32.9	•			10-				
	Solid	GRAVEL - sandy, well graded, sub rounded, moist, loos	e (est.), reddish brown								11				
-	0,										12				
4					and the second	SA04	2.5	•			13				
Ē		- 10 cm silt layer									14				
											16				
5		- some silt									17-				
-		Some Site			allow the	SA05	9.4	•			18				
										•	19				
- 0		END of BOREHOLE at 6.1 m (Target Depth).									20				
-											21				
7											22				
											23				
											24				
- 8											26				
											27				
											28				
- 9											29				
											30				
-											31				
10											32				
			Contractor: Donjeck Drilling]		Compl	etion D	Depth: 6.1 n	1						
	ł	TETRA TECH	Drilling Rig Type: Truck Mo	ounted CME75		Start D	Date: 20	D January 2	017	7					
	-	J	Reviewed By: JTP	C				Completion Date: 20 January 2017							

			Borehole No: BH17-02							17 ¹⁰ .					
	Y	ukon Government	Project: Mayo Undergrour	nd Utility Upgrades		Proje	ct No: \	W1410356	7-24						
	-		Location: First Ave. and M	lontreal St.											
			Mayo, YT			UTM:	45584	5 E; 70517	42 N; Z 8	NAD83					
Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	Moisture Content (%)	Plastic Limit	Moisture Content	Liquid Limit	Depth (ft)				
		SAND - silty, trace gravel, poorly graded, frozen, light gr	eyish brown	Seasonally Frozen	-			20	40 60	80	0				
- - - - - - - - - - - - - - - -		- dry, loose (est.)		Unfrozen	_	SA06	19.8	•			2				
- 2											6				
	n auger	- graveliy, some siit, well graded				SA07	3.3	•			7				
- 3 	Solid ster					SA08	2.6	•			10 11 12 13				
5		- moist									14 14 15 16 17 18 18				
6											20				
- 7		END of BOREHOLE at 6.1 m (Target Depth).									21 22 23 24 25 26 27 28 27 28 28				
9 											29 30 31 31				
10											32				
			Contractor: Donjeck Drilling	g		Compl	etion D	Depth: 6.1 r	n						
		TETRA TECH	Drilling Rig Type: Truck Mo	ounted CME75		Start D)ate: 20) January 2	2017						
	C		Logged By: TM			Completion Date: 20 January 2017									
			Reviewed By: JTP				Page 1 of 1								

			Borehole	No: BH17-	0	5					
	١	ukon Government	Project: Mayo Undergrour	nd Utility Upgrades		Proje	ct No: 1	W1410356	7-24		
			Location: Duncan Ave. an	d Montreal St.							
			Mayo, YT			UTM:	45583	3 E; 70516	62 N; Z 8	NAD83	
			•		T.						
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	Moisture Content (%)	Plastic Limit 20	Moisture Content 40 60	Liquid Limit I 80	o Depth (ft)
Ē		SAND and GRAVEL (FILL) - some silt, well graded, froz	en, greyish brown	Seasonally Frozen						:	
						SA22	23.5	•			2
- 1 -											3
-		SILT - sandy, frozen, greyish brown									5
											6
	-	- dry, soft (est.)		Unfrozen							7-
	ger	firm (act)				SA23	10.3	•		•	8
- 3	m au	SAND - trace silt, well graded, dry, compact (est.), grevi	sh brown								9
	id ste							-			
Ē	Soli	- 10 cm silt layer								-	12
4		- some gravel						5			13
					-stall!	SA24	2	•			14
-											15
		- gravelly								-	16
5		- silty									17-
E						SA25	6.7			:	10_1
-											
6											19
		END of BOREHOLE at 6.1 m (Target Depth).									20
-											
- 7											22
											23-
											24
-											25-
- 8											26
-											27-1
-											28
9											29
-											30-
-											31
10											32
		ר	Contractor: Donjeck Drilling]	(Comple	etion D)epth: 6.1 r	n		
	[]	TETRA TECH	Drilling Rig Type: Truck Mo	ounted CME75		Start D	ate: 21	January 2	2017		
		J Company					etion D	ate: 21 Ja	nuary 201	7	
			Neviewed Dy. JTP		- [F	rage 1	011				

			Boreho	ole No: 7							
	Go	overnment of Yukon	Project: Mayo Sew	ver and Water			Proje	ct No: I	E-1021		
			Location: Sewer ar	nd Water Installation			Grour	nd Elev	r: 490.7 m		
			Mayo, Yukon								
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	20 40 Plastic Moi Limit Co 20 40	T (N) 60 80 sture Liquid ntent Limit 60 80	Elevation (m)
Ē		HARD PACKED SNOW		Seasonal frost							
Ē1		GRAVEL (FILL) - sandy, fine to medium grained, mediu	im drown								490-
Ē		SAND - some thin silt laminations, uniform, fine, medium	n brown	Nf							
E 2		GRAVEL - fine to medium sandy, gap graded, medium	brown		M	1		25	•		489
Ē				Unfrozen							
E 3		SAND - fine uniform, silty to 3.4 m, medium grained, tra	ce of silt, medium							····;	488-
Ē		brown	,	Frozen, Nbn-Nbe	A	2	20	32			
E 4		GRAVEL - sandy, fine grained, medium grey brown		-			1				48/-
E				Nbn-Nbe	Ы	2					496
E 5		- fine to medium, very little fines			h	3		°			400
Ē		SILT - some organics, dark grey		Nhn Nho							485
F 6					Н						
Ē		END OF BOREHOLE AT 6.6 m	/		Å	4		19	•		484-
Ē,											483-
Ē											
Ē.											482
E 10											481-
Ē											1 11
E 11											480-
E 12											479
											470
13											4/8
E										:	477-
E 14											
E											476-
E- 15											
Ē											475-
10											
E 17								£1			474-
E 18											473-
- 19											472-
E										l	
= 20			Combaster	· · · · · · · · · · · · ·							471-
							Compl	etion D	epth: 6.6 m		
		TETRA TECH					Start D	vate: 19	1/5 February 2	.4	
		<u> </u>	Logged By: JK				Compl	etton D	vate: 1975 Feb	ruary 24	
			I Keviewed By: JK				Page 1	1 of 1			

LOT 4; BLOCK 33 TESTHOLES



			Bore	hole No: 4								
	G	overnment of Yukon	Project: May	o Sporting Complex				Proje	ct No:	E-1021		÷.,
			Location: Ma	ayo Curling Arena				Grour	nd Elev	/: 489.8 m		
			Mayo, Yuko	n								
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	Temperature (°C)	SPT (N)	Moisture Content (%)	20 Plastic Limit 20	SPT (N) 40 60 80 Moisture Liqu Content Lim 40 60 80	t Elevation (m)
Ē		PEAT - fibrous, roots, silty, dark brown		Seasonal frost, Nbn								-
1 1 2		GRAVEL - sandy, fine to medium grained, some coarse some oxides, cobbly and coarse from 2.0 m down, m SAND - very silty, very fine, uniform, medium to dark gr	e, trace of silt, nedium brown ey	Nf Unfrozen		1			9	•		489
ահ ահա						2		50			•	487
4		SILT - dark grey		Frozen	×	3			26	•		486-
6												484
				Nbn	X	4	0.11		27	•		483
8					X	5	0		24	•		482
1 9 1		- thinly laminated with black organics			X	6			25	•		481-
10 10		SILT - dark grey										480
11 12												478
13 14		- no organics			X	7			28	•		477
15												475
16												474
18		- thinly laminated with black organics										472
19		END OF BOREHOLE AT 18.7 m			X	8			28	•		471
E 20												470
			Contractor:					Compl	letion [Depth: 18.8	m	
	1	TETRA TECH	Drilling Rig T	уре:				Start D	Date: 1	975 Februa	гу 24	
"	L	•]	Logged By: J	K				Compl	letion [Date: 1975	ebruary 24	
	Logged E Reviewed		Reviewed By	r: JK				Page '	1 of 1			

			Borehole	No: 5					
	G	overnment of Yukon	Project: Mayo Sporting Co	omplex		Proie	ct No:	E-1021	
			Location: Mayo Curling Ar	rena		Groui	nd Flev	/ 489.9 m	
			Mayo Yukon			Cioui			×.
	<u> </u>	· · · · · · · · · · · · · · · · · · ·							<u> </u>
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	Moisture Content (%)	Plastic Moisture Liquid Limit Content Limit 20 40 60 80	Elevation (m)
E		CLAY - silty, low plastic, medium brown							
Ē1				Nbn					489
2		GRAVEL - fine to medium grained, gap graded, dry, tran	æ of silt, medium brown	Nf	X	1	8	•	488
Ē		- seasonal first to 2.4 m		Unfrozen		2			
Ē 3									487-
Ē		- SPT retusal				3			
4		- coarser							486-
E		- SPT refusal		Frozen		4			- Internet
5		SAND - some fine gravel, medium brown, grey at 5.0 m		Nbe-Nbn				·····	485
Ē		SILT - trace of fine gravel and clay, sandy, dark grey, pin	eces of wood						- thu
E 6				Nbe-Vs 0-5%		_	42		484-
Ē,		END OF BOREHOLE AT 6.7 m				5	43		492
Ē									403
E 8				2					482
Ē									
Ē-9									481
Ē									
E 10									480-
E									1
E 11									479-
Ē			С						
E ¹²									4/8
E ₁₂									477
Ē									
E 14						<			476-
E 15									475-
E									111
16									474-
Ē									1
17									473
E 10									
									7/2
E 19									471
									111
E 20					Ц				470-
			Contractor:		(Compl	etion C	Depth: 6.7 m	
		TETRA TECH				Start D	ate: 19	9/5 February 24	
			Lugged By: JK			Compl	etion D	Date: 19/5 February 24	
			Reviewed By: JK			rage 1	i ot 1		

LOTS 4 TO 8; BLOCK 25 TESTHOLES



			Bore	hole No: 4					-			
6	G	overnment of Yukon	Project: May	o Sporting Complex				Proje	ct No: I	F-1021		
			Location: Ma	avo Curling Arena				Grour	nd Flev	<i>r</i> 489.8 m		
			Mayo Yuko	n						7. 400.0 m		_
	Г		Iviayo, Tukoi		1	r	1	┼──				
Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	Temperature (°C)	SPT (N)	Moisture Content (%)	20 SPT (N)I 40 60 Plastic Moisture Limit Content 20 40 60	80 Liquid Limit 80	Elevation (m)
Ē		CLAY - trace of sand, low plastic, medium brown		Seasonal frost, Non								
1 1 1 2		GRAVEL - sandy, fine to medium grained, some coarse some oxides, cobbly and coarse from 2.0 m down, m	e, trace of silt, nedium brown	Nf	Z	1			9	•		489 488
3		SAND - very silty, very fine, uniform, medium to dark gro	ey									487
L 4				Eman		2		50		•		486
5 1		SILT - dark grey			X	3			26	•		485
шш 6						4	0.11		27			484
- - - - - - - - - - - - - - - - - - -				Nbn		•	0.11		21			483
8					X	5	0		24	•		482
1 9		- thinly laminated with black omanics				6			25	•		481
10 11		SILT - dark grev										480
11 11												479
12 12 13												477-
uluu 14		- no organics			X	7			28	•		476
15			1									475-
16 16												474
17												473
18		- thinly laminated with black organics				8			28	•		472
19		END OF BOREHOLE AT 18.7 m								i i.		471
			Contractor	. <u>.</u>				Compl	etion ^r	Denth: 18.8 m		4/0-3
		TETRA TECH	Drillina Ria T	vpe:				Start C)ate: 10	975 February 24		
	t		Logged By: J	K				Compl	etion F	Date: 1975 February	24	
			Reviewed By	Logged By: JK Completion Date: 1975 February 24 Reviewed By: JK Page 1 of 1								

			Borehole	No: 5					
	G	overnment of Yukon	Project: Mayo Sporting Co	mplex		Proie	ct No: I	E-1021	
			Location: Mayo Curling An	ena		Grour	nd Flev	/: 489.9 m	
			Mayo Yukon		-	Giodi			
\vdash	Т		mayo, rakon			<u> </u>			
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	Moisture Content (%)	Plastic Moisture Liquid Limit Content Limit 20 40 60 80	Elevation (m)
Ē		CLAY - silty, low plastic, medium brown		Allen					111
Ē1				NDN					489-
Ē		GRAVEL - fine to medium grained, gap graded, dry, trac	e of silt, medium brown	Nf					
E 2					X	1	8	•	488
Ē		- seasonal frost to 2.4 m		Unfrozen		2	:		- III
E 3		- SPT refusal				3			487-
Ē									Int
E 4		- coarser							486-
		- SPT refusal		Frozen		4			405
Ē		SAND - some fine gravel, medium brown, grey at 5.0 m		Nbe-Nbn					400
Ē.		SILT - trace of fine gravel and clay, sandy, dark grey, pie	eces of wood						484-
Ē				NDE-VS 0-5%		5	43	•	
Ę 7		END OF BOREHOLE AT 6.7 m						<u> </u>	483-
Ē									1
E-8									482
E									1
F 9									481-
									400
E ¹⁰									400-1
Ē ₁₁									479
Ē									
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									476
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E 16									474
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18									472
									111
19									471-
E 20							ļ		
			Contractor:			Compl	etion [Depth: 6.7 m	4/0-
			Drilling Rig Type:			Start D)ate: 19	975 February 24	
	C	A man a start to be said to be	Logged By: JK			Compl	etion [Date: 1975 February 24	
			Reviewed By: JK		- 1	Page 1	l of 1		

		C Department of	Testpit No:	TP04					,	
		G - Department of	Project: Urban Infill Phase 2 - Ge	eotechnical Evaluation	Proje	ct No:	W1410148	9		
	С	ommunity Services	Location: Area "B"							
			Mayo, YT		1					
						(%			· · · · ·	
Depth (m)	Method	Soil Description	ı	Ground Ice Description	Sample Type	Moisture Content (Plastic Limit	Moisture Content	Liquid Limit 1	Depth (ft)
	\vdash	ORGANIC ROOT MAT					- 20	: :	:	
- 1	Excavated	SAND AND SILT - trace clay, fine grained, soft, very mo GRAVEL - sandy, trace silt, well graded gravel, medium compact, damp, grey and brown - cobbles throughout gravel layer	ist, medium grey to coarse grained sand, loose to							2 3 4 6
-				Permatrost						
F		- unable to sample due to slough						: :		8-
F		END OF TESTPTI @ 2.5 m (Rerusal on Permatrost)								
-		NOTE: Sloughing throughout gravel								9
-3										
F										
-										
[11-
F										
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-										
- 4										13-
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[
-										
										16
5			Contractor:		Comp	etion l)epth: 2.5 r	n		
		TETRATECH	Drilling Rig Type: CAT 325		Start F)ate: 2	010 Octobe	er 7		
			Logged By: JSB		Compl	etion [)ate: 2010	Octoher 7		
			Reviewed By: JRT		Page	1 of 1		50.00017		

AIRPORT SUBDIVISION TESTHOLES LOT 1004, QUAD 105 M/12



		Stowert Valley	Boreho	ole No: 01								
			Project: Foundation	n Investigation			Proje	ct No:	0201-1062	6		
		Enterprises	Location: Bedrock	Motel			ŕ	50				
			Mayo, Yukon									
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	20 Plastic Limit 20	SPT (N) 40 60 Moisture Content 40 60	80 Liquid Limit 80	Depth (ft)
		GRAVEL AND SAND - trace to some silt, rounded coars fine gravel, fine to medium grained sand, light brown compact	se gravel with some , damp, loose to	Unfrozen	2	1		1.5				2
		- occasional cobbles (150 mm+)										4
2⊈		- difficult, rough drilling through coarse gravel				2		3.4	•			T e ¹
Ē		- at 2.1 m, ther gravel	ar amyol wall graded						-		1	8
3		sand, brown, saturated, loose to compact	ar graver, wen graded		X	3	8	10.5	•			10 mm
4												12-112-114-114-114-114-114-114-114-114-1
5	em auger	SAND - trace of gravel, trace of silt, occasional cobbles, fine angular gravel, brown, saturated, loose	medium to fine sand,		Х	4	26	6.8	•			16 16
6	Hollow ste	GRAVEL - some to trace of sand, trace of silt, rounded f gravel, brown, saturated, dense - difficult drilling to 7.2 m	ine with some coarse		X	5		14.3	•			18 18 20 20
7		 moderately easy drilling from 7.6 to 9.1 m SAND - some gravel, trace of silt, well graded sand, fine saturated, compact 	gravel, brown,		X	6						22 24 24
8												որովուրովուրով 28-րդ
9					X	7	13	9.7				30 30 Manuhantantantantantantantantantantantantanta
10		- becomes dense at 10.4 m			X	8	51/ 213mm	10.3	•			ستسلسل 1/213
E E 11		END OF BOREHOLE 10.7 m					ະເວກາກ					26 m
												38 Indundraduad
12			Contractor:	· · · · · · · · · · · · · · · · · · ·			Comp	letion F)enth: 10 7	m		
		TETRATECH	Drilling Ria Type: C	ME 75			Start Date: 1991 May 6					
	t		Logged By: CRH				Compl	etion F)ate: 1991	Mav 6		
			Reviewed By: JRT	MCP			Page	1 of 1				

			Boreho	ole No: 02						
		Stewart valley	Project: Foundatio	n Investigation			Proje	ct No:	0201-10626	
		Enterprises	Location: Bedrock	Motel						
			Mayo, Yukon	-						
o Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	Plastic Moisture Liquid Limit Content Limit 20 40 60 80	o Depth (ft)
Ē		SAND - silty, tine, occasional roots, brown, moist, loose		Unfrozen						
	v stem auger	 GRAVEL AND SAND - trace of sit, coarse grave, occar medium to coarse sand, brown, damp, compact very rough drilling 	sional coddies,			1				2 8 8 8 8 8 10 10 10 10 10 10 10 10 10 10
	Hollov	SAND - some fine gravel, occasional coarse gravel and well graded sand, brown, saturated, loose - easy drilling	cobbles, trace of silt,	-		2	6	5.9		
5 6 7 10 10 10 11		END OF BOREHOLE 4.6 m								
12		2	Contractor:	I	<u> </u>		Comp	letion [Depth: 4.6 m	
		TETRA TECH	Drilling Rig Type: C	CME 75			Start [Date: 1	991 May 7	
	C		Logged By: CRH				Comp	letion [Date: 1991 May 7	
			Reviewed By: JRT	MCP			Page	1 of 1		

		Che Nuck Due First	Testpit No	D: TP01					
	a	-Cho Nyak Dun First	Project: Percolation Tests		Т	Proie	ct No: (201-99-14107	
		Nation	Location: Peter Residence	a	\neg				
			Mayo Yukon						·
<u> </u>	Г				\square				
Depth (m)	Method	Soil Description		Ground Ice Description	Sample Type	Sample Number	Moisture Content (%)	Plastic Moisture	Liquid Limit 80
	\square	ORGANIC ROOT MAT		Unfrozen					
		SAND & SILT - gravelly, well graded sand, well graded damp, light grey brown - no gravel from 0.3 - 0.7 m	subrounded gravel, compact,			1			2-
- 1 - - -	cavated	GRAVEL & SAND - trace of silt, well graded subrounde compact, damp, mottled grey and brown	d gravel, coarse grained sand,			2			4-
- 2	Ŭ	- cobbly below 1.5 m				3			5- ▼6- 7- 8-
- - - - - - - - - - - - - - - - - - -		END OF TESTPIT @ 2.8 m - major slough throughout - water table @ 1.8 m							10- 11- 12- 13- 13- 14- 14-
									15-1
			Contractor:	· · · · · · · · · · · · · · · · · · ·		Compl	etion C	epth: 2.8 m	
		TETRA TECH	Drilling Rig Type: CAT 325	Ное		Start D	Date: 19	999 August 26	
	U		Logged By: MCP		(Compl	etion C	Date: 1999 August 26	
			Reviewed By: JRT		F	Page '	1 of 1		

Yukon Energy Corp. Project Bealance-Lot 1985 Project No. 120114 Losaton: YEC House Mayo, Yukon				Testpit No:	TP01				
Idealin: YEC House Mayo, Yulon Idealin: YEC House Mayo, Yulon g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g g		Y	ukon Eneray Corp.	Project: Geotechnical Evaluation	n - Lot 1095	Proie	ct No:	1200104	
Dodawit // Explosion Ground Ice Description State (Image Total Content - Limit Description State (Image Total Conten - Limit Description State (Image Total Content		-		Location: VEC House		1.10,0			
Image: Tree of a start and some day, frame of graved, fine grained, dark gray. Competition Competition <thcompetition< t<="" td=""><td></td><td></td><td></td><td>Maya Vultar</td><td></td><td></td><td></td><td></td><td></td></thcompetition<>				Maya Vultar					
End Soil Description Ground Ice Description End Sol Description SIMP - gravity, some sit, fine to medium sand, well graded gravel, compact, damp Uniforcen 5.8 • SIMP - gravity, some sit, fine to medium sand, well graded gravel, compact, damp Uniforcen 5.8 • • SIMP - gravity, some sit, fine to medium sand, well graded gravel, compact, damp Uniforcen 5.8 • • SIMP - gravity, some sit, fine to medium sand, well graded gravel, compact, damp Uniforcen 5.8 • • • • • 5.8 • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • • •	<u> </u>	-		Mayo, Yukon	······································	L	<u> </u>		
SINDELD CREAMIC ROUT MAT SND - gravely, some alt, fine to medium sind, well graded gravel, compact, damp. GRAVEL AND SAND - trace of silt, well graded gravel, coarse sand, compact, damp. GRAVEL AND SAND - trace of silt, well graded gravel, coarse sand, compact, damp. brown - valer seepage around 1.3 m - valer seepage around 1.3 m - (Gravel - 57%; Send - 62%; Silt & Clay - 2%) - (Gravel - 67%; Send - 62%; Silt & Clay - 2%) - (Gravel - 67%; Send - 62%; Silt & Clay - 2%) - (Gravel - 67%; Send - 62%; Silt & Clay - 2%) - (Gravel - 67%; Send - 62%; Silt & Clay - 2%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Send - 1%; Sin - 7%; Clay - 8.4%) - (Gravel - 67%; Sin - 67%; Si	 Depth (m) 	Method	Soil Descriptio	n	Ground Ice Description	Sample Type	Moisture Content (%)	Plastic Moisture Liquid Limit Content Limit 20 40 60 80	 Depth (ft)
SAND - gravely, some sit, fire to madum sand, well graded gravel, compact, damp GRAVEL AND SAND - trace of sit, well graded gravel, coarse sand, compact, damp, brown - water seepage around 1.3 m - water seepage around 1.3 m - (Gravel - 57%; Sand - 42%; Sit & Clay - 2%) - 3 - (Gravel - 57%; Sand - 42%; Sit & Clay - 2%) - 3 - (Gravel - 57%; Sand - 42%; Sit & Clay - 2%) - 3 - (Gravel - 57%; Sand - 42%; Sit & Clay - 2%) - 4 - (Gravel - 57%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sit - 7%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sand - 1%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sand - 1%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sand - 1%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sand - 1%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sand - 1%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Sand - 1%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Clay - 64%) - (Gravel - 67%; Sand - 1%; Clay - 64%) - (Gravel - 67%; Clay	-		STRIPPED ORGANIC ROOT MAT		Unfrozen				
- water seepage around 1.3 m - water seepage around 1.3 m - (Gravel - 57%; Sand - 42%; Silt & Clay - 2%) - (Gravel - 57%; Sand - 42%; Silt & Clay - 2%) - (Gravel - 57%; Sand - 42%; Silt & Clay - 2%) - (Gravel - 57%; Sand - 42%; Silt & Clay - 2%) - (Gravel - 4%; Sand - 11%; Silt - 7%; Clay - 8.4%) END OF TESTPIT 3.5 m (REFUSAL) - water seepage from around 1.3 m depth - 4 - 4 - 4 - 4 - 4 - 4 - 5 - 5 - 5 - 5 - 5 - 5 - 5 - 5			SAND - gravelly, some silt, fine to medium sand, well g GRAVEL AND SAND - trace of silt, well graded gravel,	raded gravel, compact, damp coarse sand, compact, damp, brown			5.8	•	1
- (Gravel - 57%; Sand - 42%; Silt & Clay - 2%) - 3 SILT - some sand and some clay, trace of gravel, fine grained, dark grey - (Gravel - 4%; Sand - 11%; Silt - 77%; Clay - 8.4%) END OF TESTPIT 3.5 m (REFUSAL) - water seepage from around 1.3 m depth - 4 - 4 - 5 - 5 - 5 - 5 - 5 - 5 - 7 - 7 - 7 - 7 - 7 - 7 - 7 - 7	- 1 - - - - - - - - - - - - - - - - - -	Excavator	- water seepage around 1.3 m				2.6		3
SILT - some sand and some clay, trace of gravel, fine grained, dark grey 27.8 - (Gravel - 4%; Sand - 11%; Silt - 77%; Clay - 8.4%) END OF TESTPIT 3.5 m (REFUSAL) - water seepage from around 1.3 m depth - 4 - 4 - 5 - 5 - 6 - 7 - 7 - 8 - 9 - 9 - 10 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11 - 11			- (Gravel - 57%; Sand - 42%; Silt & Clay - 2%)				7.1	•	9 10 10
SILT - some sand and some clay, trace of gravel, fine grained, dark grey 27.8 27.8 1 - (Gravel - 4%; Sand - 11%; Sit - 77%; Clay - 8.4%) 1 1 1 END OF TESTPIT 3.5 m (REFUSAL) - water seepage from around 1.3 m depth 1 1 - 4 - water seepage from around 1.3 m depth 1 1 - 5 - Contractor: Completion Depth: 3.5 m - 5 Dilling Pig Targe: CAT 225 L Contractor:	Ľ								11-
- (uravel - 4%; sand - 11%; Sit - 1/%; Clay - 8.4%) END OF TESTPIT 3.5 m (REFUSAL) - water seepage from around 1.3 m depth - 4 - 4 - 5 - 5 Contractor: Completion Depth: 3.5 m Drilling Pire Turge: CAT 225 L	F		SILT - some sand and some clay, trace of gravel, fine g	rained, dark grey		12	27.8	•	
5 1 5 Contractor: Contractor: Completion Depth: 3.5 m	- 4		 - (Gravel - 4%; Sand - 11%; Silt - 77%; Clay - 8.4%) END OF TESTPIT 3.5 m (REFUSAL) - water seepage from around 1.3 m depth 	/					12
5 1 5 Contractor: Completion Depth: 3.5 m Drilling Pig Type: CAT 225 I	-								E
Contractor: Completion Depth: 3.5 m									16
Completion Depth: 3.5 m	5		L	Contractor:				Donthi 2.5 m	Ŧ
			I TETRA TECH	Uniling Kig Type: CAT 325 L		Start D	ate: 2	UU4 July 1	
Logged By: JSB Completion Date: 2004 July 1	11 "			Logged By: JSB		Compl	etion [Date: 2004 July 1	
Reviewed By: JRT Page 1 of 1				Reviewed By: JRT		Page 1	of 1		

			Testpit No:	TP02						
	Y	ukon Enerav Corp.	Project: Geotechnical Evaluation	n - Lot 1088	Projec	t No: '	1200104			
	-		Location: YEC House		<u> </u>	·			_	
			Mavo, Yukon							
					<u> </u>	[
o Depth (m)	Method	Soil Description	n	Ground Ice Description	Sample Type	Moisture Content (%)	Plastic M Limit (Noisture Content	Liquid Limit	Depth (ft)
		STRIPPED ORGANIC ROOT MAT		Unfrozen			:			
		SAND - some silt to silty, fine grained, soft, moist, light y	vellowish grey			14.1	•			1
Ľ		GRAVEL AND SAND - trace of silt, well graded gravel, of	coarse sand, damp, compact, brown							
<u> </u> 1		- (Gravel - 64%: Sand - 33%: Silt & Clay - 2%)								3-
Ę						2.2				
ŀ	5									4
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ŀ	Exc									5
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F		- color changes to grey below 2.8 m			142					9
-3						5.9	• 28			
E										10-
-										
										""
-		- no water table encountered								
È										"" "
-										
4										13
-										
t I										14
-										
										15-
$\left \right $										
5										16-
$\left \right $			Contractor:		Compl	etion [Depth: 3 m			
		TETRA TECH	Drilling Rig Type: CAT 325 L		Start D	ate: 20	004 June 1			
			Logged By: JSB		Compl	etion [Date: 2004 J	une 1		
NORTHER		YO GPU FBA GDT 19-10-11	Reviewed By: JRT		Page 1	of 1	e			

Yukon Energy Corp.			Testpit No: TP03					
			Project: Geotechnical Evaluation - Lot 1088		Project No: 1200104			
			Location: YEC House					
	Γ		mayo, raton	1	I			
o Depth (m)	Method	Soil Description	Soil Description		Sample Type	Moisture Content (%)	Plastic Moisture Liquid Limit Content Limit 20 40 60 80	⊂ Depth (ft)
-				Unfrozen				
- - -	Excavator	SAND - silty, fine grained, soft, moist, yellowish brown GRAVEL AND SAND - trace of silt, well graded gravel, coarse sand, compact, damp, light brown				10.5	•	1
- 1						3	•	2 3 4 5 6 7
- - - - - - - - -		- colour changes to light grey below 2.5 m				7.2	•	
-		END OF TESTPIT 3.0 m (REFUSAL)						10-
		- no water table encountered						111 12 13 13 14 14
Ľ								15-1
-								1
5								16-
	• • • •		ontractor:		Completion Depth: 3 m			
Tł		TETRATECH	Drilling Rig Type: CAT 325 L		Start Date: 2004 June 1			
			Logged By: JSB		Completion Date: 2004 June 1			
			Reviewed By: JRT		Page 1 of 1			

APPENDIX A

TETRA TECH'S LIMITATIONS ON THE 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").

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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.

Both electronic file and/or hard copy versions of TETRA TECH's Instruments of Professional Service shall not, under any circumstances, be altered by any party except TETRA TECH. TETRA TECH's Instruments of Professional Service will be used only and exactly as submitted by TETRA TECH.

Electronic files submitted by TETRA TECH have been prepared and submitted using specific software and hardware systems. TETRA TECH makes no representation about the compatibility of these files with the Client's current or 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. No warranty or guarantee, express or implied, is made concerning the test results, comments, recommendations, or any other portion of the Professional Document.

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

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. The Client further acknowledges that in order for TETRA TECH to properly provide the services contracted for in the Contract, TETRA TECH has relied upon the Client with respect to both the full disclosure and accuracy of any such information.

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, 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.

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 document, 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, 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 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.

1.8 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.

1.9 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.

1.10 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.

1.11 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.

1.12 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.

1.13 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.

1.14 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.

1.15 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.

1.16 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.

1.17 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.

1.18 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.