

APPENDIX A

TETRA TECH'S GENERAL CONDITIONS

GENERAL CONDITIONS

GEOTECHNICAL REPORT

This report incorporates and is subject to these "General Conditions".

1.1 USE OF REPORT AND OWNERSHIP

This geotechnical report pertains to a specific site, a specific development and a specific scope of work. It is not applicable to any other sites nor should it be relied upon for types of development other than that to which it refers. Any variation from the site or development would necessitate a supplementary geotechnical assessment.

This report and the recommendations contained in it are intended for the sole use of TETRA TECH's Client. TETRA TECH does not accept any responsibility for the accuracy of any of the data, the analyses or the recommendations contained or referenced in the report when the report is used or relied upon by any party other than TETRA TECH's Client unless otherwise authorized in writing by TETRA TECH. Any unauthorized use of the report is at the sole risk of the user.

This report is subject to copyright and shall not be reproduced either wholly or in part without the prior, written permission of TETRA TECH. Additional copies of the report, if required, may be obtained upon request.

1.2 ALTERNATE REPORT FORMAT

Where TETRA TECH submits both electronic file and hard copy versions of reports, drawings and 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 and legally binding. The original signed and/or sealed version archived by TETRA TECH shall be deemed to be the original for the Project.

Both electronic file and hard copy versions of TETRA TECH's instruments of professional service shall not, under any circumstances, no matter who owns or uses them, 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 ENVIRONMENTAL AND REGULATORY ISSUES

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

1.4 NATURE AND EXACTNESS OF SOIL AND ROCK DESCRIPTIONS

Classification and identification of soils and rocks are based upon commonly accepted systems and methods 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.

1.5 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.

1.6 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 historic 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 investigation and review may be necessary.

1.7 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.

1.8 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.

1.9 INFLUENCE OF CONSTRUCTION ACTIVITY

There is a direct correlation between construction activity and 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 are known.

1.10 OBSERVATIONS DURING CONSTRUCTION

Because of the nature of geological deposits, the judgmental nature of geotechnical engineering, as well as 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.

1.11 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 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.

1.12 BEARING CAPACITY

Design bearing capacities, loads and allowable stresses 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 assumed. Sufficient observations should be made by qualified geotechnical personnel during construction to assure that the soil and/or rock conditions assumed in this report in fact exist at the site.

1.13 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.

1.14 INFORMATION PROVIDED TO TETRA TECH BY OTHERS

During the performance of the work and the preparation of the report, TETRA TECH may rely on information provided by persons other than the Client. While TETRA TECH endeavours to verify the accuracy of such information when instructed to do so by the Client, TETRA TECH accepts no responsibility for the accuracy or the reliability of such information which may affect the report.

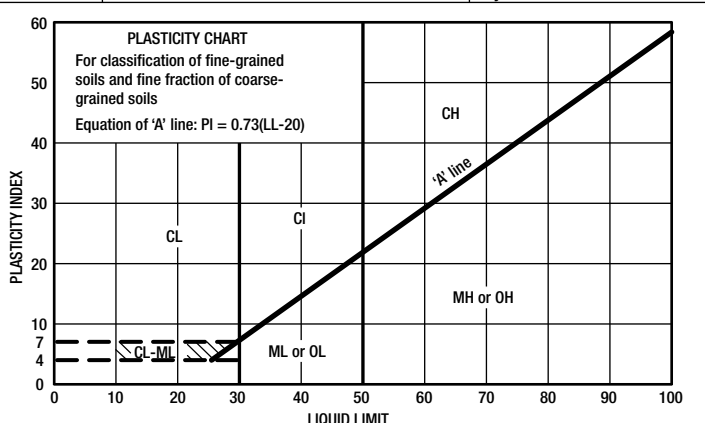
APPENDIX B

GINT BOREHOLE AND TESTPIT LOGS

MODIFIED UNIFIED SOIL CLASSIFICATION

MAJOR DIVISION		GROUP SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA			
COARSE - GRAINED SOILS More than 50% retained on No. 75 µm sieve*	GRAVELS 50% or more of coarse fraction retained on No. 4 sieve	GW	Well-graded gravels and gravel-sand mixtures, little or no fines	Classification on basis of percentage of fines GW, GP, SW, SP GM, GC, SM, SC Borderline classification requiring use of dual symbols	$C_u = D_{60} / D_{10}$ Greater than 4 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3		
		GP	Poorly-graded gravels and gravel-sand mixtures, little or no fines		Not meeting both criteria for GW		
		GRAVELS WITH FINES	GM		Silty gravels, gravel-sand-silt mixtures	Atterberg limits plot below 'A' line or plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			GC		Clayey gravels, gravel-sand-clay mixtures	Atterberg limits plot above 'A' line and plasticity index greater than 7	
		SANDS More than 50% of coarse fraction passes No. 4 sieve	CLEAN SANDS		SW	Well-graded sands and gravelly sands, little or no fines	$C_u = D_{60} / D_{10}$ Greater than 6 $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}}$ Between 1 and 3
	SP				Poorly-graded sands and gravelly sands, little or no fines	Not meeting both criteria for SW	
	SANDS WITH FINES		SM		Silty sands, sand-silt mixtures	Atterberg limits plot above 'A' line and plasticity index less than 4	Atterberg limits plotting in hatched area are borderline classifications requiring use of dual symbols
			SC		Clayey sands, sand-clay mixtures	Atterberg limits plot above 'A' line and plasticity index greater than 7	

FINE-GRAINED SOILS (by behavior)		GROUP SYMBOL	TYPICAL DESCRIPTION
50% or more passes 75 µm sieve*	SILTS Liquid limit	ML	Inorganic silts, very fine sands, rock flour, silty or clayey fine sands of slight plasticity
		MH	Inorganic silts, micaceous or diatomaceous fine sands or silts, elastic silts
	CLAYS Above 'A' line on plasticity chart negligible organic content Liquid limit	CL	Inorganic clays of low plasticity, gravelly clays, sandy clays, silty clays, lean clays
		CI	Inorganic clay of medium plasticity, silty clays
		CH	Inorganic clay of high plasticity, fat clays
	ORGANIC SILTS AND CLAYS Liquid limit	OL	Organic silts and organic silty clays of low plasticity
		OH	Organic clays of medium to high plasticity



* Based on the material passing the 75 mm sieve
 † ASTM Designation D 2487, for identification procedure see D 2488 USC as modified by PFRA

GROUND ICE DESCRIPTION

ICE NOT VISIBLE				VISIBLE ICE LESS THAN 50% BY VOLUME			
GROUP SYMBOL	SYMBOL	SUBGROUP DESCRIPTION	IMAGE	GROUP SYMBOL	SYMBOL	SUBGROUP DESCRIPTION	IMAGE
N	Nf	Poorly-bonded or friable		V	Vx	Individual ice crystals or inclusions	
	Nbn	No excess ice, well-bonded			Vc	Ice coatings on particles	
	Nbe	Excess ice, well-bonded			Vr	Random or irregularly oriented ice formations	
					Vs	Stratified or distinctly oriented ice formations	
				VISIBLE ICE GREATER THAN 50% BY VOLUME			
ICE		ICE + Soil Type	Ice with soil inclusions	ICE		Ice without soil inclusions (greater than 25 mm thick)	

- NOTES:**
- Dual symbols are used to indicate borderline or mixed ice classifications.
 - Visual estimates of ice contents indicated on borehole logs ± 5%
 - This system of ground ice description has been modified from NRC Technical Memo 79, Guide to the Field Description of Permafrost for Engineering Purposes.

LEGEND: Soil Ice

TERMS USED ON BOREHOLE LOGS

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on 0.075mm sieve): Includes (1) clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as inferred from laboratory or in situ tests.

DESCRIPTIVE TERM	RELATIVE DENSITY	N (blows per 0.3m)
Very Loose	0 TO 20%	0 to 4
Loose	20 TO 40%	4 to 10
Compact	40 TO 75%	10 to 30
Dense	75 TO 90%	30 to 50
Very Dense	90 TO 100%	greater than 50

The number of blows, N, on a 51mm O.D. split spoon sampler of a 63.5kg weight falling 0.76m, required to drive the sampler a distance of 0.3m from 0.15m to 0.45m.

FINE GRAINED SOILS (major portion passing 0.075mm sieve): Includes (1) inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as estimated from laboratory or in situ tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH (KPA)
Very Soft	Less than 25
Soft	25 to 50
Firm	50 to 100
Stiff	100 to 200
Very Stiff	200 to 400
Hard	Greater than 400

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil.

GENERAL DESCRIPTIVE TERMS

Slickensided - having inclined planes of weakness that are slick and glossy in appearance.

Fissured - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.

Laminated - composed of thin layers of varying colour and texture.

Interbedded - composed of alternate layers of different soil types.

Calcareous - containing appreciable quantities of calcium carbonate.;

Well graded - having wide range in grain sizes and substantial amounts of intermediate particle sizes.

Poorly graded - predominantly of one grain size, or having a range of sizes with some intermediate size missing.

BOREHOLE KEYSHEET

Water Level Measurement



Measured in standpipe, piezometer or well



Inferred

Sample Types



A-Casing



Core



Disturbed, Bag, Grab



HQ Core



Jar



Jar and Bag



NQ Core



No Recovery



Split Spoon/SPT



Tube



CRREL Core

Backfill Materials



Asphalt



Bentonite



Cement/Grout



Drill Cuttings



Grout



Gravel



Sand



Slough



Topsoil Backfill

Lithology - Graphical Legend¹



Asphalt



Bedrock



Cobbles/Boulders



Clay



Coal



Concrete



Fill



Gravel



Limestone



Mudstone



Organics



Peat



Sand



Sandstone



Shale



Silt



Siltstone



Till



Topsoil

1. The graphical legend is an approximation and for visual representation only. Soil strata may comprise a combination of the basic symbols shown above. Particle sizes are not drawn to scale



Testpit No: P1-01

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 525963 E; 6928010 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, dry, brown, red, tan to grey, fine to coarse sand	Unfrozen		268
1		- some gravel, damp, rounded gravel to 20 mm diameter			267
2		SAND - gravelly, well graded, wet, rounded gravel to 25 mm diameter			266
3		END OF TESTPIT (2.4 metres) slough - 0.4 metres at 0 hrs. water - 2.0 metres at 0 hrs. Note: Stopped due to sloughing soil			265
4					264
5					263
6					262
7					261
7.5					

Not Reviewed



Contractor: TLI CHO

Completion Depth: 2.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-02

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 525936 E; 6927983 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, dry to damp, red, brown, tan to grey, fine sand - grey - trace rounded gravel to 25 mm diameter	Unfrozen			268
1						267
2		SAND AND GRAVEL - trace silt, well graded, wet, grey brown, fine to coarse sand, fine to coarse rounded gravel - (Gravel - 36%; Sand - 63%; Silt - 1%)				9.3
3		END OF TESTPIT (2.4 metres) slough - 0.4 metres at 0 hrs. water - 2.0 metres at 0 hrs. Note: Stopped due to sloughing soil				265
4						264
5						263
6						262
7						261
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 2.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-03

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 266 m

2017 Summer Geotechnical Investigation

UTM: 525620 E; 6928053 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0					266
0 to 3.2	Excavated	ROOTLETS - (150 mm thick) SAND - trace silt, trace gravel, dry to damp, red brown to grey, fine to coarse sand, fine gravel - grey, fine to medium sand - no visible gravel	Unfrozen		266 to 259
3.2		END OF TESTPIT (3.2 metres) slough - 0.9 metres at 0 hrs. Note: Stopped due to sloughing soil			262

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.2 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-04

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 525332 E; 6928118 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, dry, red brown, fine sand	Unfrozen		268
1		- damp, grey			267
2		- moist			266
3		END OF TESTPIT (3.1 metres) slough - 0.9 metres at 0 hrs. Note: Stopped due to sloughing soil			265
4					264
5					263
6					262
7					261
7.5					

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.1 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-05

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 266 m

2017 Summer Geotechnical Investigation

UTM: 525086 E; 6928163 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						266
0		ROOTLETS - (100 mm thick) SAND - trace silt, dry to damp, red brown, fine sand - grey - (Gravel - 0%; Sand - 99%; Silt - 1%)	Unfrozen		2.4	266
1	Excavated					265
2						264
3						263
4		END OF TESTPIT (3.94 metres) Note: Stopped due to sloughing soil				262
5						261
6						260
7						259
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

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Testpit No: P1-06

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 263 m

2017 Summer Geotechnical Investigation

UTM: 524922 E; 6928190 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0					Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	263
0 - 2	Excavated	ROOTLETS - (150 mm thick) SAND - trace silt, trace gravel, red to brown, fine sand - trace silt, dry to damp, grey, fine to medium sand - no visible gravel - (Gravel - 2%; Sand - 96%; Silt - 2%)	Unfrozen		11.5	263 - 261
3		END OF TESTPIT (3.0 metres) slough - 1.0 metres at 0 hrs. Note: Stopped due to sloughing soil				260
4						259
5						258
6						257
7						256
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

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Testpit No: P1-07

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 266 m

2017 Summer Geotechnical Investigation

UTM: 525658 E; 6928212 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, dry to damp, brown red to grey, fine sand	Unfrozen			266
1	Excavated	- grey				265
2		- damp				264
3						263
4		END OF TESTPIT (3.4 metres) slough - 1.2 metres at 0 hrs. Note: Stopped due to sloughing soil				262
5						261
6						260
7						259
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-08

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 525545 E; 6928328 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, red brown, fine to medium sand	Unfrozen			268
0.5		- grey			2.3	
1	Excavated					
2						
3						
4						
4.4		END OF TESTPIT (4.4 metres) Note: Stopped due to sloughing soil				
5						
6						
7						
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-09

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 265 m

2017 Summer Geotechnical Investigation

UTM: 525445 E; 6928431 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						265
0	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, trace gravel, dry, red brown to grey, fine to medium sand, fine rounded gravel - dry to damp, grey - no visible gravel	Unfrozen		3.7	
1						
2						
3						
3.4		END OF TESTPIT (3.4 metres) slough - 1.0 metres at 0 hrs. Note: Stopped due to sloughing soil				
4						261
5						260
6						259
7						258
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-10

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 266 m

2017 Summer Geotechnical Investigation

UTM: 525800 E; 6928354 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, trace gravel, well graded, dry to damp, red brown, fine to coarse sand, fine rounded gravel to 15 mm diameter - (Gravel - 1%; Sand - 97%; Silt - 2%) - grey - no visible gravel - (Gravel - 0%; Sand - 100%; Silt - 0%)	Unfrozen			266
1	Excavated				2.4	265
3		END OF TESTPIT (3.0 metres)				263
4						262
5						261
6						260
7						259
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-11

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 525699 E; 6928456 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0					Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	268
0 - 1	Excavated	ROOTLETS - (200 mm thick) SAND - trace gravel, dry to damp, red brown, fine to medium sand, rounded gravel to 20 mm diameter - trace silt, grey - no visible gravel - 100 mm thick coarse sand layer	Unfrozen		2.2	267
1 - 2	Excavated	- damp				266
2 - 3	Excavated					265
3 - 4	Excavated					264
4 - 5	Excavated	END OF TESTPIT (4.0 metres) slough - 0.6 metres at 0 hrs. Note: Stopped due to sloughing soil				263
5 - 6	Excavated					262
6 - 7	Excavated					261
7 - 7.5	Excavated					260

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-12

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 263 m

2017 Summer Geotechnical Investigation

UTM: 525573 E; 6928583 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0					Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	263
0 - 3.4	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, trace gravel, dry to damp, red, brown, tan, fine to coarse sand, fine rounded gravel - grey - no visible gravel - water infiltration	Unfrozen		3	262 - 263
3.4		END OF TESTPIT (3.4 metres) slough - 0.6 metres at 0 hrs. Note: Stopped due to sloughing soil				259 - 263

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-13

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 267 m

2017 Summer Geotechnical Investigation

UTM: 525919 E; 6928525 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, red to brown, fine to medium sand - trace silt, damp, grey, fine to coarse sand - trace gravel, fine rounded gravel	Unfrozen			267
1		- fine to medium sand				266
2						265
3						264
4						263
5		END OF TESTPIT (4.1 metres) slough - 1.1 metres at 0 hrs. Note: Stopped due to sloughing soil				262
6						261
7						260
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.1 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-14

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 525859 E; 6928592 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0					Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	268
0 - 3.9	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, trace gravel, dry to damp, brown, red, fine to coarse sand, rounded gravel to 20 mm diameter - damp, grey, fine to medium sand - trace gravel to cobbles, rounded gravel to 100 mm diameter - no visible gravel	Unfrozen		3.1	
3.9 - 7.5		END OF TESTPIT (3.9 metres) slough - 1.0 metres at 0 hrs. Note: Stopped due to sloughing soil				

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.9 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-15

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 263 m

2017 Summer Geotechnical Investigation

UTM: 525756 E; 6928700 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						263
0 to 2.1	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, damp, grey to tan, fine to coarse sand - trace fine gravel - no visible gravel - fine to medium sand	Unfrozen			263 to 261
2.1 to 3.5		END OF TESTPIT (3.5 metres) slough - 1.4 metres at 0 hrs. water - 2.1 metres at 0 hrs. Note: Stopped due to sloughing soil				261 to 259

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.5 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-16

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 267 m

2017 Summer Geotechnical Investigation

UTM: 525807 E; 6928646 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, trace gravel, dry to damp, red brown, fine to coarse sand, rounded gravel	Unfrozen			267
1	Excavated	- no visible gravel				266
2		- damp, fine to medium sand				265
3					3.2	264
4						263
5		END OF TESTPIT (4.3 metres) Note: Stopped due to sloughing soil				262
6						261
7						260
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.3 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-17

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 267 m

2017 Summer Geotechnical Investigation

UTM: 525638 E; 6928516.355 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0					Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	267
0 - 1	Excavated	ROOTLETS - (200 mm thick)	Unfrozen		3.5	267
1 - 2		SAND - trace silt, dry to damp, grey, tan, red brown, fine to coarse sand - damp, grey, fine to medium sand - trace gravel, 100 mm thick coarse sand layer				
2 - 4						
4		END OF TESTPIT (4.0 metres) slough - 1.5 metres at 0 hrs. Note: Stopped due to sloughing soil				263
5						262
6						261
7						260
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-18

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 525753 E; 6928401.755 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						268
0 - 0.7	Excavated	ROOTLETS - (200 mm thick) SAND - trace silt, trace gravel, well graded, dry, brown red to tan to grey, fine to coarse sand, fine gravel - grey, fine to medium sand	Unfrozen			
0.7 - 3.5	Excavated	- no visible gravel - (Gravel - 7%; Sand - 91%; Fines - 2%)			4.3	
3.5 - 7.5		END OF TESTPIT (3.5 metres) slough - 0.7 metres at 0 hrs. Note: Stopped due to sloughing soil				

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.5 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-19

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 267 m

2017 Summer Geotechnical Investigation

UTM: 525495 E; 6928379.937 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, dry, red brown to grey, fine to coarse sand	Unfrozen			267
1	Excavated	- grey, fine to medium sand - trace gravel, rounded gravel to 25 mm diameter			2.6	266
2						265
3						264
4		END OF TESTPIT (4.0 metres) slough - 0.8 metres at 0 hrs. Note: Stopped due to sloughing soil				
5						262
6						261
7						260
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-20

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 267 m

2017 Summer Geotechnical Investigation

UTM: 525612 E; 6928260.138 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)			Elevation (m)
					Plastic Limit	Moisture Content	Liquid Limit	
0		ROOTLETS - (100 mm thick) SAND - trace silt, red brown to grey	Unfrozen		20	40	80	267
1	Excavated	- damp to moist						
2								
3								
4		END OF TESTPIT (3.5 metres) slough - 0.8 metres at 0 hrs. Note: Stopped due to sloughing soil						263
5								262
6								261
7								260
7.5								

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.5 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-21

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 525429 E; 6928230.679 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Excavated	ROOTLETS - (150 mm thick) SAND - trace silt, dry, red, brown, fine to medium sand - grey	Unfrozen		Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	268
1						267
2		- damp to moist				266
3						265
4						264
5		END OF TESTPIT (4.3 metres) slough - 0.6 metres at 0 hrs. Note: Stopped due to sloughing soil				263
6						262
7						261
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.3 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 13

Logged By: THS

Completion Date: 2017 July 13

Reviewed By: EG

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Testpit No: P1-22

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 269 m

2017 Summer Geotechnical Investigation

UTM: 526290 E; 6928599 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0					269
0 to 2.5	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, trace gravel, dry to damp - red, brown, tan to grey - grey - gravel seam - rounded gravel to 20 mm diameter - no visible gravel - fine to medium sand	Unfrozen		269 to 266.5
2.5		END OF TESTPIT (2.5 metres) slough - 0.6 metres at 0 hrs. Note: Stopped due to sloughing soil			266.5

Not Reviewed



Contractor: TLI CHO

Completion Depth: 2.5 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-23

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 269 m

2017 Summer Geotechnical Investigation

UTM: 526298 E; 6928489 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0				Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	269
0 - 3	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, dry, red brown, tan to grey - trace rounded gravel to 15 mm diameter - grey - gravel seams, gravel to 20 mm diameter - no visible gravel	Unfrozen		268 - 267
3		END OF TESTPIT (2.9 metres) slough - 0.3 metres at 0 hrs. Note: Stopped due to sloughing soil			266
4					265
5					264
6					263
7					262
7.5					

Not Reviewed



Contractor: TLI CHO

Completion Depth: 2.9 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P1-24

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 1

Ground Elev: 269 m

2017 Summer Geotechnical Investigation

UTM: 526277 E; 6928318 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Excavated	ROOTLETS - (100 mm thick) SAND - some gravel, trace silt, dry, red, brown, tan to grey, fine to coarse sand, subrounded to subangular gravel to 20 mm diameter - trace gravel, fine gravel - grey, fine to medium sand	Unfrozen		269
1					268
2					267
3		END OF TESTPIT (3.0 metres) slough - 0.3 metres at 0 hrs. Note: Stopped due to sloughing soil			266
4					265
5					264
6					263
7					262
7.5					

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 14

Logged By: THS

Completion Date: 2017 July 14

Reviewed By: EG

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Testpit No: P13B-01

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 272 m

2017 Summer Geotechnical Investigation

UTM: 511536 E; 6933213 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS AND SAND - silty, organics, black, (100 mm thick) SAND - trace silt, well graded, damp, red brown to grey, fine to coarse sand	Unfrozen			272
1		- grey, fine to medium sand				271
2						270
3	Excavated	- some silt, moist, grey				269
4		- (Gravel - 0%; Sand - 89%; Silt - 11%)			11.8	268
5		CLAY (TILL) - silty, damp, low plastic, grey			14.7	267
6		END OF TESTPIT (5.3 metres) slough - 0.3 metres at 0 hrs. Note: Stopped due to sloughing soil				266
7						265
7.5						



Contractor: TLI CHO

Completion Depth: 5.3 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13B-02

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 271 m

2017 Summer Geotechnical Investigation

UTM: 511572 E; 6933298 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, well graded, dry to damp, brown red, fine to coarse sand	Unfrozen			271
1		- dry, grey, fine to medium sand - coarse sand vein				270
2	Excavated	- some silt, moist				269
3					12.7	268
4						267
5		END OF TESTPIT (4.6 metres) slough - 0.7 metres at 0 hrs. Note: Stopped due to sloughing soil				266
6						265
7						264
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.6 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13B-03

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 276 m

2017 Summer Geotechnical Investigation

UTM: 511434 E; 6933139 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (200 mm thick)	Unfrozen			276
0	Excavated	SAND - well graded, red brown				
1		- trace silt, damp, grey, fine to medium sand				
1		- coarse sand layer				
2						
3					3.8 ●	273
4						
5		END OF TESTPIT (5.0 metres) slough - 0.5 metres at 0 hrs. Note: Stopped due to sloughing soil				271
6						270
7						269
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 5 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13B-04

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 511394 E; 6933312 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (200 mm thick)	Unfrozen			275
0 - 1	Excavated	SAND - trace silt, well graded, damp, brown, fine to coarse sand - grey, fine to medium sand	Unfrozen			
1 - 2		- coarse sand layer				
2 - 3	Excavated		Unfrozen		4.8	272
3 - 4						
4 - 5	Excavated		Unfrozen			271
5 - 6						
6 - 7	Excavated	END OF TESTPIT (5.2 metres) slough - 0.5 metres at 0 hrs. Note: Stopped due to sloughing soil	Unfrozen			270
7 - 7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 5.2 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13B-05

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 276 m

2017 Summer Geotechnical Investigation

UTM: 511274 E; 6933404 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Excavated	ROOTLETS AND SAND - (150 mm thick)	Unfrozen			276
1		SAND - red brown - trace silt, damp, grey, fine to medium sand - black organic layering - coarse sand layering				275
3		CLAY (TILL) - silty, damp, low plastic, grey				273
4		END OF TESTPIT (4.0 metres) slough - 0.4 metres at 0 hrs. Note: Refusal due to probable bedrock				272
5						271
6						270
7						269
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13B-06

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 271 m

2017 Summer Geotechnical Investigation

UTM: 511378 E; 6933566 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, damp, grey, fine to medium sand	Unfrozen			271
1	Excavated	- (Gravel - 0%; Sand - 100%; Silt - 0%)			1.8	270
2		CLAY (TILL) - silty, damp, low plastic, grey				269
2		END OF TESTPIT (1.9 metres) slough - 0.2 metres at 0 hrs. Note: Refusal due to bedrock				269
3						268
4						267
5						266
6						265
7						264
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 1.9 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13B-07

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 511109 E; 6933517 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						275
0 - 1	Excavated	ROOTLETS AND SAND - some silt to silty, organics, damp, grey SAND - trace gravel, trace silt, well graded, brown red, fine to medium sand, fine gravel - no visible gravel - (Gravel - 1%; Sand - 98%; Silt/Clay - 1%)	Unfrozen			
1 - 2.3					2.3	274
2.3 - 2.6						
2.6 - 2.7		CLAY (TILL) - silty, damp, low plastic, grey				
2.7 - 2.8		BEDROCK - weathered				
2.8 - 3.0		END OF TESTPIT (42.6 metres) slough - 0.8 metres at 0 hrs. Note: Refusal due to bedrock				272
3.0 - 4.0						271
4.0 - 5.0						270
5.0 - 6.0						269
6.0 - 7.0						268
7.0 - 7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 2.6 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13B-08

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 272 m

2017 Summer Geotechnical Investigation

UTM: 511197 E; 6933721 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						272
0 - 1	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, well graded, dry to damp, red brown - trace cobbles, grey, fine sand, angular cobbles to 300 mm diameter	Unfrozen			
1 - 2	Excavated	- silty, damp			13.4	
2 - 3	Excavated	- weathered bedrock fragments				
3		END OF TESTPIT (2.6 metres) slough - 0.3 metres at 0 hrs. Note: Stopped due to sloughing soil				269
4						268
5						267
6						266
7						265
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 2.6 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13B-09

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13B

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 511043 E; 6933689 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
					Plastic Limit Moisture Content Liquid Limit 20 40 60 80	
0		ROOTLETS - (100 mm thick) SAND - well graded, damp, red brown, fine to coarse sand - damp, grey, fine to medium sand	Unfrozen			274
1	Excavated					273
2						272
3		- silty, moist			19.1	271
4		CLAY (TILL) - silty, moist, low plastic, grey - (Gravel - 0%; Sand - 19%; Silt/Clay - 81%)			18.7	270
4		END OF TESTPIT (4.0 metres) slough - 0.3 metres at 0 hrs. Note: Stopped due to sloughing soil				270
5						269
6						268
7						267
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13C-01

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 509935.297 E; 6935393.556 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, well graded, damp, red brown, fine to medium sand	Unfrozen			274
1	Excavated	- coarse sand layering - grey				273
2						272
3		- (Gravel - 0%; Sand - 98%; Silt - 2%)			4.6	271
4						270
5		END OF TESTPIT (4.5 metres) slough - 1.0 metres at 0 hrs. Note: Stopped due to sloughing soil				269
6						268
7						267
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.5 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13C-02

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 276 m

2017 Summer Geotechnical Investigation

UTM: 510029.5588 E; 6935420.135 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, dry to damp, red brown - grey	Unfrozen			276
1		- coarse sand layering				275
2						274
3						273
4						272
5		END OF TESTPIT (4.5 metres) slough - 0.9 metres at 0 hrs. Note: Stopped due to sloughing soil				271
6						270
7						269
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.5 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 11

Logged By: THS

Completion Date: 2017 July 11

Reviewed By: EG

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Testpit No: P13C-03

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 510136.4331 E; 6935421.298 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0					Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	274
0 - 4.34	Excavated	ROOTLETS - (100 mm thick) SAND - trace silt, well graded, dry to damp, red brown, fine to coarse sand - (Gravel - 0%; Sand - 99%; Silt - 1%) - grey, fine sand - coarse sand layering	Unfrozen	5.2 2.8 5		274 - 270
4.34 - 7.5		END OF TESTPIT (4.34metres) slough - 1.0 metres at 0 hrs. Note: Stopped due to sloughing soil				269 - 267

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

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Testpit No: P13C-04

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 509898.6441 E; 6935495.48 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (150 mm thick) SAND - red brown, fine sand	Unfrozen			275
1	Excavated	- dry to damp, grey, coarse sand				274
2		- red brown layering		3.6	273	
3		- damp to moist			272	
4						271
5		END OF TESTPIT (4.3 metres) slough - 0.6 metres at 0 hrs. Note: Stopped due to sloughing soil				270
6						269
7						268
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.3 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

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Testpit No: P13C-05

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 510006.048 E; 6935528.819 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						275
0 - 4.6	Excavated	ROOTLETS - (150 mm thick) SAND - red brown, fine sand - trace silt, dry to damp, grey, fine to medium sand - coarse sand layers	Unfrozen		4.2	
4.6		END OF TESTPIT (4.6 metres) Note: Stopped due to sloughing soil				

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.6 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

Page 1 of 1



Testpit No: P13C-06

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 509854.2251 E; 6935620.752 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0					Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	275
0 - 3.9	Excavated	ROOTLETS - (100 mm thick) SAND - red brown, fine to medium sand - grey - well graded, layering, coarse sand	Unfrozen		2.5	274
3.9 - 4.1		CLAY (TILL) - silty, damp to moist, low plastic				273
4.1 - 4.2		BEDROCK - weathered				272
4.2 - 3.9		END OF TESTPIT (3.9 metres) slough - 0.2 metres at 0 hrs. Note: Refusal due to bedrock				271
5						270
6						269
7						268
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.9 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

Page 1 of 1



Testpit No: P13C-07

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 509952.9207 E; 6935654.038 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						274
0 - 1	Excavated	ROOTLETS - (150 mm thick) SAND - trace silt, dry, red brown, fine to medium sand - trace silt, dry to damp	Unfrozen			
1 - 2	Excavated	- damp to moist				
2 - 3	Excavated	CLAY (TILL) - silty, damp to moist, low plastic				
3 - 4	Excavated	END OF TESTPIT (3.7 metres) Note: Refusal due to probable bedrock				
4 - 5						
5 - 6						
6 - 7						
7 - 7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 3.7 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

Page 1 of 1



Testpit No: P13C-08

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 273 m

2017 Summer Geotechnical Investigation

UTM: 510222.1793 E; 6935591.209 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - trace silt, dry, red brown, fine sand - trace silt, damp, grey - (Gravel - 0%; Sand - 100%; Silt - 0%)	Unfrozen			273
1	Excavated				1.8	
2					6.7	
3		- moist				
4						
5		END OF TESTPIT (4.7 metres) slough - 1.1 metres at 0 hrs. Note: Stopped due to sloughing soil				
6						
7						
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.7 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

Page 1 of 1



Testpit No: P13C-09

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13C

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 510354.9169 E; 6935465.778 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SAND - well graded, red brown, coarse sand - damp, grey, fine to medium sand	Unfrozen			274
1	Excavated					273
2						272
3		- (Gravel - 0%; Sand - 98%; Silt - 2%)			4.4	271
4						270
5		END OF TESTPIT (4.3 metres) slough - 0.9 metres at 0 hrs. Note: Stopped due to sloughing soil				269
6						268
7						267
7.5						

Not Reviewed



Contractor: TLI CHO

Completion Depth: 4.3 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

Page 1 of 1



Borehole No: P13D-01

Project: TASR Granular & Bedrock Sources

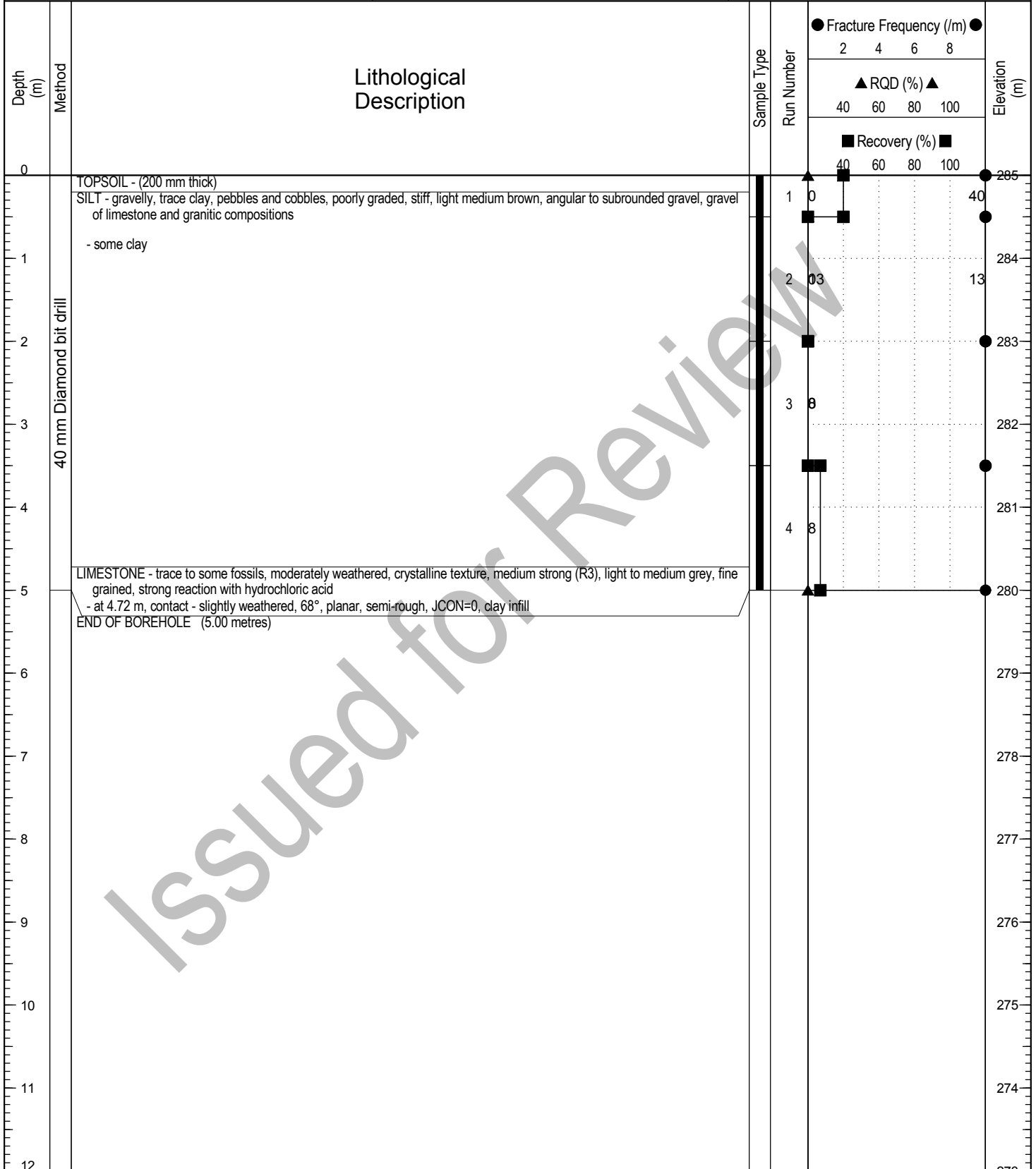
Project No: ENG.YARC03107-01

Location: Prospect 13D

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 510341 E; 6934213 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 5 m

Drilling Rig Type: NT550

Start Date: 2017 July 4

Logged By: SK

Completion Date: 2017 July 4

Reviewed By: EG

Page 1 of 1



Borehole No: P13D-02

Project: TASR Granular & Bedrock Sources

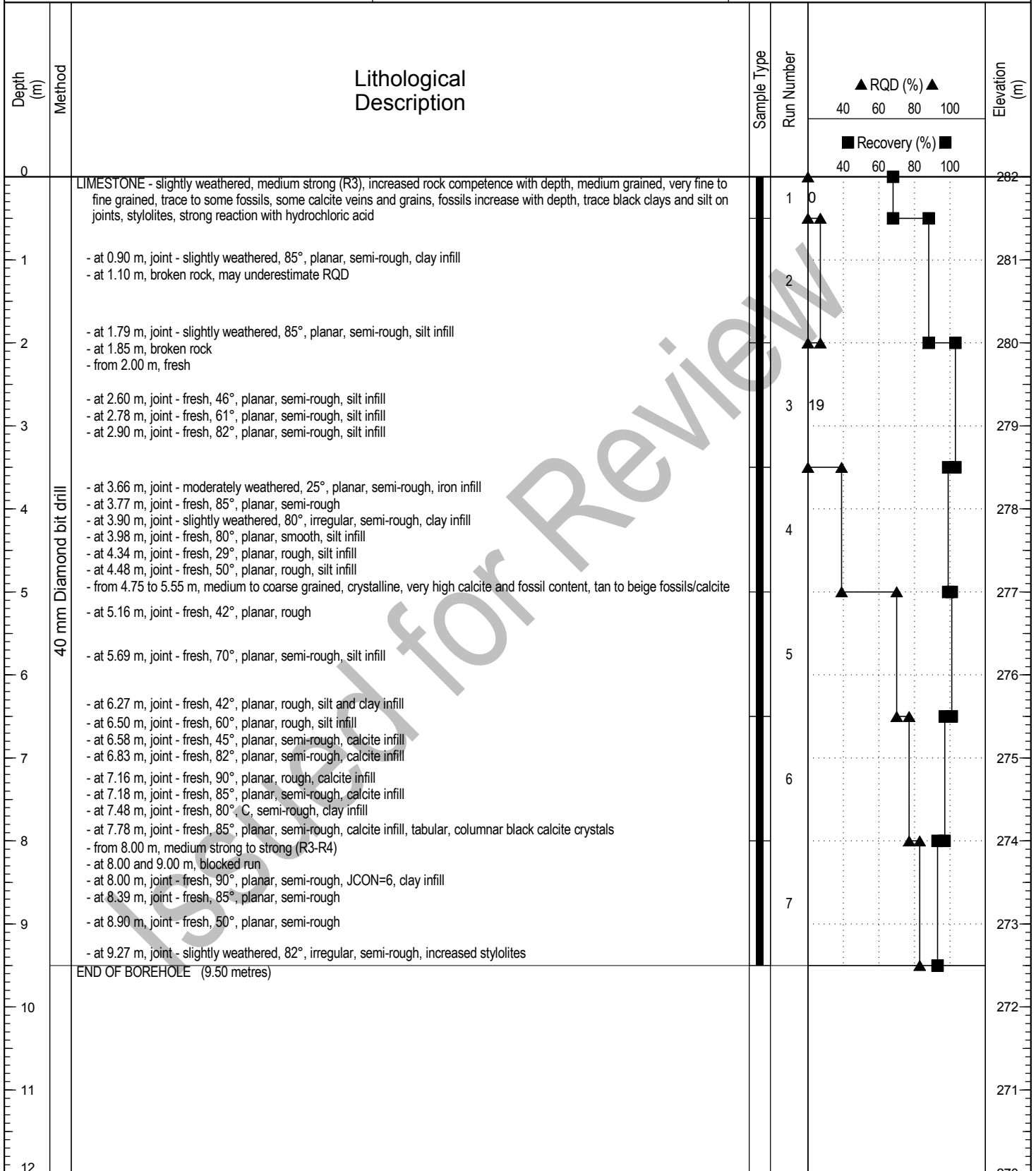
Project No: ENG.YARC03107-01

Location: Prospect 13D

Ground Elev: 282 m

2017 Summer Geotechnical Investigation

UTM: 510436 E; 6934246 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 4

Logged By: SK

Completion Date: 2017 July 4

Reviewed By: EG

Page 1 of 1



Borehole No: P13D-03

Project: TASR Granular & Bedrock Sources

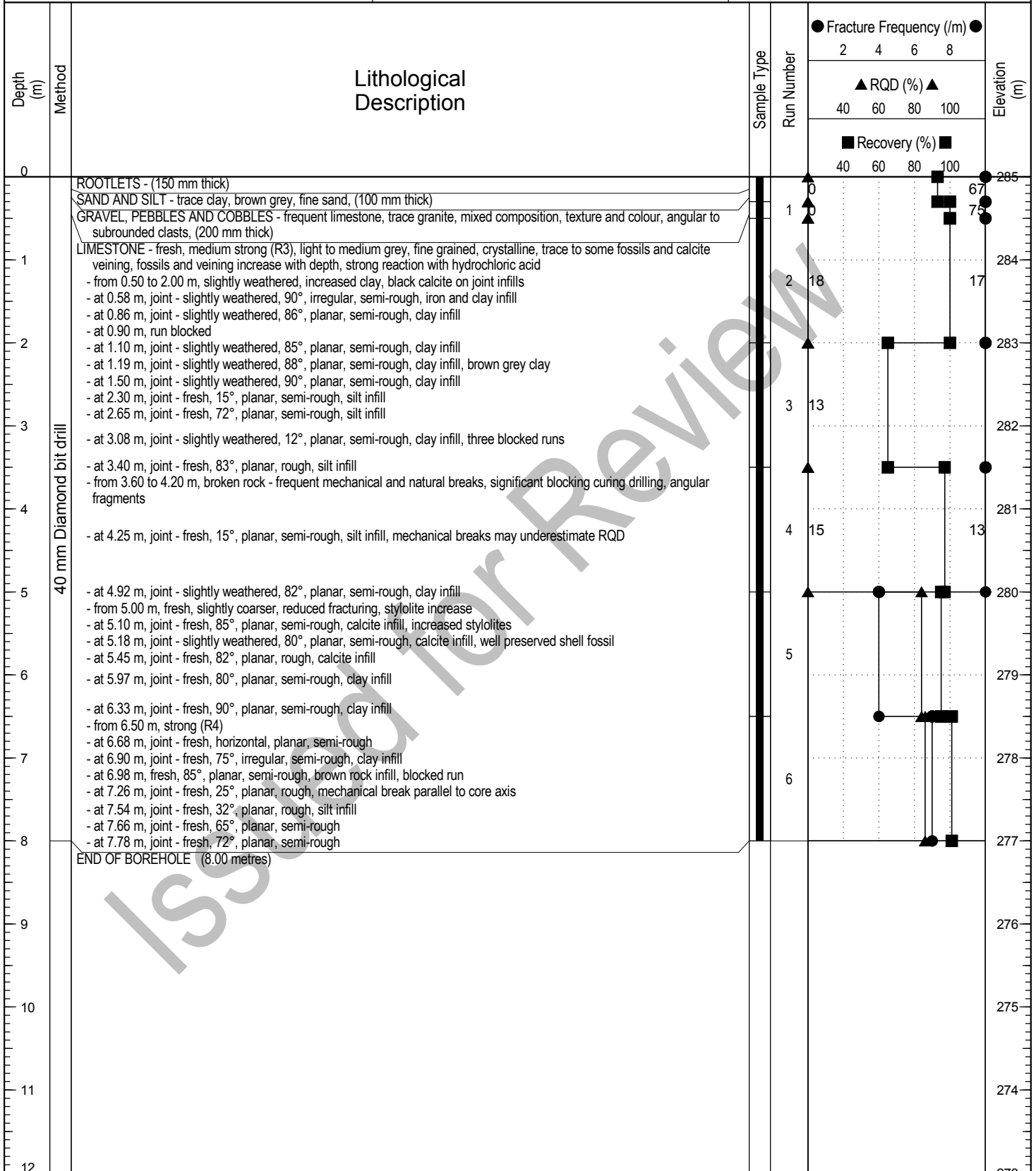
Project No: ENG.YARC03107-01

Location: Prospect 13D

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 510305 E; 6934325 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 8 m

Drilling Rig Type: NT550

Start Date: 2017 July 3

Logged By: SK

Completion Date: 2017 July 3

Reviewed By: EG

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Borehole No: P13D-04

Project: TASR Granular & Bedrock Sources

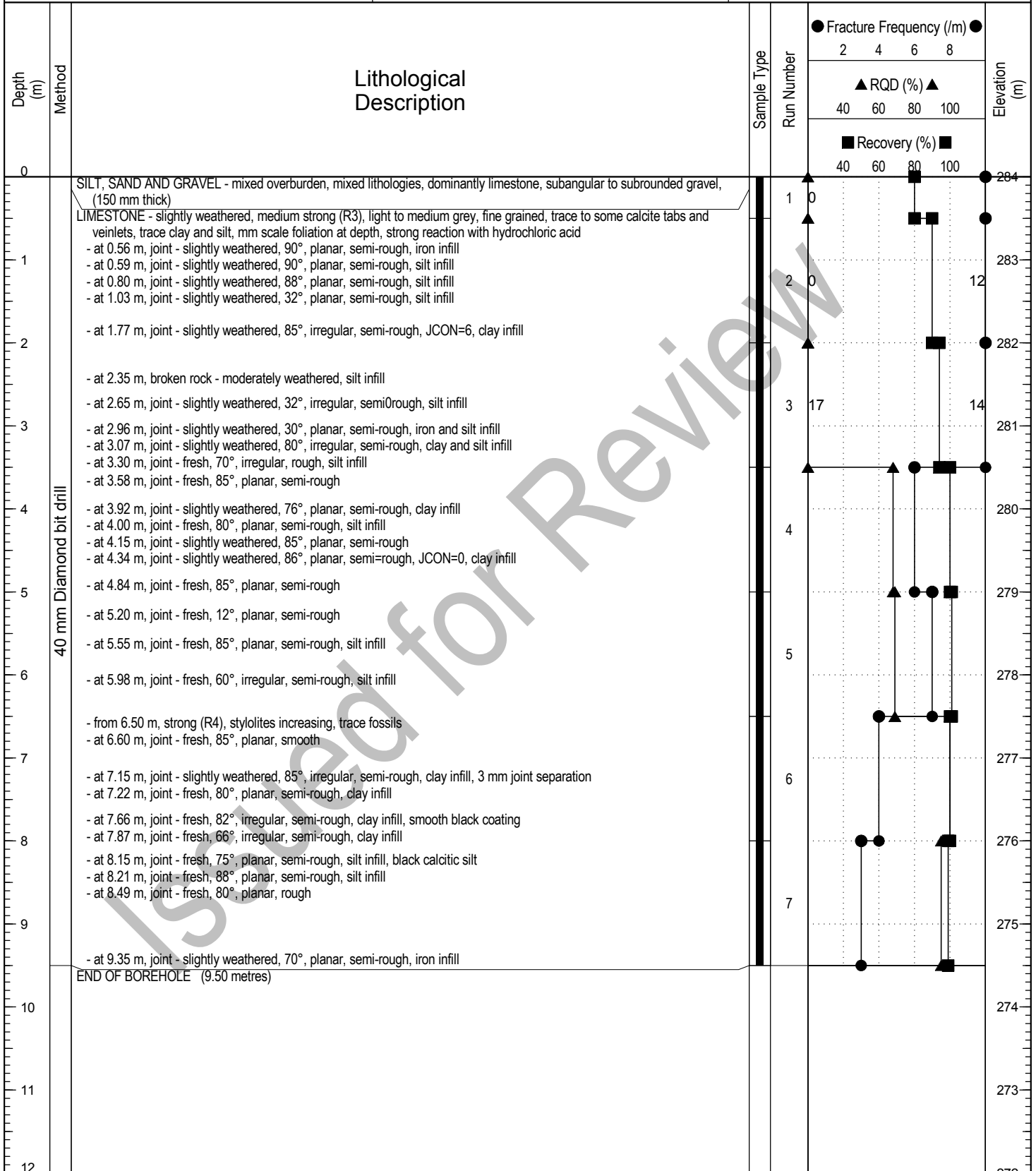
Project No: ENG.YARC03107-01

Location: Prospect 13D

Ground Elev: 284 m

2017 Summer Geotechnical Investigation

UTM: 510228 E; 6934423 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 2

Logged By: SK

Completion Date: 2017 July 2

Reviewed By: EG

Page 1 of 1



Borehole No: P13D-05

Project: TASR Granular & Bedrock Sources

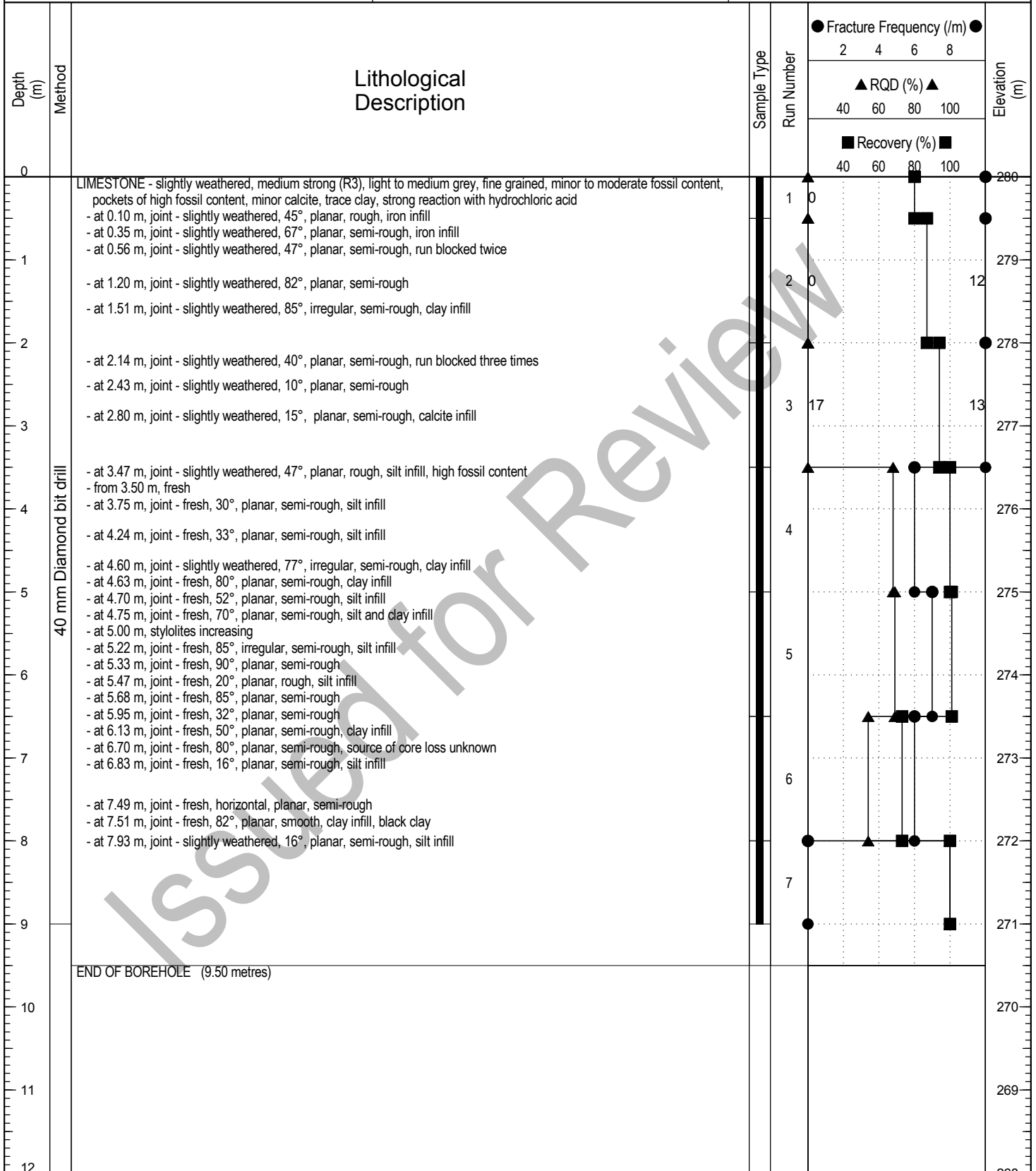
Project No: ENG.YARC03107-01

Location: Prospect 13D

Ground Elev: 280 m

2017 Summer Geotechnical Investigation

UTM: 510414 E; 6934539 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 4

Logged By: SK

Completion Date: 2017 July 5

Reviewed By: EG

Page 1 of 1



Testpit No: P13D-01t

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 13D

Ground Elev: 283 m

2017 Summer Geotechnical Investigation

UTM: 510341 E; 6934231 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (100 mm thick) SILT - sandy, gravelly, trace cobbles, trace clay, poorly graded, damp, brown, rounded to subrounded gravel	Unfrozen			283
1	Excavated	- some clay, some gravel, low plastic				282
2		- 400 mm boulder - trace cobbles to 300 mm diameter			14.1	281
3		END OF TESTPIT (2.4 metres)				280
4						279
5						278
6						277
7						276
7.5						

Issued for Review



Contractor: TLICHO

Completion Depth: 2.4 m

Drilling Rig Type: CAT 320C Excavator

Start Date: 2017 July 12

Logged By: THS

Completion Date: 2017 July 12

Reviewed By: EG

Page 1 of 1



Borehole No: P29-01

Project: TASR Granular & Bedrock Sources

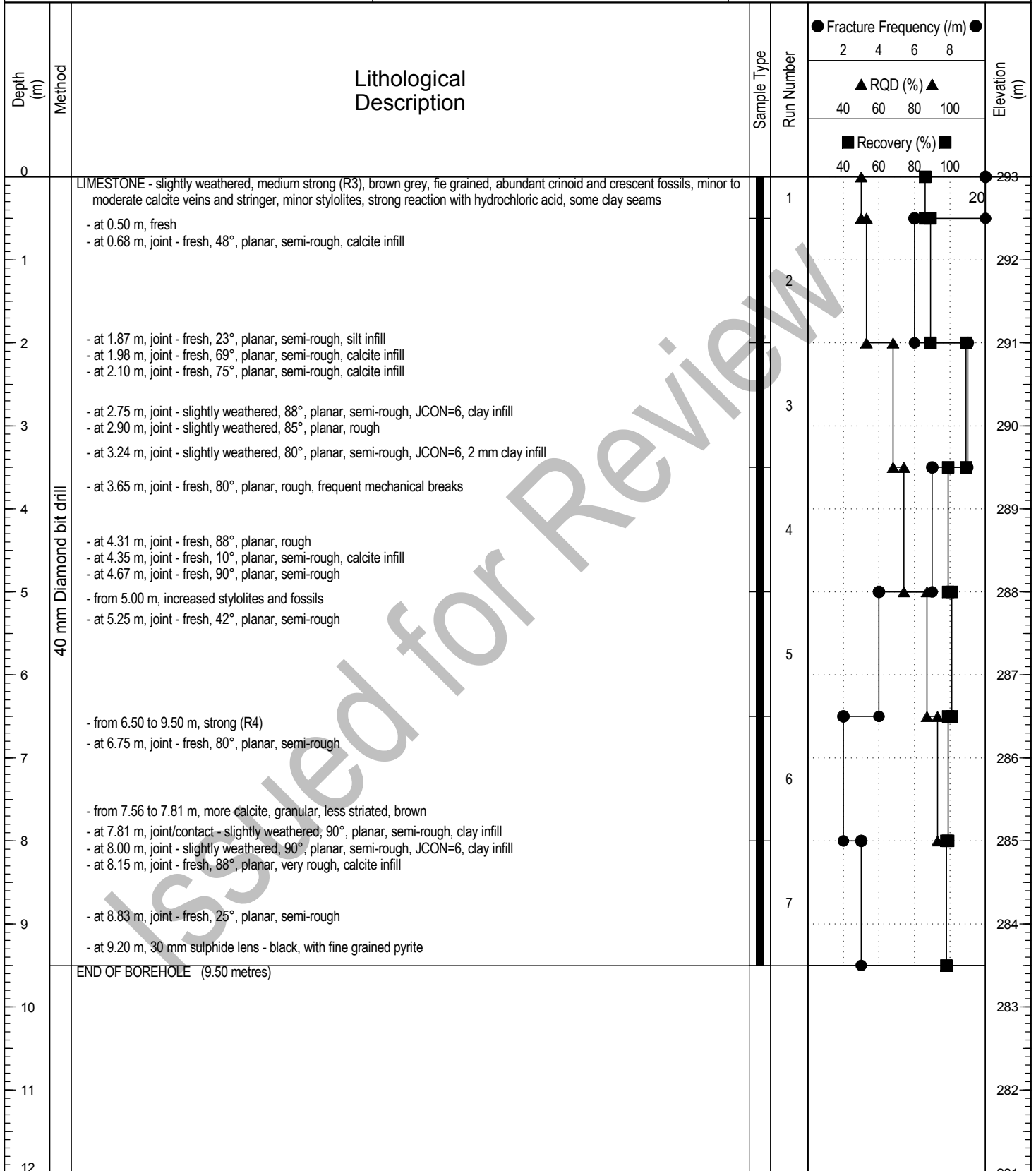
Project No: ENG.YARC03107-01

Location: Prospect 29

Ground Elev: 293 m

2017 Summer Geotechnical Investigation

UTM: 508730 E; 6946345 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 June 27

Logged By: SK

Completion Date: 2017 June 27

Reviewed By: EG

Page 1 of 1



Borehole No: P29-03

Project: TASR Granular & Bedrock Sources

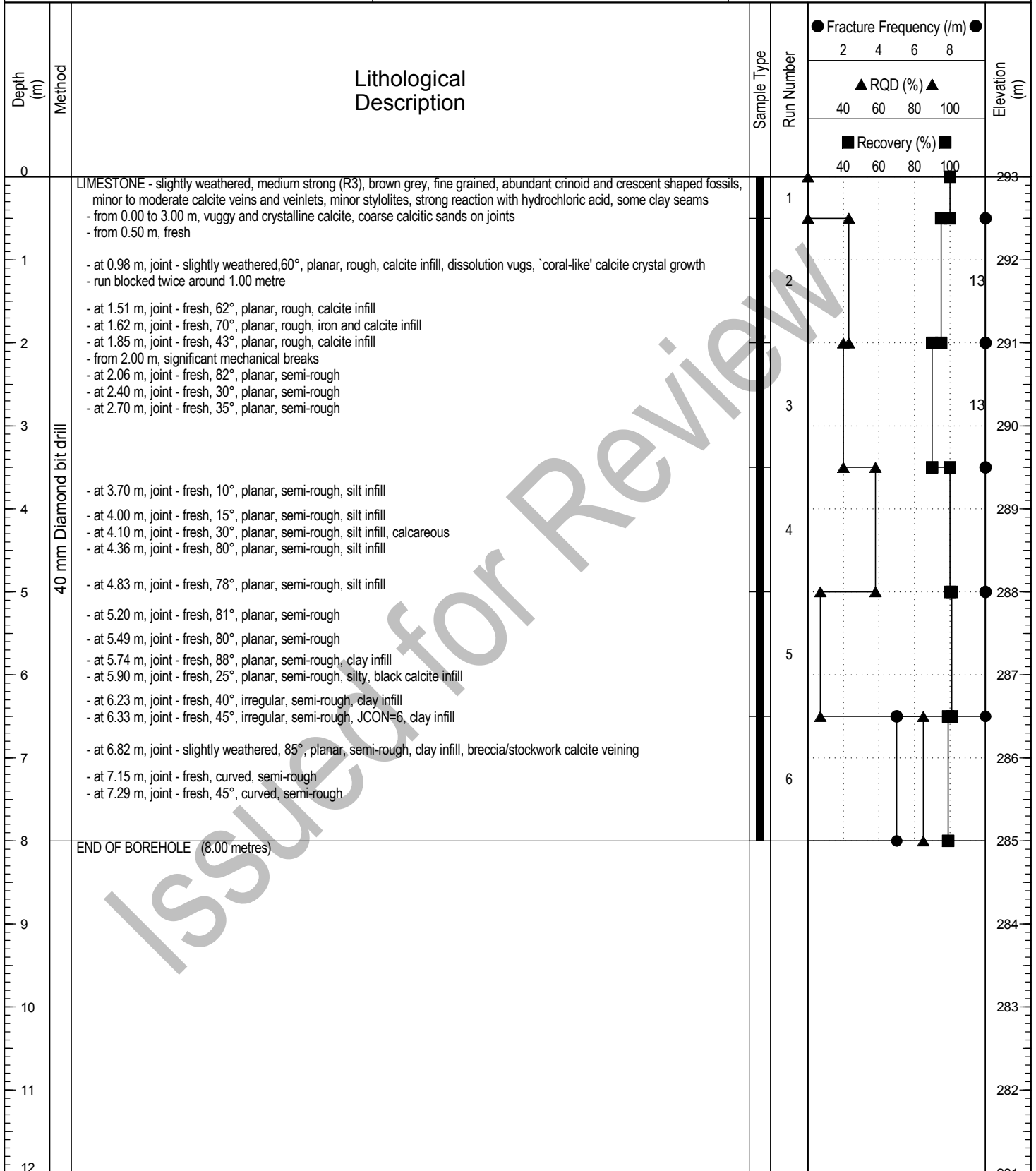
Project No: ENG.YARC03107-01

Location: Prospect 29

Ground Elev: 293 m

2017 Summer Geotechnical Investigation

UTM: 508975 E; 6946396 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 8 m

Drilling Rig Type: NT550

Start Date: 2017 June 28

Logged By: SK

Completion Date: 2017 June 28

Reviewed By: EG

Page 1 of 1



Borehole No: P29-04

Project: TASR Granular & Bedrock Sources

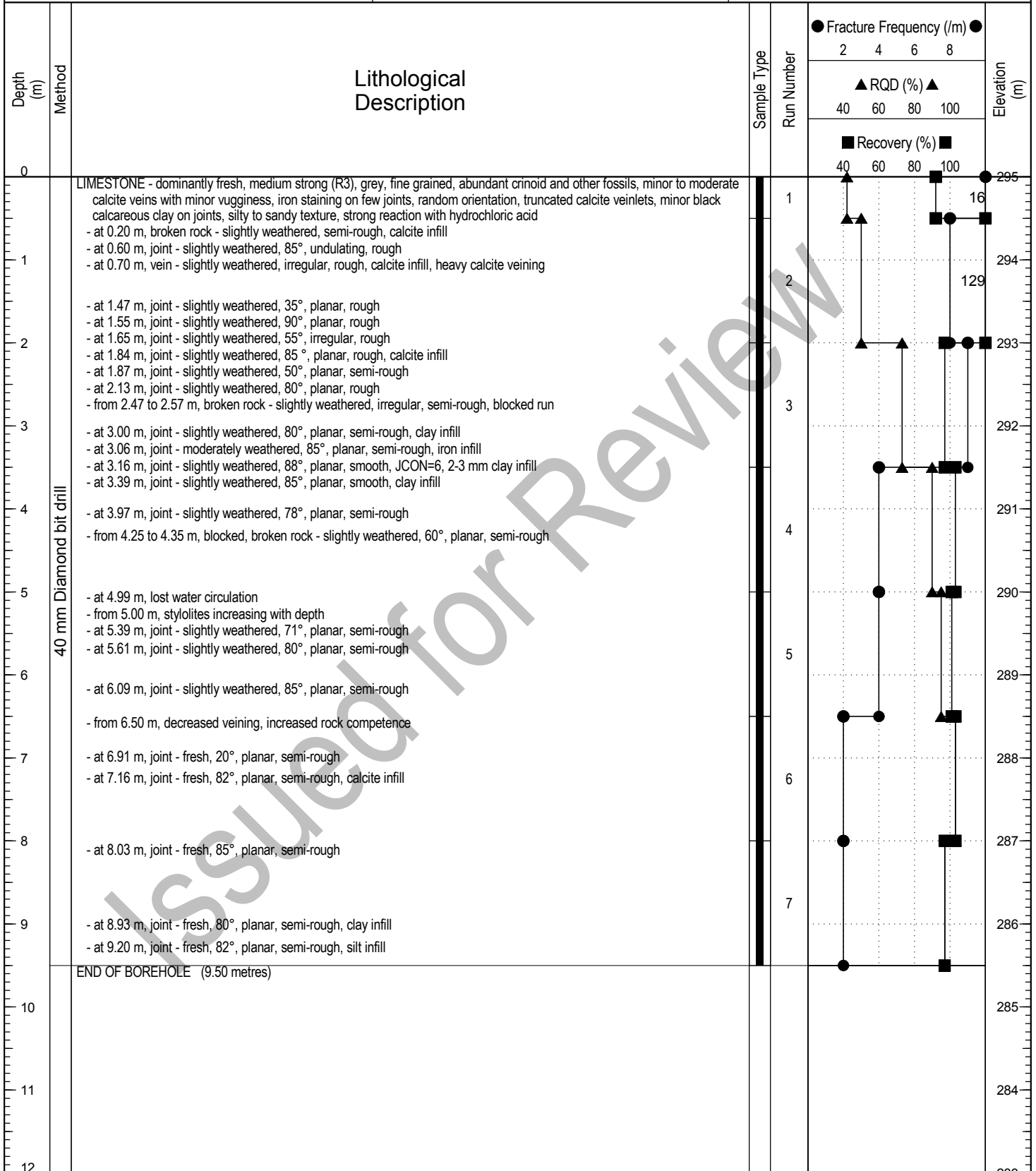
Project No: ENG.YARC03107-01

Location: Prospect 29

Ground Elev: 295 m

2017 Summer Geotechnical Investigation

UTM: 508754 E; 6946225 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 June 26

Logged By: SK

Completion Date: 2017 June 26

Reviewed By: EG

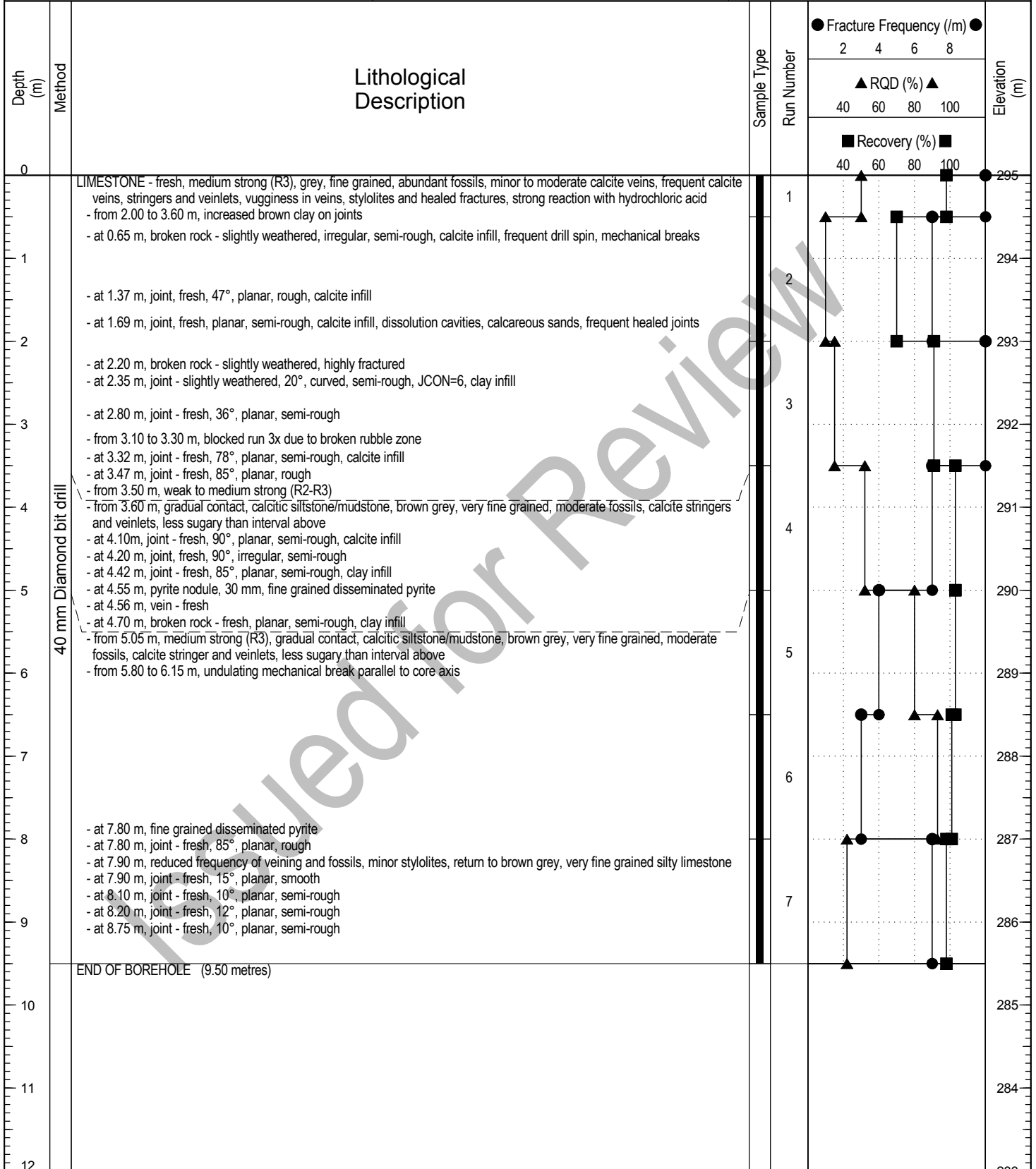
Page 1 of 1



Borehole No: P29-05

Project: TASR Granular & Bedrock Sources
 Location: Prospect 29
 2017 Summer Geotechnical Investigation

Project No: ENG.YARC03107-01
 Ground Elev: 295 m
 UTM: 508960 E; 6946214 N; Z 11



Contractor: Northtech Drilling
 Drilling Rig Type: NT550
 Logged By: SK
 Reviewed By: EG

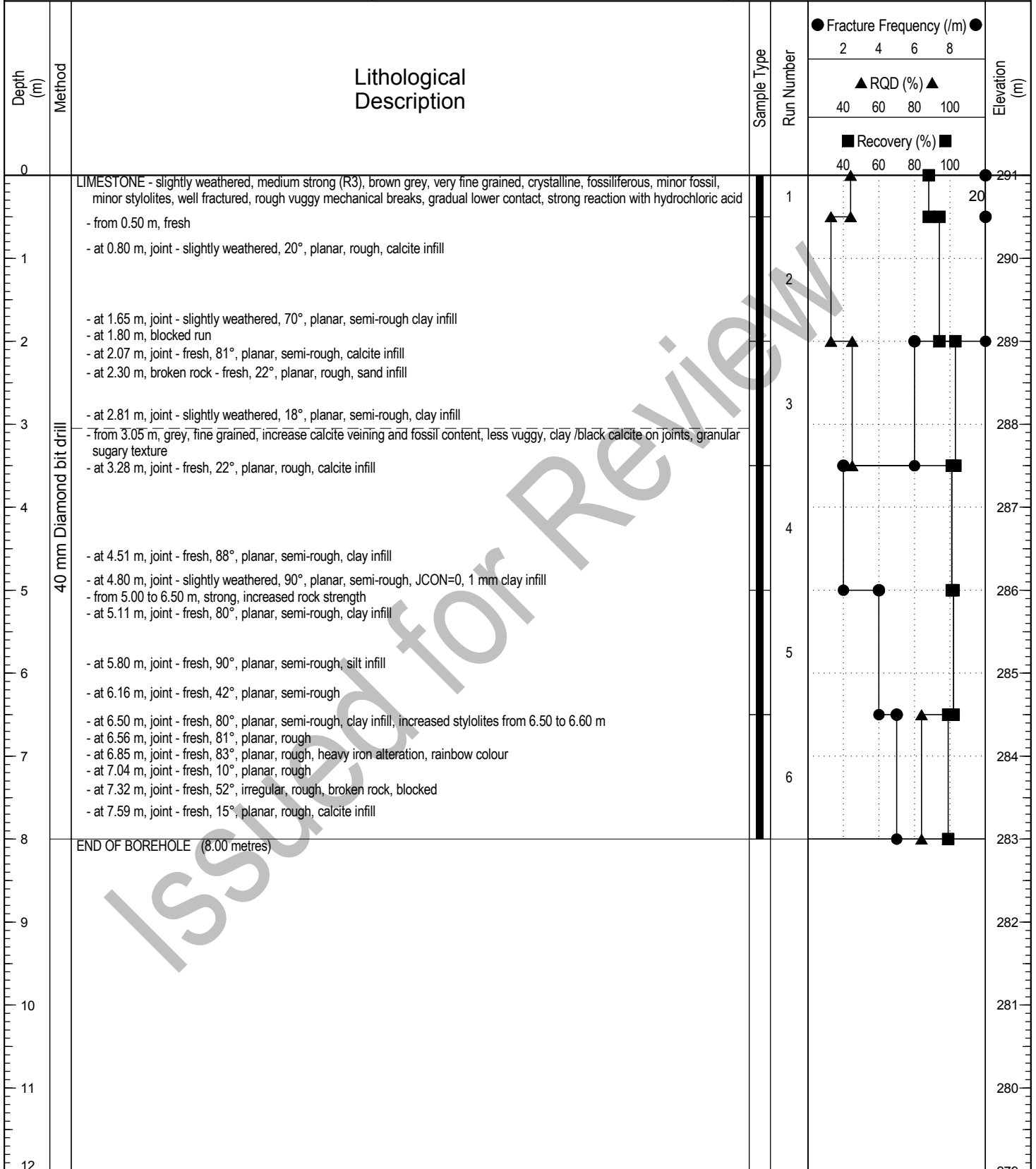
Completion Depth: 9.5 m
 Start Date: 2017 June 27
 Completion Date: 2017 June 28
 Page 1 of 1



Borehole No: P29-06

Project: TASR Granular & Bedrock Sources
 Location: Prospect 29
 2017 Summer Geotechnical Investigation

Project No: ENG.YARC03107-01
 Ground Elev: 291 m
 UTM: 509054 E; 6946226 N; Z 11



Contractor: Northtech Drilling
 Drilling Rig Type: NT550
 Logged By: SK
 Reviewed By: EG

Completion Depth: 8 m
 Start Date: 2017 June 28
 Completion Date: 2017 June 28
 Page 1 of 1



Borehole No: P29-07

Project: TASR Granular & Bedrock Sources

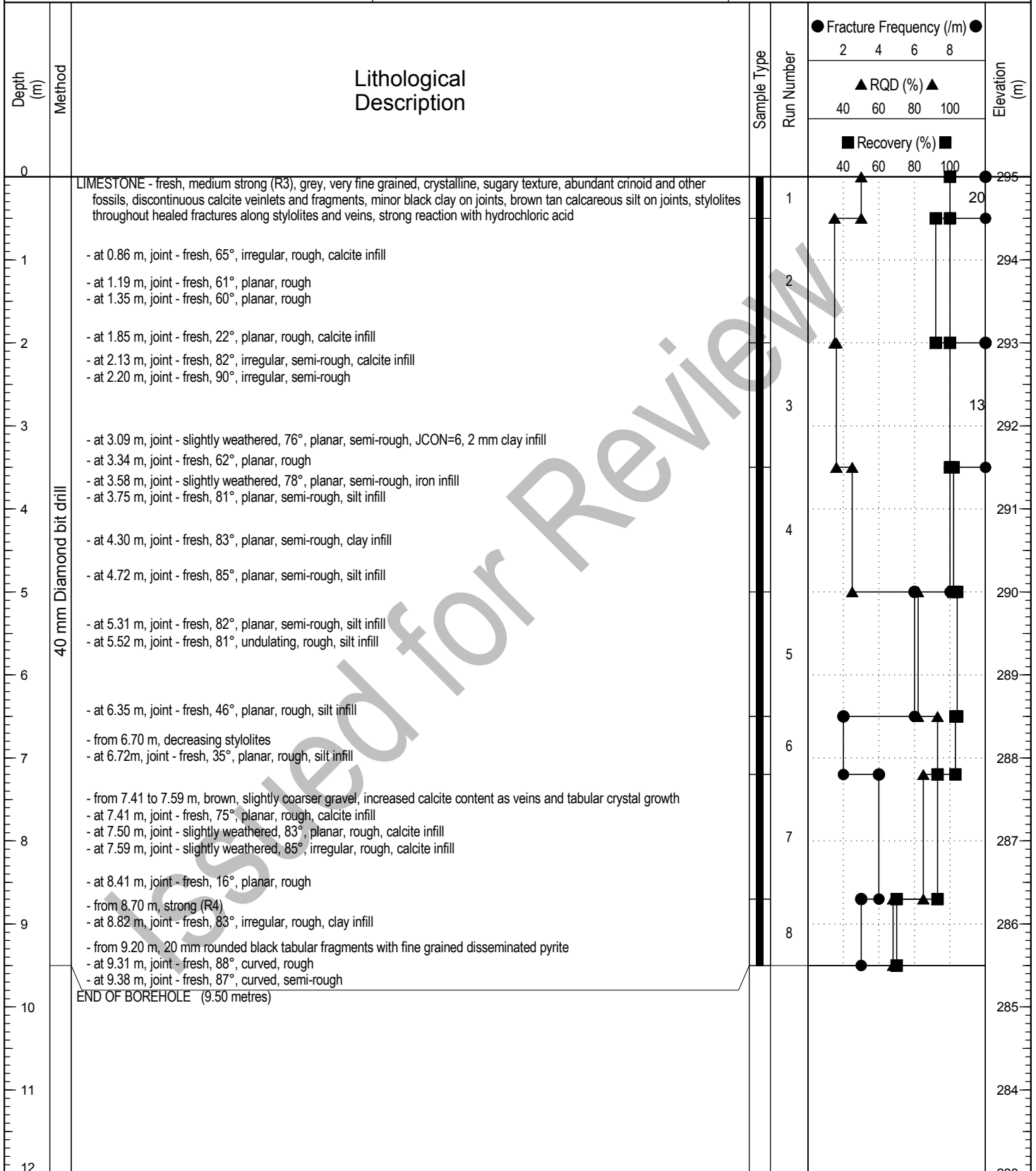
Project No: ENG.YARC03107-01

Location: Prospect 29

Ground Elev: 295 m

2017 Summer Geotechnical Investigation

UTM: 508855 E; 6946203 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 June 27

Logged By: SK

Completion Date: 2017 June 27

Reviewed By: EG

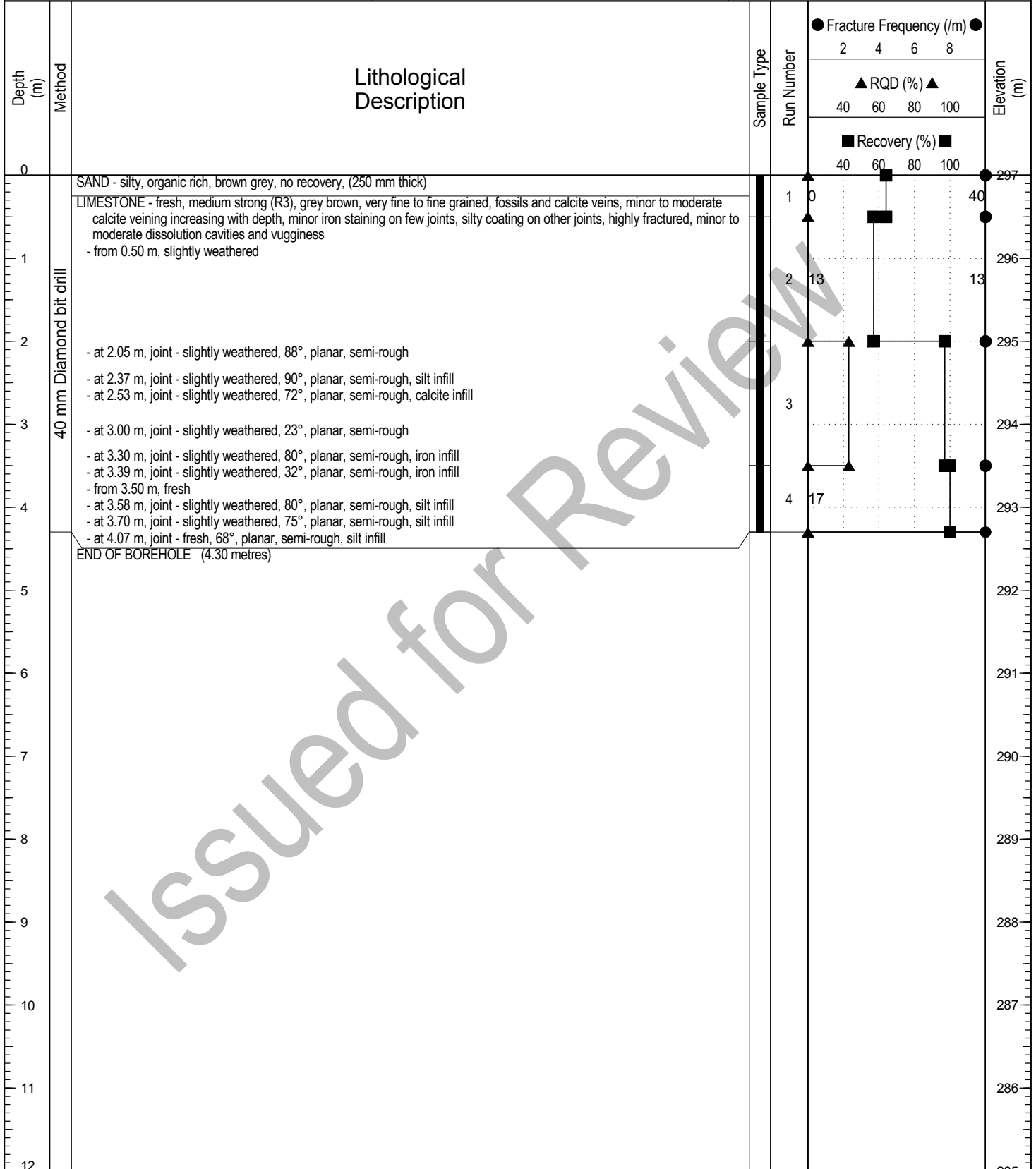
Page 1 of 1



Borehole No: P29-08

Project: TASR Granular & Bedrock Sources
 Location: Prospect 29
 2017 Summer Geotechnical Investigation

Project No: ENG.YARC03107-01
 Ground Elev: 297 m
 UTM: 508898 E; 6946248 N; Z 11



Contractor: Northtech Drilling
 Drilling Rig Type: NT550
 Logged By: SK
 Reviewed By: EG

Completion Depth: 4.3 m
 Start Date: 2017 June 29
 Completion Date: 2017 June 29
 Page 1 of 1



Borehole No: P33A-01

Project: TASR Granular & Bedrock Sources

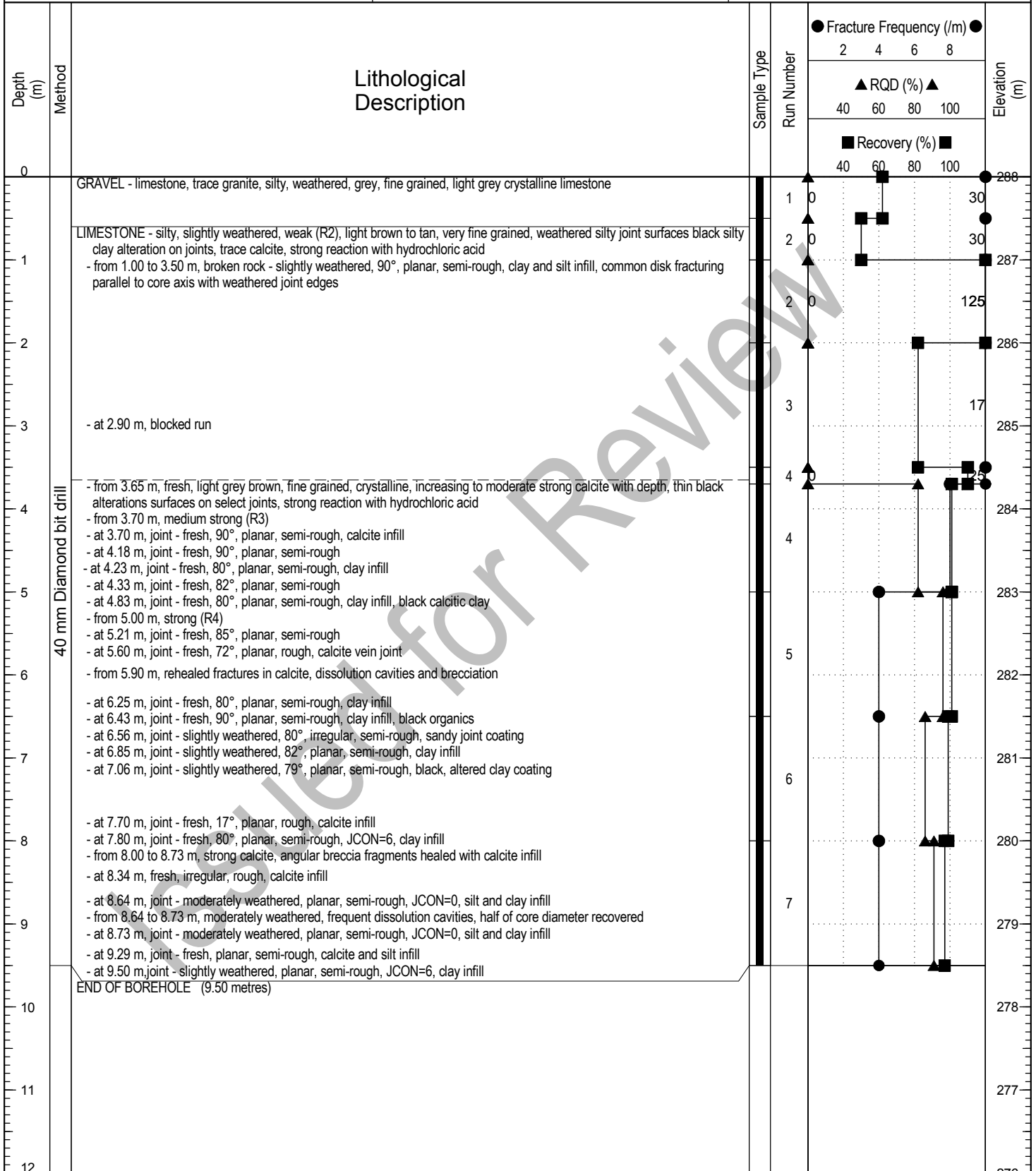
Project No: ENG.YARC03107-01

Location: Prospect 33A

Ground Elev: 288 m

2017 Summer Geotechnical Investigation

UTM: 507867 E; 6951539 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 9

Logged By: SK

Completion Date: 2017 July 9

Reviewed By: EG

Page 1 of 1



Borehole No: P33A-02

Project: TASR Granular & Bedrock Sources

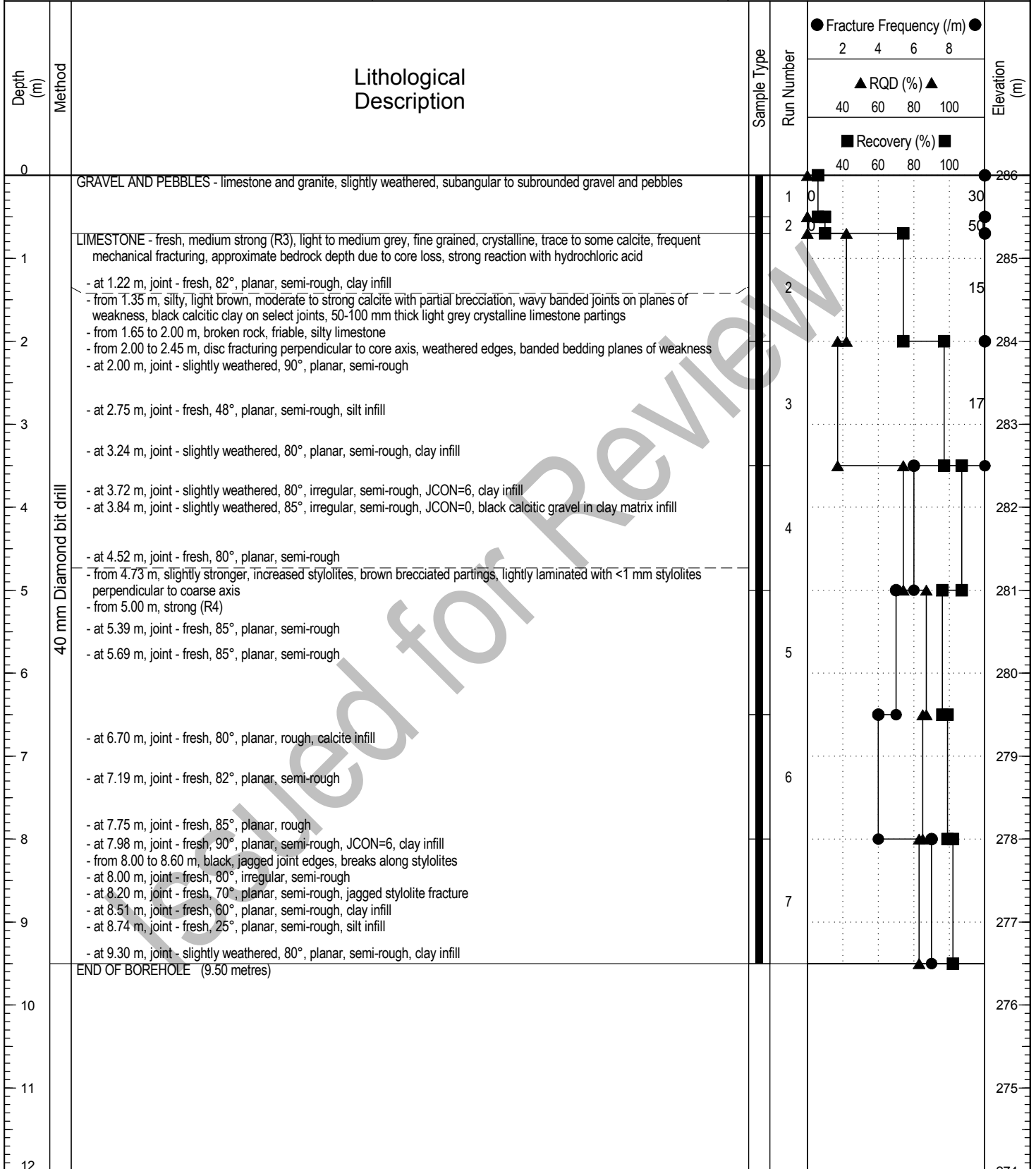
Project No: ENG.YARC03107-01

Location: Prospect 33A

Ground Elev: 286 m

2017 Summer Geotechnical Investigation

UTM: 507572 E; 6951487 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 8

Logged By: SK

Completion Date: 2017 July 8

Reviewed By: EG

Page 1 of 1



Borehole No: P33A-03

Project: TASR Granular & Bedrock Sources

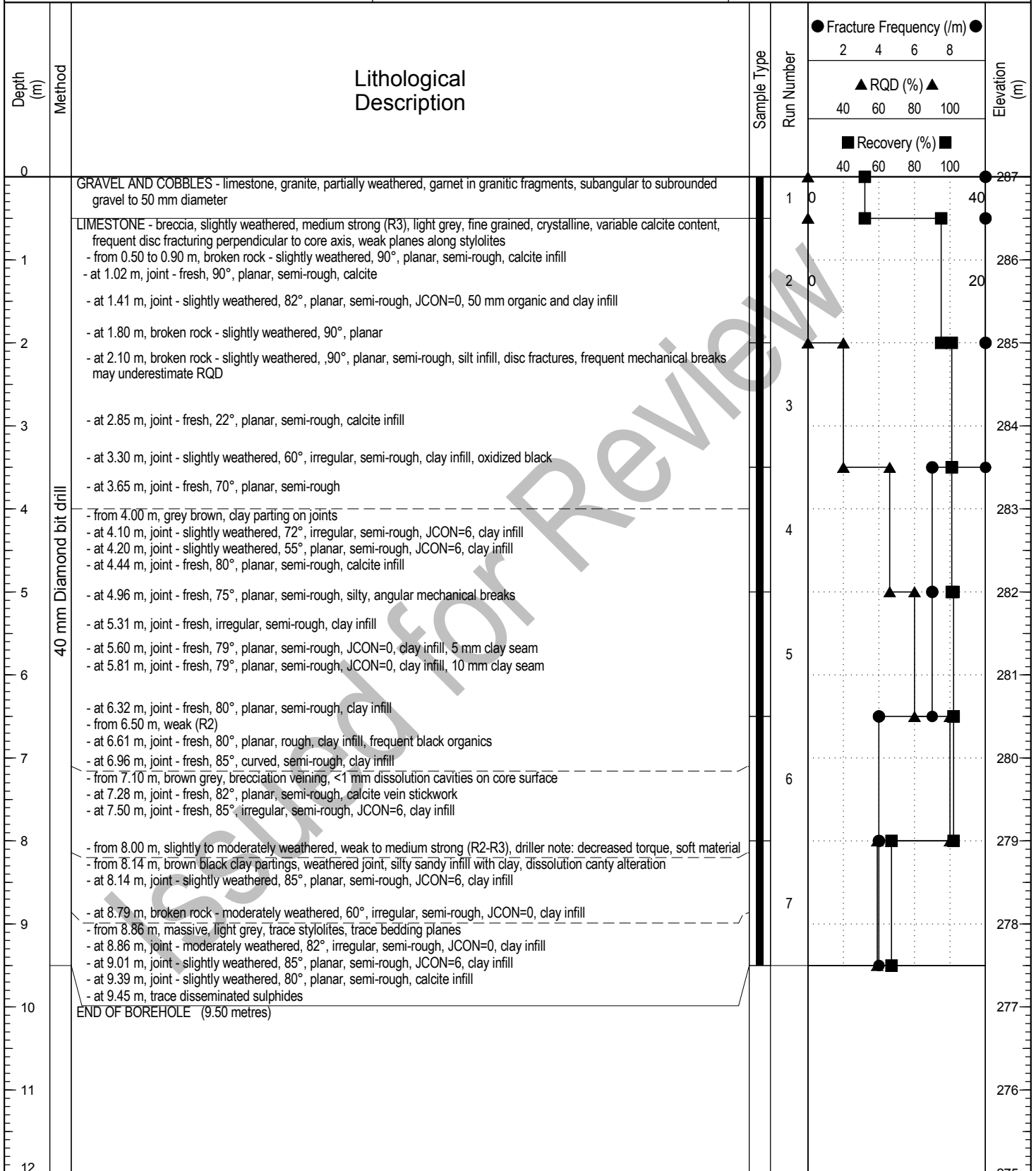
Project No: ENG.YARC03107-01

Location: Prospect 33A

Ground Elev: 287 m

2017 Summer Geotechnical Investigation

UTM: 507535 E; 6951769 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 8

Logged By: SK

Completion Date: 2017 July 8

Reviewed By: EG

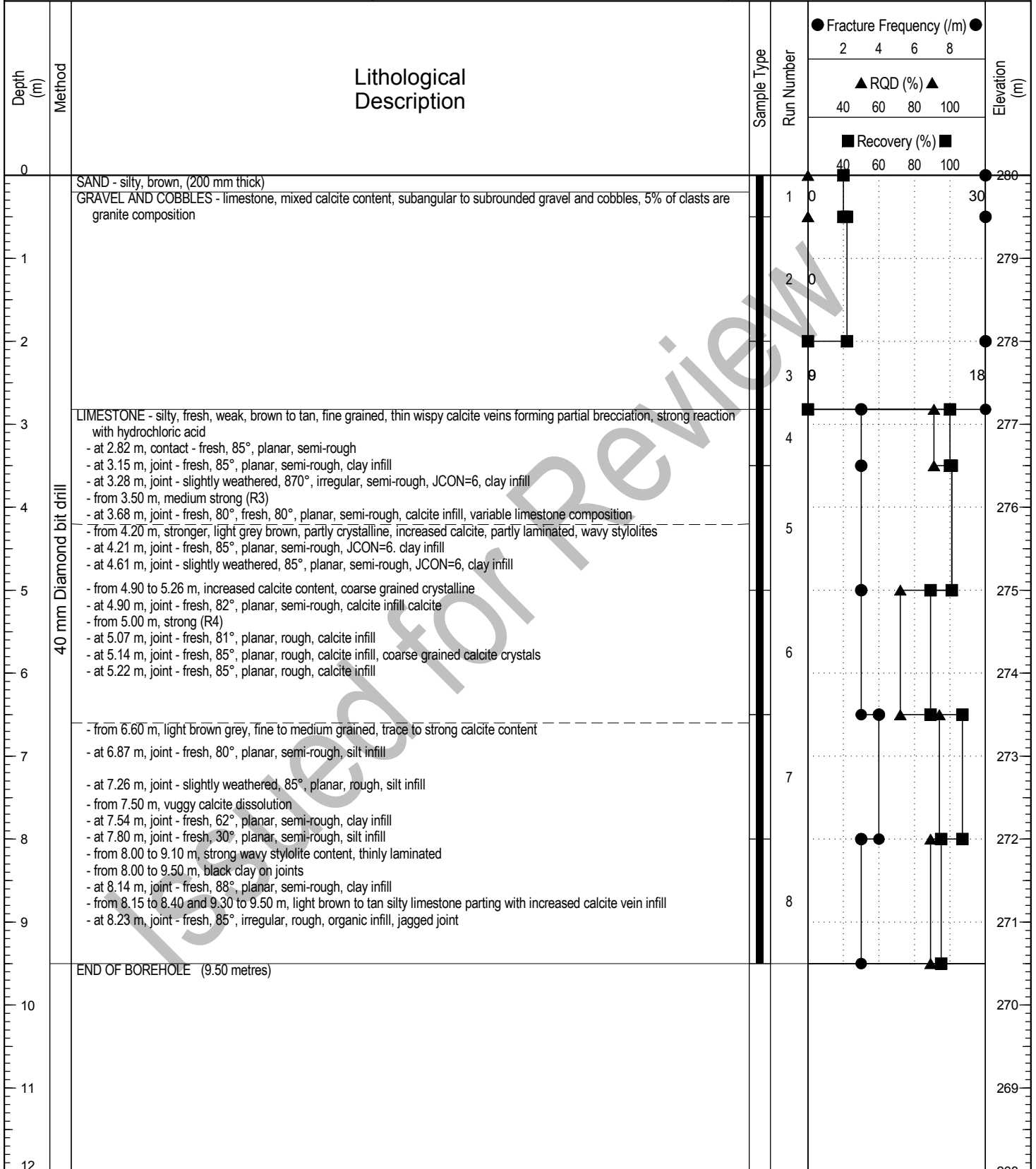
Page 1 of 1



Borehole No: P33A-04

Project: TASR Granular & Bedrock Sources
 Location: Prospect 33A
 2017 Summer Geotechnical Investigation

Project No: ENG.YARC03107-01
 Ground Elev: 280 m
 UTM: 507485 E; 6952125 N; Z 11



Contractor: Northtech Drilling
 Drilling Rig Type: NT550
 Logged By: SK
 Reviewed By: EG

Completion Depth: 9.5 m
 Start Date: 2017 July 8
 Completion Date: 2017 July 8
 Page 1 of 1



Borehole No: P33A-05

Project: TASR Granular & Bedrock Sources

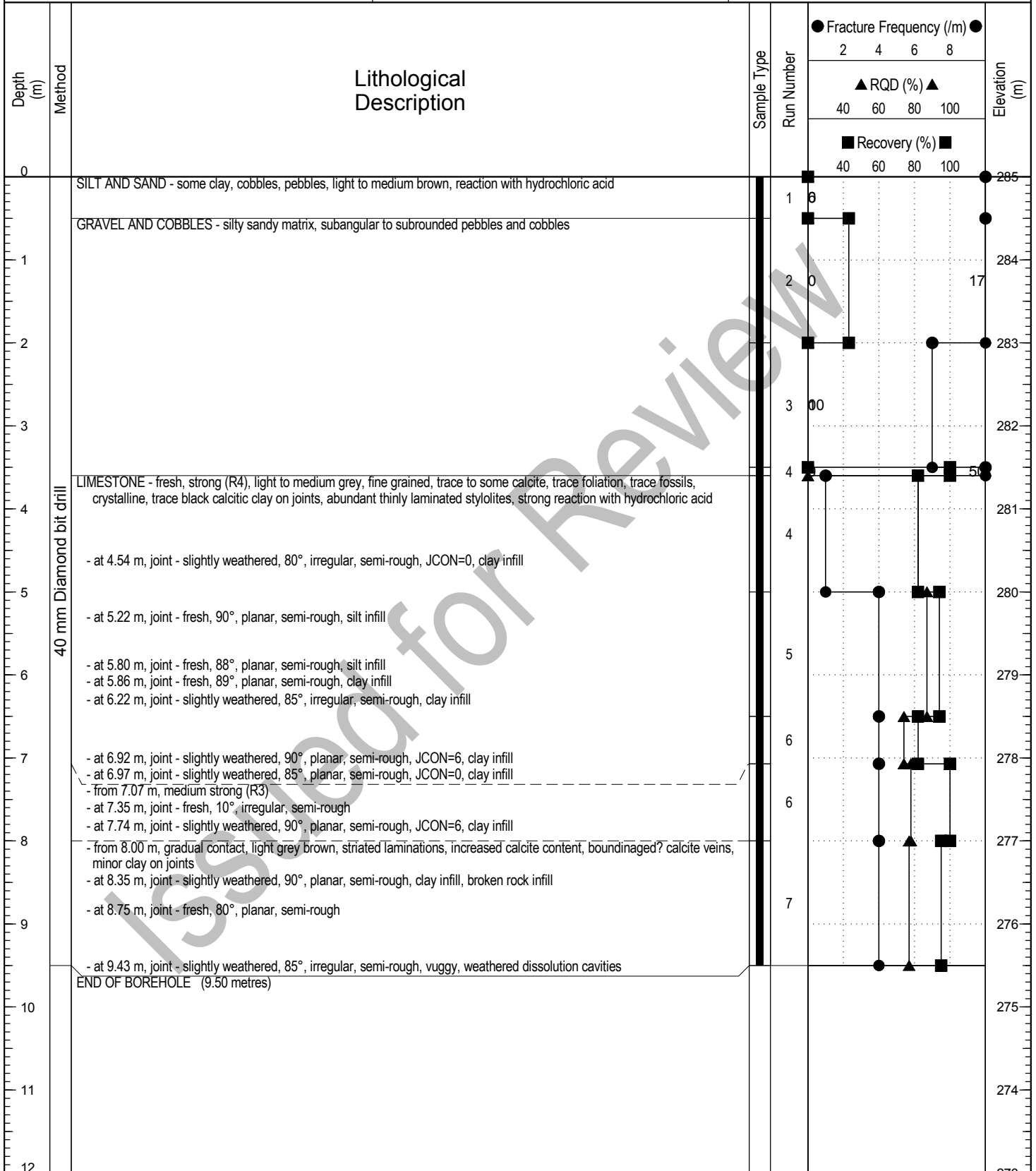
Project No: ENG.YARC03107-01

Location: Prospect 33A

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 507456 E; 6952337 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 6

Logged By: SK

Completion Date: 2017 July 6

Reviewed By: EG

Page 1 of 1



Borehole No: P33A-06

Project: TASR Granular & Bedrock Sources

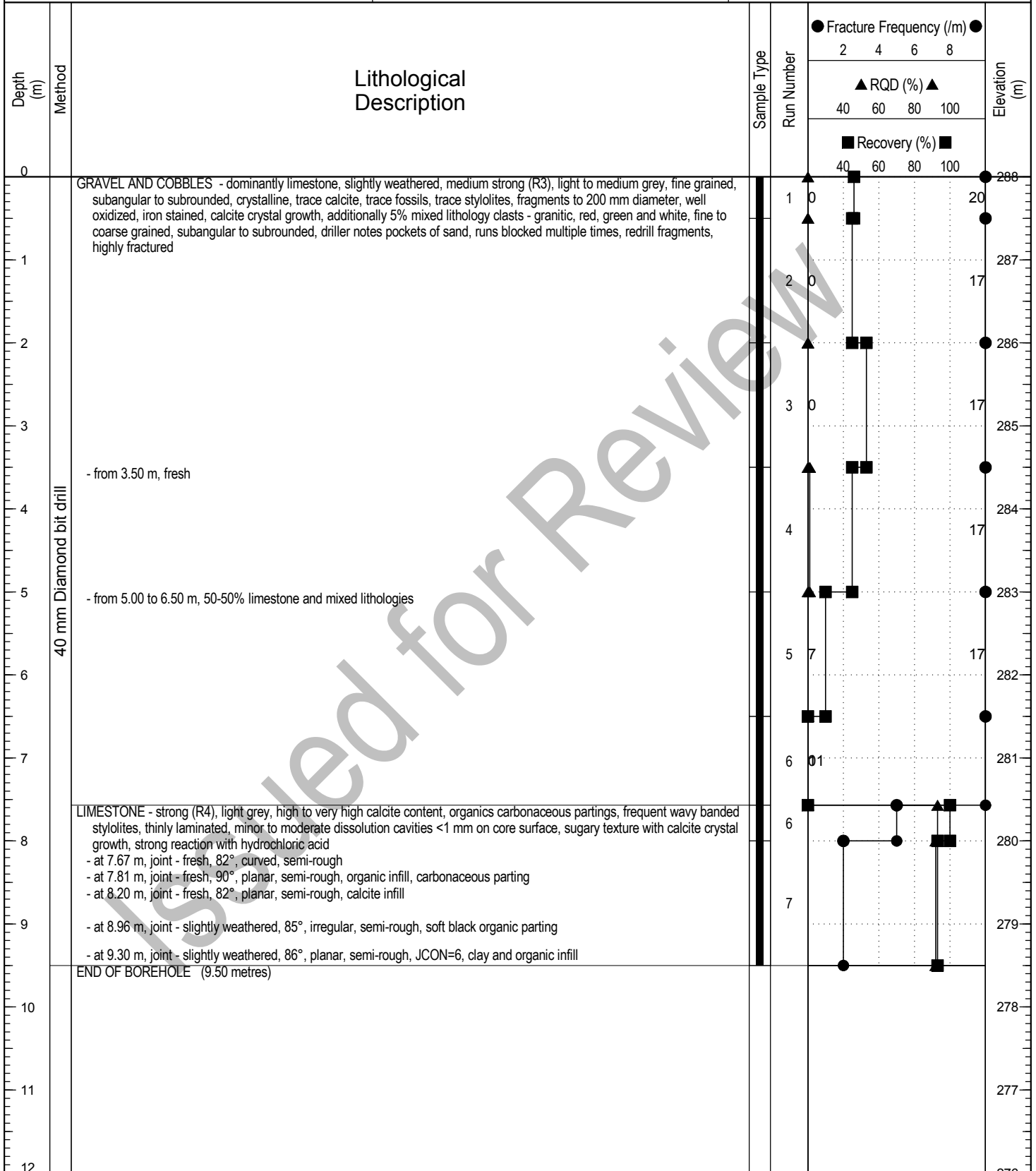
Project No: ENG.YARC03107-01

Location: Prospect 33A

Ground Elev: 288 m

2017 Summer Geotechnical Investigation

UTM: 507644 E; 6952399 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 6

Logged By: SK

Completion Date: 2017 July 6

Reviewed By: EG

Page 1 of 1



Borehole No: P33A-07

Project: TASR Granular & Bedrock Sources

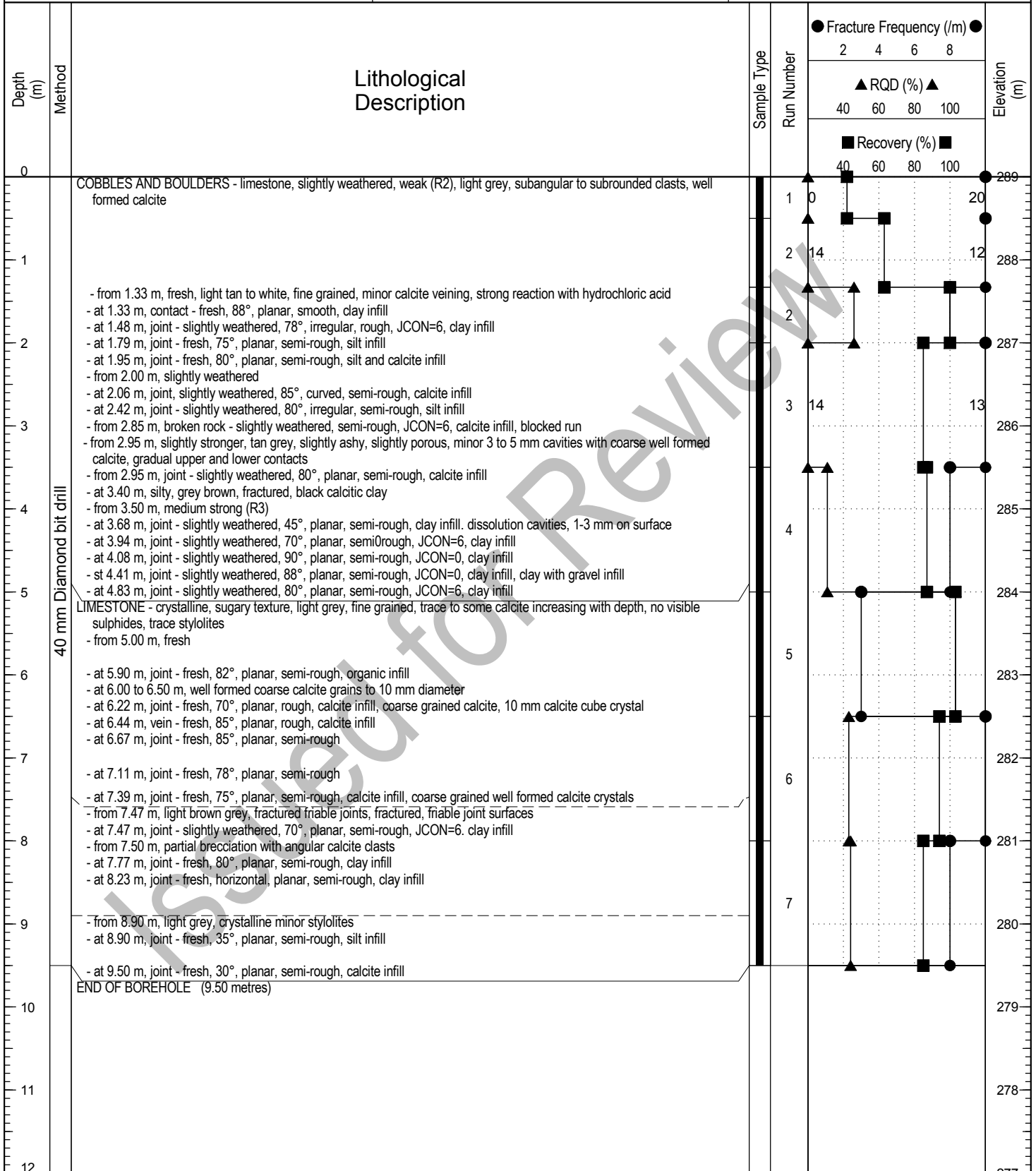
Project No: ENG.YARC03107-01

Location: Prospect 33A

Ground Elev: 289 m

2017 Summer Geotechnical Investigation

UTM: 507881 E; 6952458 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 6

Logged By: SK

Completion Date: 2017 July 7

Reviewed By: EG

Page 1 of 1



Borehole No: P33A-08

Project: TASR Granular & Bedrock Sources

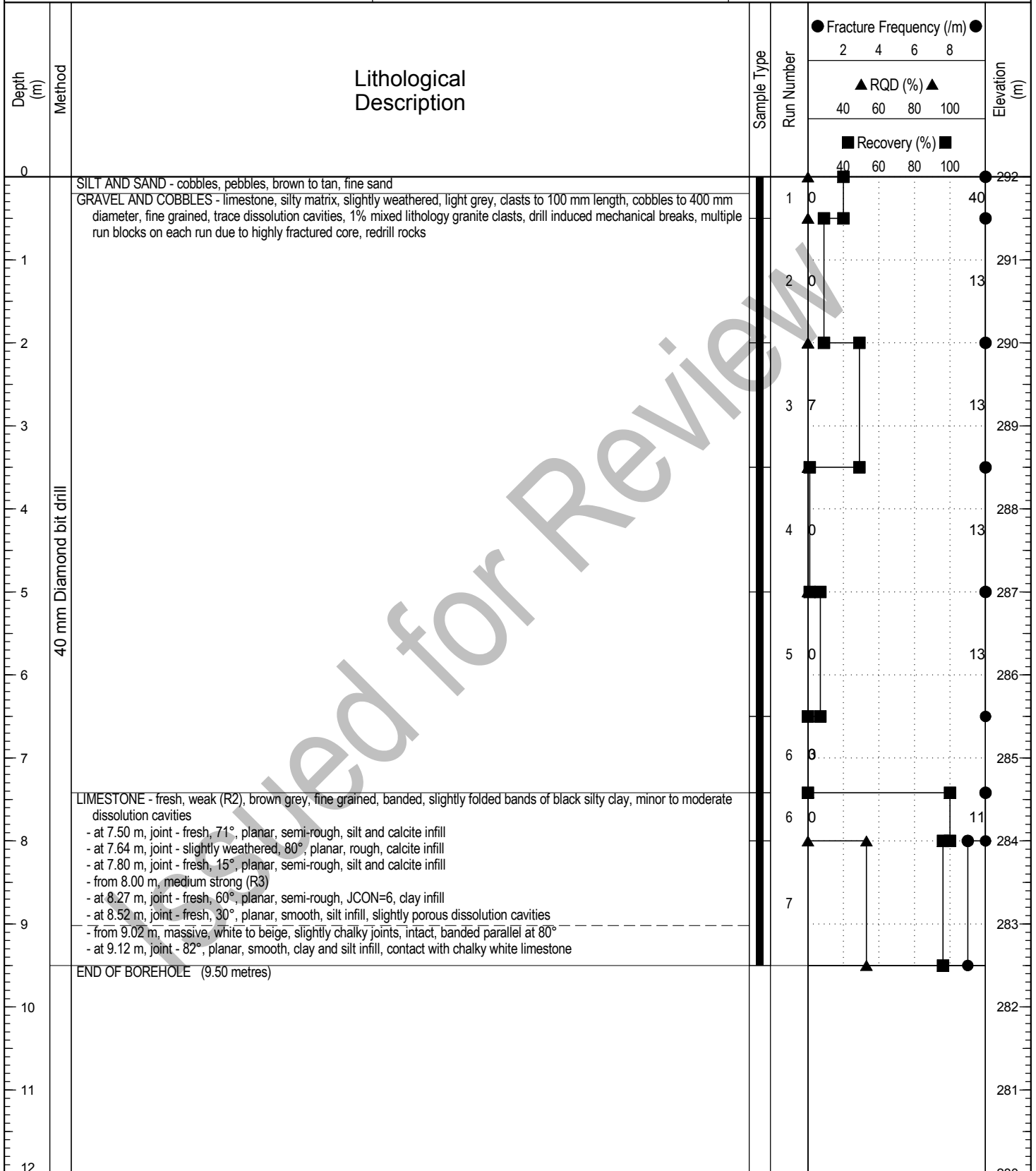
Project No: ENG.YARC03107-01

Location: Prospect 33A

Ground Elev: 292 m

2017 Summer Geotechnical Investigation

UTM: 508041 E; 6952423 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 7

Logged By: SK

Completion Date: 2017 July 7

Reviewed By: EG

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Borehole No: P33A-10

Project: TASR Granular & Bedrock Sources

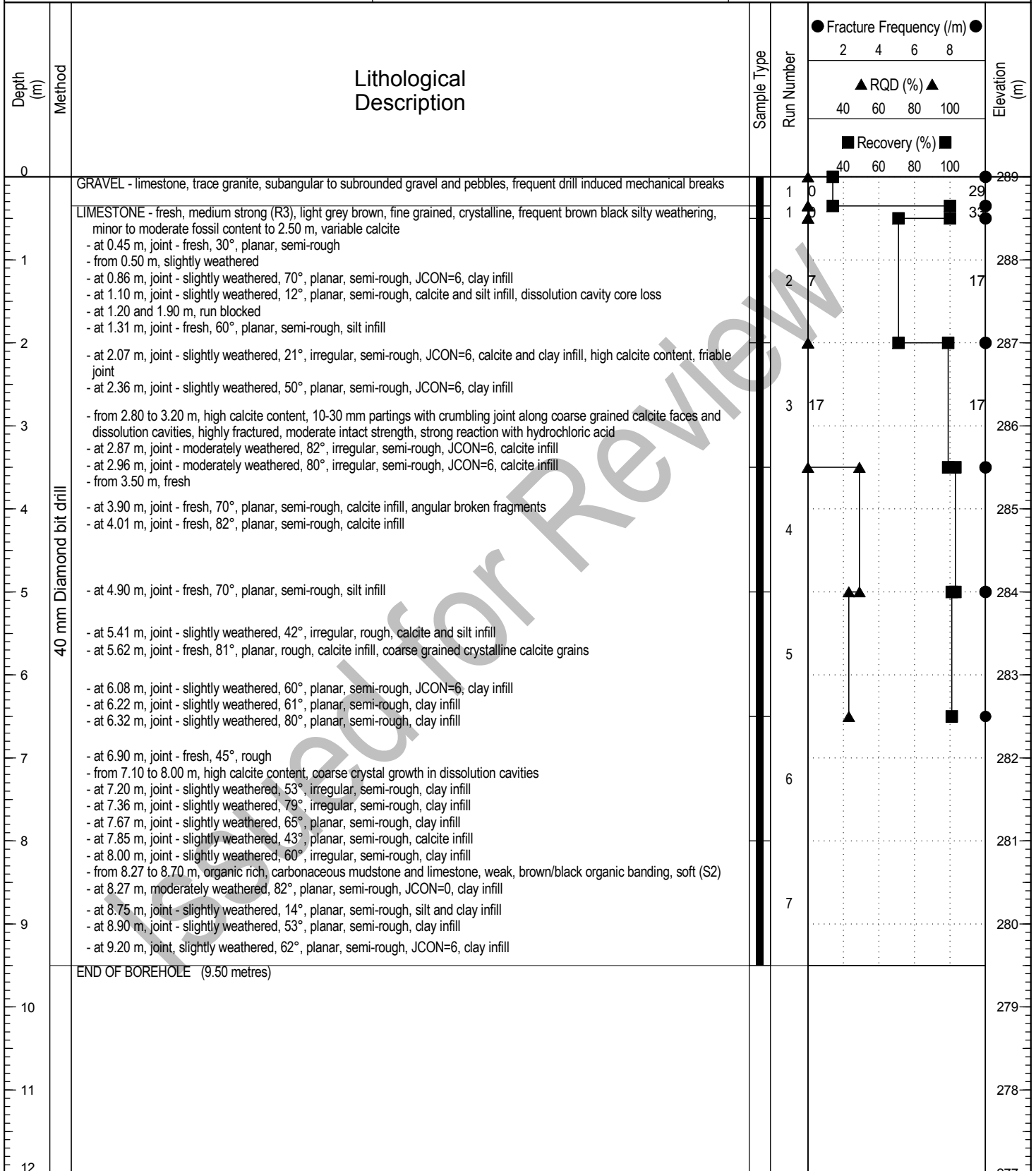
Project No: ENG.YARC03107-01

Location: Prospect 33A

Ground Elev: 289 m

2017 Summer Geotechnical Investigation

UTM: 507778 E; 6951490 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 9.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 9

Logged By: SK

Completion Date: 2017 July 9

Reviewed By: EG

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Borehole No: P69-01

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 271 m

2017 Summer Geotechnical Investigation

UTM: 508190 E; 6977999 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	100 mm Auger	ROOTLETS	Unfrozen		271
		GRAVEL - some sand, some silt, trace cobbles, dry to damp, fine to coarse rounded gravel to 75 mm diameter, cobbles to 75 mm diameter			
1		END OF BOREHOLE (0.60 metres) Note: Stopped due to refusal on cobbles			270
2					269
3					268
4					267
5					266
6					265
7					264
7.5					

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.6 m

Drilling Rig Type: NT550

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

Page 1 of 1



Borehole No: P69-02

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 273 m

2017 Summer Geotechnical Investigation

UTM: 507930 E; 6978070 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	100 mm Auger	ROOTLETS GRAVEL - some sand, some silt, dry to damp, fine to coarse rounded gravel to 50 mm diameter END OF BOREHOLE (0.30 metres) Note: Stopped due to refusal on cobbles	Unfrozen		273
1					272
2					271
3					270
4					269
5					268
6					267
7					266
7.5					

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.3 m

Drilling Rig Type: NT550

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

Page 1 of 1



Borehole No: P69-03

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 507704 E; 6978140 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	100 mm Auger	ROOTLETS GRAVEL - trace sand, trace silt, dry to damp, fine to coarse rounded gravel to 75 mm diameter - (Gravel - 94%; Sand - 2%; Silt - 4%) END OF BOREHOLE (0.30 metres) Note: Stopped due to refusal on cobbles	Unfrozen			274
1						273
2						272
3						271
4						270
5						269
6						268
7						267
7.5						

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.3 m

Drilling Rig Type: NT550

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

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Borehole No: P69-04

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 507499 E; 6978213 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	100 mm Auger	ROOTLETS GRAVEL - some sand, trace silt, damp, brown, fine to coarse rounded gravel to 75 mm diameter - (Gravel - 81%; Sand - 11%; Silt - 8%) END OF BOREHOLE (0.25 metres) Note: Stopped due to refusal on cobbles	Unfrozen			274
1						273
2						272
3						271
4						270
5						269
6						268
7						267
7.5						

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.25 m

Drilling Rig Type: NT550

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

Page 1 of 1



Borehole No: P69-05

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 507367 E; 6978275 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	100 mm Auger	ROOTLETS GRAVEL - trace sand, trace silt, damp, brown, gravel to 75 mm diameter - (Gravel - 85%; Sand - 7%; Silt - 8%) END OF BOREHOLE (0.30 metres) Note: Stopped due to refusal on cobbles	Unfrozen			274
1						273
2						272
3						271
4						270
5						269
6						268
7						267
7.5						

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.3 m

Drilling Rig Type: NT550

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

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Borehole No: P69-06

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 273 m

2017 Summer Geotechnical Investigation

UTM: 507573 E; 6978247 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Hand excavated	ORGANICS - rootlets, (100 mm thick)	Unfrozen		273
		GRAVEL - some sand, some silt, trace cobbles, dry to damp, fine to coarse rounded gravel to 75 mm diameter (200 mm thick)			
		END OF TESTPIT (0.3 metres) Note: Stopped due to refusal on cobbles.			
1					272
2					271
3					270
4					269
5					268
6					267
7					266
7.5					

Issued for Review



Contractor: Tetra Tech

Completion Depth: 0.3 m

Drilling Rig Type:

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

Page 1 of 1



Borehole No: P69-07

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 271 m

2017 Summer Geotechnical Investigation

UTM: 507529 E; 6978116 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Hand excavated	ORGANICS - rootlets, (100 mm thick)	Unfrozen		271
		GRAVEL - some sand, some silt, trace cobbles, dry to damp, fine to coarse rounded gravel to 75 mm diameter (300 mm thick)			
0.4		END OF TESTPIT (0.4 metres) Note: Stopped due to refusal on cobbles.			
1					270
2					269
3					268
4					267
5					266
6					265
7					264
7.5					

Issued for Review



Contractor: Tetra Tech

Completion Depth: 0.4 m

Drilling Rig Type:

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

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Borehole No: P69-08

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 270 m

2017 Summer Geotechnical Investigation

UTM: 508075 E; 6978094 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Hand excavated	ORGANICS - rootlets, (100 mm thick)	Unfrozen		270
		GRAVEL - some sand, some silt, trace cobbles, dry to damp, fine to coarse rounded gravel to 75 mm diameter (100 mm thick)			
		END OF TESTPIT (0.2 metres) Note: Stopped due to refusal on cobbles.			
1					269
2					268
3					267
4					266
5					265
6					264
7					263
7.5					

Issued for Review



Contractor: Tetra Tech

Completion Depth: 0.2 m

Drilling Rig Type:

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

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Borehole No: P69-09

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 270 m

2017 Summer Geotechnical Investigation

UTM: 508040 E; 6977970 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Hand excavated	ORGANICS - rootlets, (100 mm thick)	Unfrozen		270
		GRAVEL - some sand, some silt, trace cobbles, dry to damp, fine to coarse rounded gravel to 75 mm diameter (100 mm thick)			
		END OF TESTPIT (0.2 metres) Note: Stopped due to refusal on cobbles.			
1					269
2					268
3					267
4					266
5					265
6					264
7					263
7.5					

Issued for Review



Contractor: Tetra Tech

Completion Depth: 0.2 m

Drilling Rig Type:

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 July 23

Reviewed By: EG

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Borehole No: P69-05d

Project: TASR Granular & Bedrock Sources

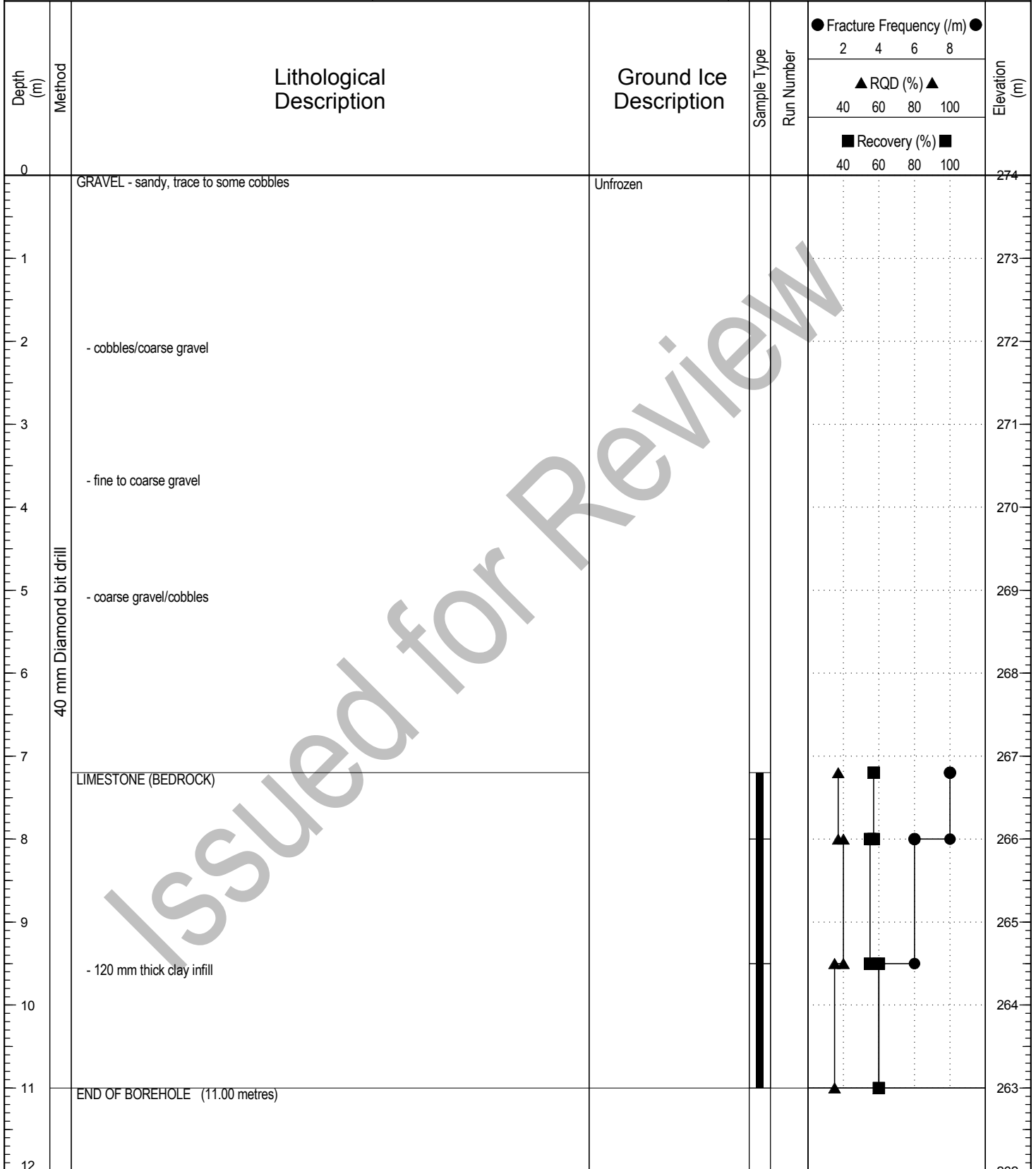
Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 507367 E; 6978275 N; Z 11



Issued for Review



Contractor: Northtech Drilling

Completion Depth: 11 m

Drilling Rig Type: NT550

Start Date: 2017 July 23

Logged By: THS

Completion Date: 2017 June 24

Reviewed By: EG

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Borehole No: P76-01

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 277 m

2017 Summer Geotechnical Investigation

UTM: 504790 E; 6982107 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0				Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	277
0	100 mm Auger	SAND - silty	Unfrozen		
		END OF BOREHOLE (0.20 metres) Note: Stopped due to refusal on cobbles			
1					276
2					275
3					274
4					273
5					272
6					271
7					270
7.5					

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.2 m

Drilling Rig Type: NT550

Start Date: 2017 July 22

Logged By: THS

Completion Date: 2017 July 22

Reviewed By: EG

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Borehole No: P76-02

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 504954 E; 6982192 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0				Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	274
0	100 mm Auger	SAND AND SILT - rootlets, damp, brown	Unfrozen		
		GRAVEL - sandy, some silt			
		END OF BOREHOLE (0.30 metres) Note: Stopped due to refusal on cobbles			
1					273
2					272
3					271
4					270
5					269
6					268
7					267
7.5					

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.3 m

Drilling Rig Type: NT550

Start Date: 2017 July 22

Logged By: THS

Completion Date: 2017 July 22

Reviewed By: EG

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Borehole No: P76-03

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 505138 E; 6982279 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	100 mm Auger	GRAVEL - sandy, some silt to silty, damp, brown, gravel to 75 mm diameter	Unfrozen		275
0.30		END OF BOREHOLE (0.30 metres) Note: Stopped due to refusal on cobbles			
1					274
2					273
3					272
4					271
5					270
6					269
7					268
7.5					

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.3 m

Drilling Rig Type: NT550

Start Date: 2017 July 22

Logged By: THS

Completion Date: 2017 July 22

Reviewed By: EG

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Borehole No: P76-04

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 505172 E; 6982463 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						
0	100 mm Auger	ROOTLETS - (100 mm thick) SAND AND SILT - damp, tan - (Gravel - 0%; Sand - 57%; Silt/Clay - 43%) GRAVEL - sandy, some silt to silty, damp, brown, gravel to 75 mm diameter END OF BOREHOLE (0.50 metres) Note: Stopped due to refusal on cobbles	Unfrozen		Moisture Content (%) Plastic Limit: 20 Moisture Content: 8.1 Liquid Limit: 80	275
1						274
2						273
3						272
4						271
5						270
6						269
7						268
7.5						

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 22

Logged By: THS

Completion Date: 2017 July 22

Reviewed By: EG

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Borehole No: P76-05

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 505045 E; 6982603 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Plastic Limit	Moisture Content	Liquid Limit	Elevation (m)
0						20	40	80	268
0	100 mm Auger	ROOTLETS - (100 mm thick) SILT - sandy, damp, grey, fine sand - (Gravel - 0%; Sand - 23%; Silt/Clay - 77%)	Unfrozen		13.4				268
1		- trace sand - trace to some clay, low plastic							267
2		- (Gravel - 0%; Sand - 9%; Silt - 75%; Clay - 16%)	Frozen, Nbn		14.6				266
3		- cobbles							265
4		END OF BOREHOLE (3.90 metres) Note: Stopped due to refusal on cobbles							264
5									263
6									262
7									261
7.5									

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 3.9 m

Drilling Rig Type: NT550

Start Date: 2017 July 22

Logged By: THS

Completion Date: 2017 July 22

Reviewed By: EG

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Borehole No: P76-06

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 264 m

2017 Summer Geotechnical Investigation

UTM: 504936 E; 6982603 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						264
0 to 1.10	100 mm Auger	ROOTLETS AND MOSS - (100 mm thick) SILT - sandy, trace to some gravel, trace to some clay, damp, low plastic, grey, fine gravel - (Gravel - 9%; Sand - 32%; Silt - 49%; Clay - 10%)	Unfrozen		8	263
1.10 to 7.5		END OF BOREHOLE (1.10 metres) Note: Stopped due to refusal on cobbles				262 to 257

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 1.1 m

Drilling Rig Type: NT550

Start Date: 2017 July 22

Logged By: THS

Completion Date: 2017 July 22

Reviewed By: EG

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Borehole No: P76-07

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 273 m

2017 Summer Geotechnical Investigation

UTM: 504700 E; 6982281 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Plastic Limit	Moisture Content	Liquid Limit	Elevation (m)
0						20	40	60	273
0.4	100 mm Auger	SAND - trace to some silt, trace gravel, damp, grey to tan, fine sand, surface gravel - (Gravel - 1%; Sand - 86%; Silt - 13%) - cobble	Unfrozen		4.4				
1.0	100 mm Auger	SILT - sandy, damp, grey, fine sand - (Gravel - 1%; Sand - 25%; Silt - 74%) - cobbles			8.6				272
1.6	100 mm Auger	END OF BOREHOLE (1.60 metres) Note: Stopped due to refusal on cobbles			14.4				271
2.0									270
3.0									269
4.0									268
5.0									267
6.0									266
7.0									266
7.5									266

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 1.6 m

Drilling Rig Type: NT550

Start Date: 2017 July 21

Logged By: THS

Completion Date: 2017 July 21

Reviewed By: EG

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Borehole No: P76-08

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 269 m

2017 Summer Geotechnical Investigation

UTM: 504815 E; 6982341 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Plastic Limit	Moisture Content	Liquid Limit	Elevation (m)
0	100 mm Auger	SILT - some sand, trace gravel - (Gravel - 1%; Sand - 20%; Silt - 79%) GRAVEL - cobbly, silty, sandy, damp, brown	Unfrozen		12.9	20	40	80	269
1		END OF BOREHOLE (0.60 metres) Note: Stopped due to refusal on cobbles							268
2									267
3									266
4									265
5									264
6									263
7									262
7.5									

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.6 m

Drilling Rig Type: NT550

Start Date: 2017 July 21

Logged By: THS

Completion Date: 2017 July 21

Reviewed By: EG

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Borehole No: P76-09

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 268 m

2017 Summer Geotechnical Investigation

UTM: 504980 E; 6982421 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						268
0 - 1.80	100 mm Auger	ROOTLETS - (100 mm thick) SILT - some sand, some clay, damp, low plastic, brown to grey, fine sand	Unfrozen		14.7	268
1.80		END OF BOREHOLE (1.80 metres) Note: Stopped due to refusal on cobbles				266
2.00						266
3.00						265
4.00						264
5.00						263
6.00						262
7.00						261
7.50						261



Contractor: Northtech Drilling

Completion Depth: 1.8 m

Drilling Rig Type: NT550

Start Date: 2017 July 21

Logged By: THS

Completion Date: 2017 July 21

Reviewed By: EG

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Borehole No: P76-03d

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 505138 E; 6982279 N; Z 11

Depth (m)	Method	Lithological Description	Ground Ice Description	Sample Type	Run Number	Fracture Frequency (/m)			Elevation (m)	
						●	▲	■		
						2	4	6	8	
						40	60	80	100	
						40	60	80	100	
0		ROOTLETS, MOSS AND PEAT - (100 mm thick) SILT AND SAND - gravelly, some cobbles to 100 mm diameter, gravel to 70 mm diameter	Unfrozen							275
1		- some silt								274
2		- coarse gravel								273
3		- cobbles to 250 mm diameter								272
4		- coarse gravel								271
5	40 mm Diamond bit drill	- silty, some clay								270
6										269
7		- coarse gravel								268
8		- cobbles								267
9										266
10		- 200 mm boulder								265
11										264
12		LIMESTONE (BEDROCK)								263

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 18.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 25

Logged By: THS

Completion Date: 2017 July 25

Reviewed By: EG

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Borehole No: P76-03d

Project: TASR Granular & Bedrock Sources

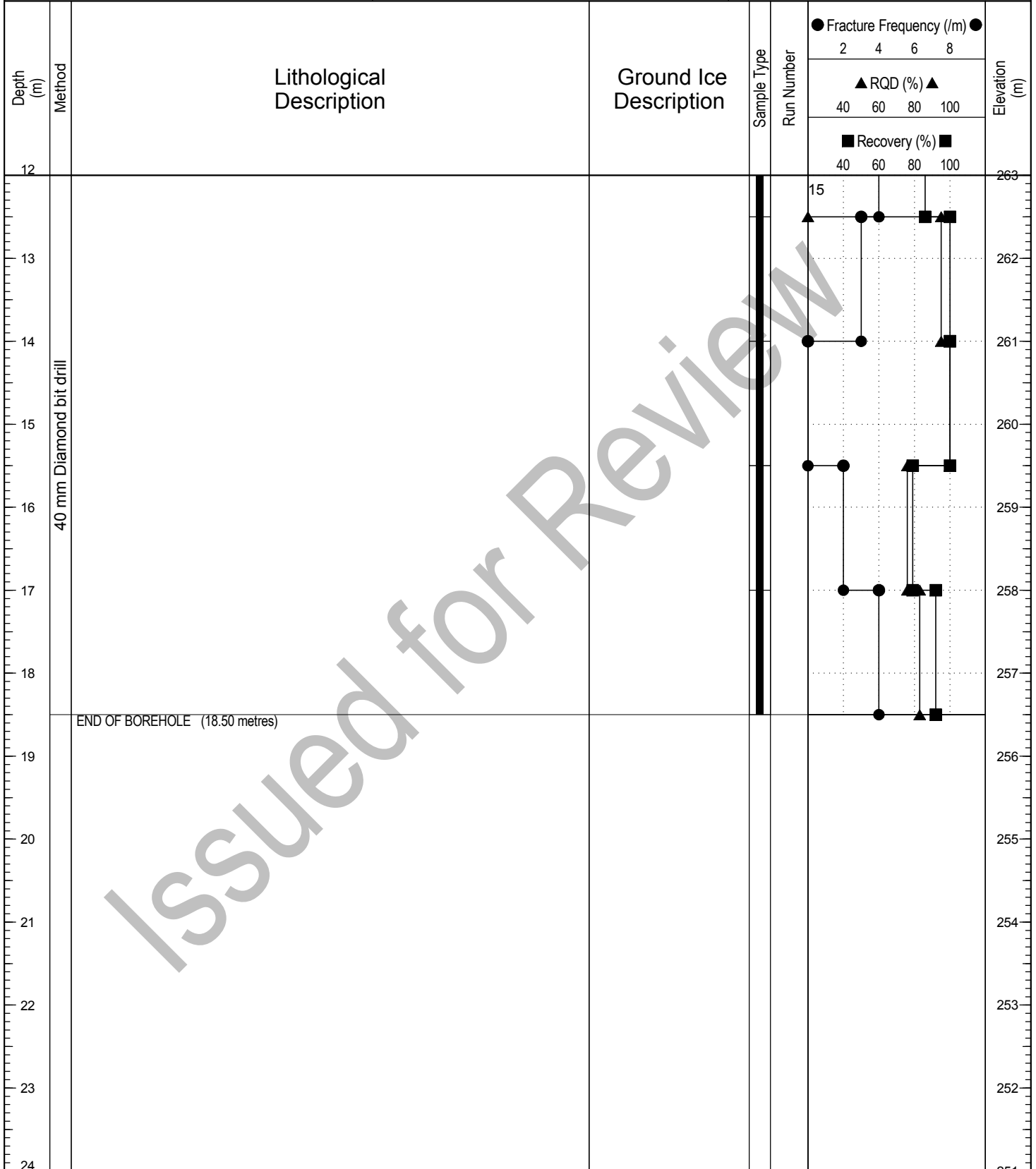
Project No: ENG.YARC03107-01

Location: Prospect 76

Ground Elev: 275 m

2017 Summer Geotechnical Investigation

UTM: 505138 E; 6982279 N; Z 11



Issued for Review



Contractor: Northtech Drilling

Completion Depth: 18.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 25

Logged By: THS

Completion Date: 2017 July 25

Reviewed By: EG

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Borehole No: P86-01A

Project: TASR Granular & Bedrock Sources

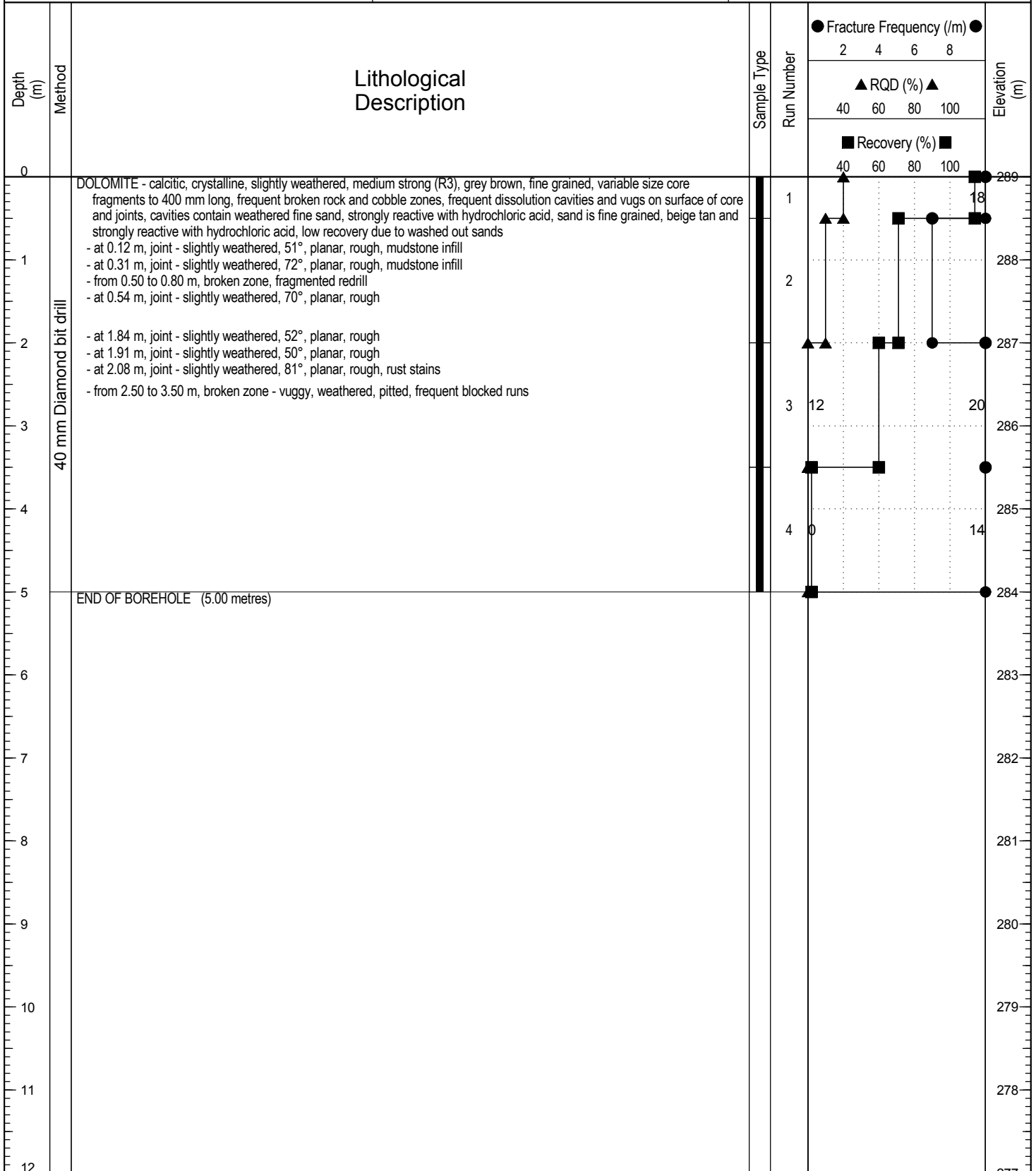
Project No: ENG.YARC03107-01

Location: Prospect 86

Ground Elev: 289 m

2017 Summer Geotechnical Investigation

UTM: 503408 E; 6989031 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 5 m

Drilling Rig Type: NT550

Start Date: 2017 July 12

Logged By: SK

Completion Date: 2017 July 13

Reviewed By: EG

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Borehole No: P86-01B

Project: TASR Granular & Bedrock Sources

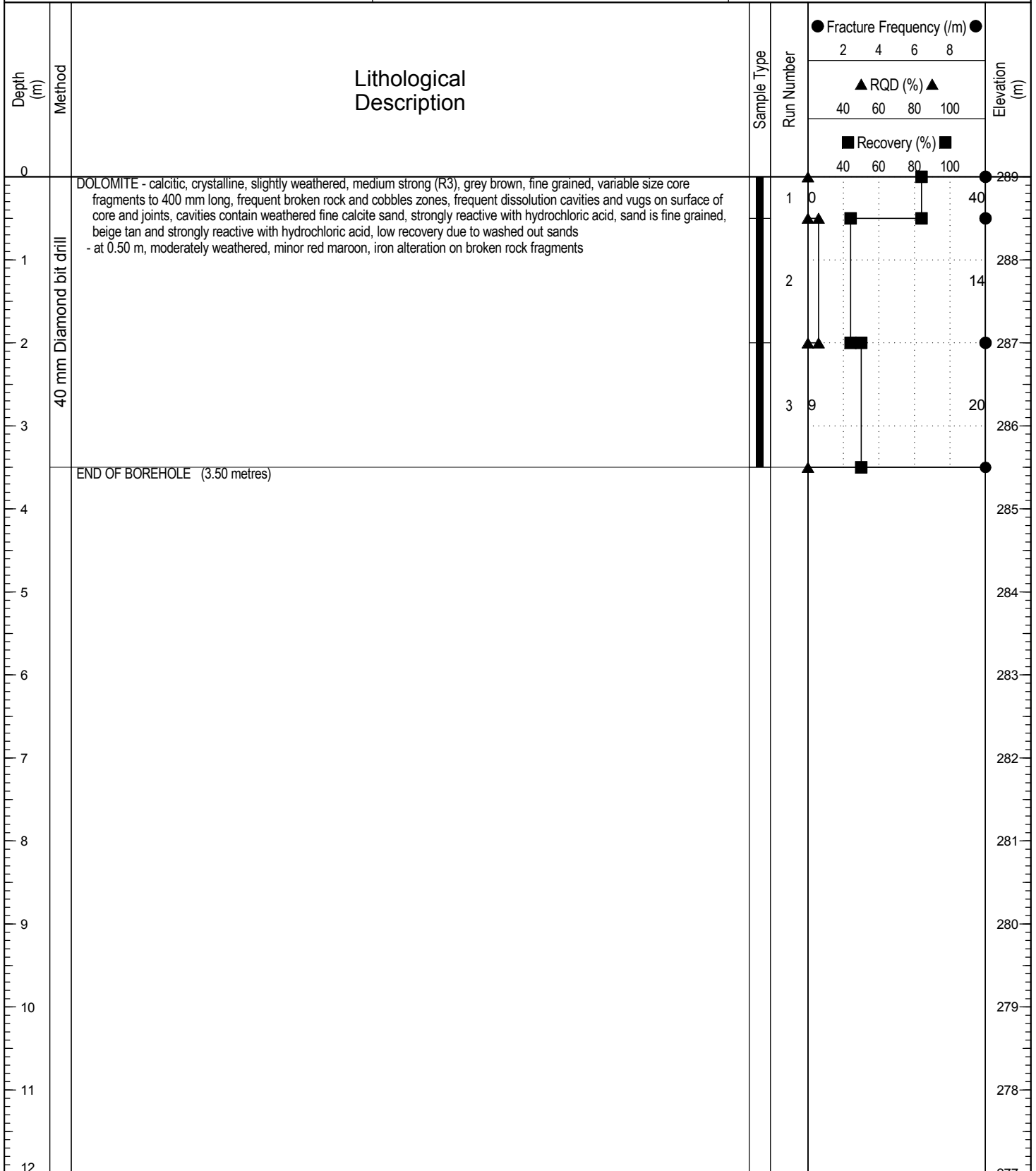
Project No: ENG.YARC03107-01

Location: Prospect 86

Ground Elev: 289 m

2017 Summer Geotechnical Investigation

UTM: 503408 E; 6989031 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 3.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 13

Logged By: SK

Completion Date: 2017 July 13

Reviewed By: EG

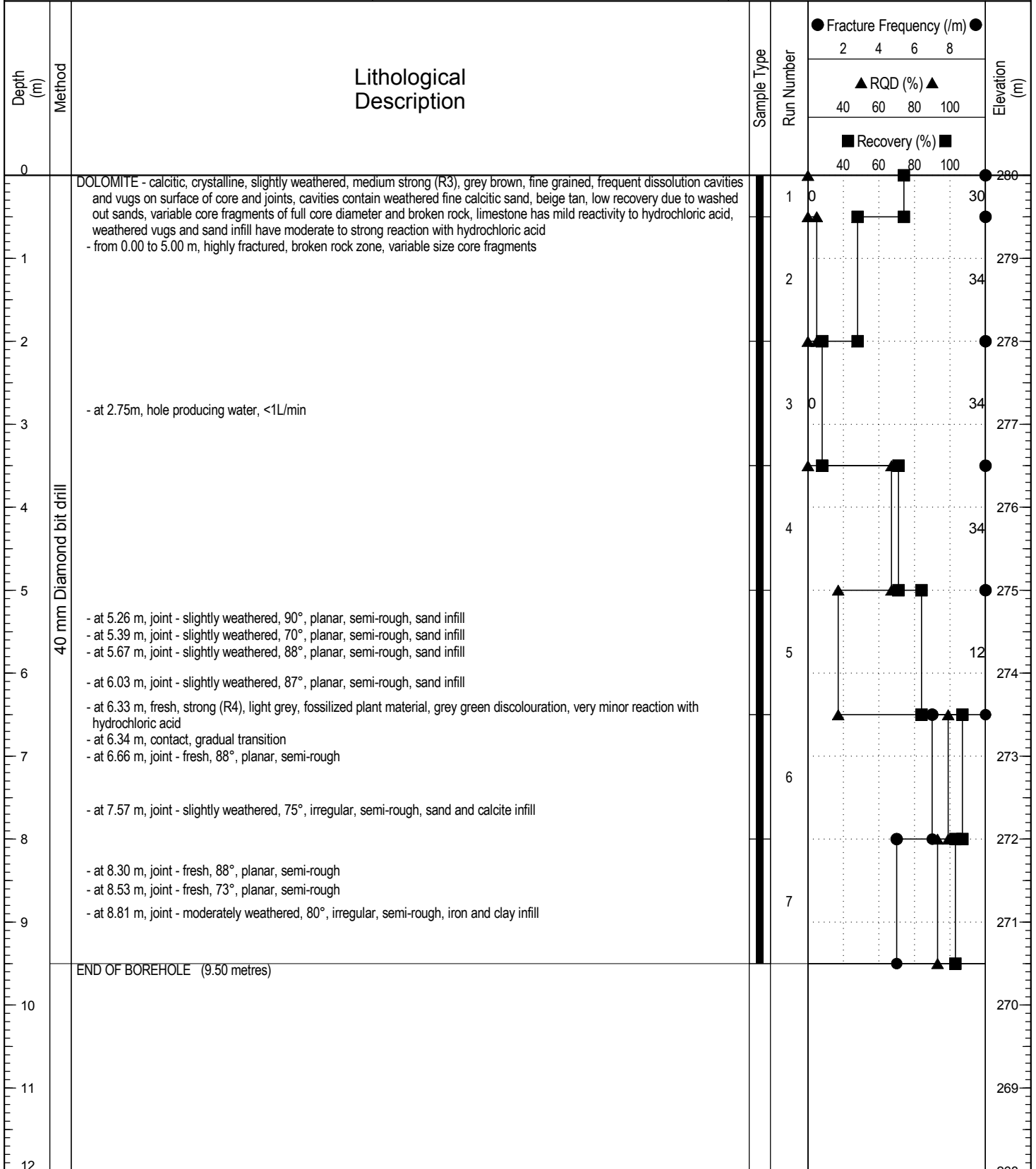
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Borehole No: P86-02

Project: TASR Granular & Bedrock Sources
 Location: Prospect 86
 2017 Summer Geotechnical Investigation

Project No: ENG.YARC03107-01
 Ground Elev: 280 m
 UTM: 503407 E; 6988795 N; Z 11



Contractor: Northtech Drilling
 Drilling Rig Type: NT550
 Logged By: SK
 Reviewed By: EG

Completion Depth: 9.5 m
 Start Date: 2017 July 14
 Completion Date: 2017 July 15
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Borehole No: P86-04

Project: TASR Granular & Bedrock Sources

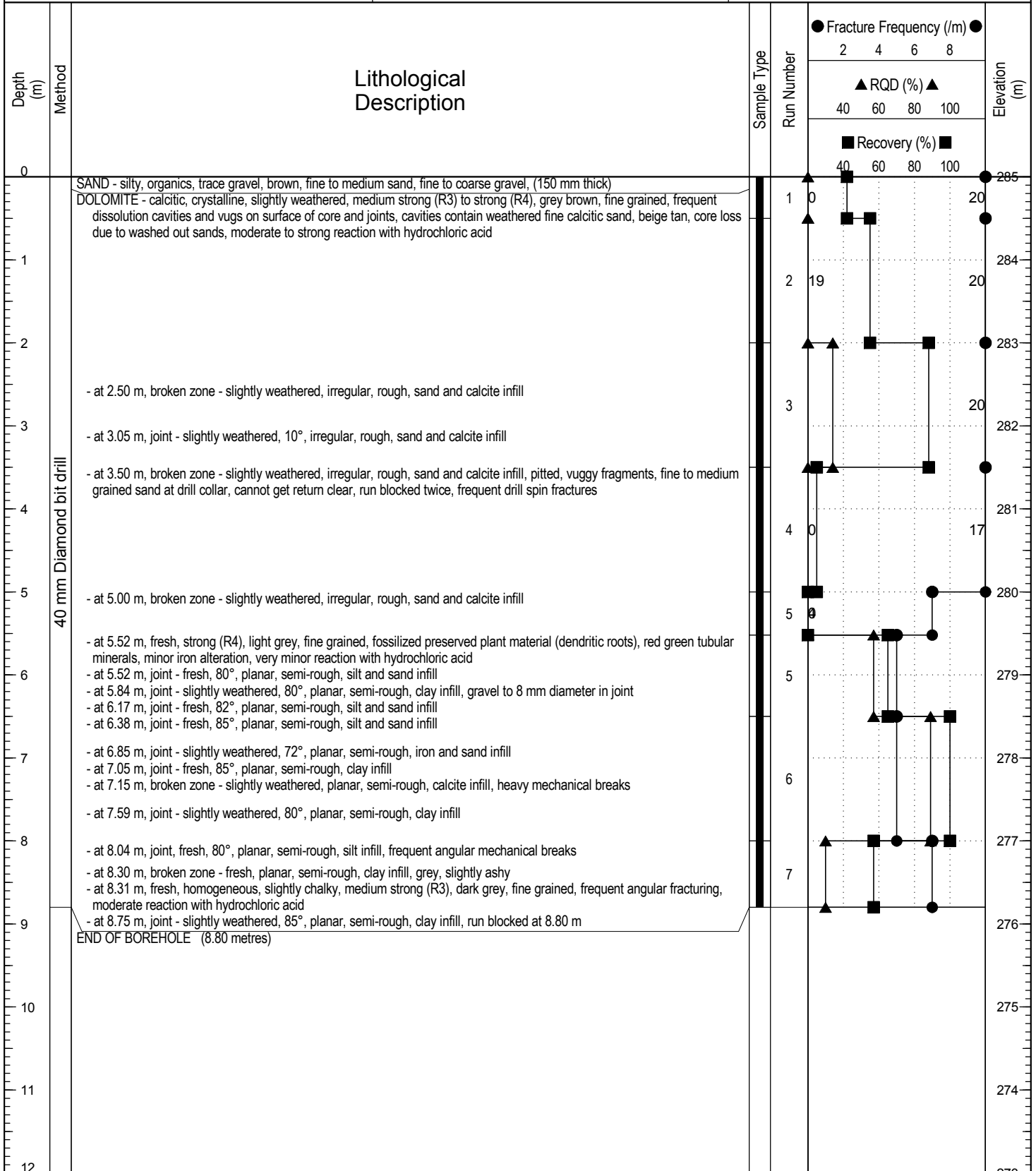
Project No: ENG.YARC03107-01

Location: Prospect 86

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 503188 E; 6988958 N; Z 11



Contractor: Northtech Drilling

Completion Depth: 8.8 m

Drilling Rig Type: NT550

Start Date: 2017 July 13

Logged By: SK

Completion Date: 2017 July 13

Reviewed By: EG

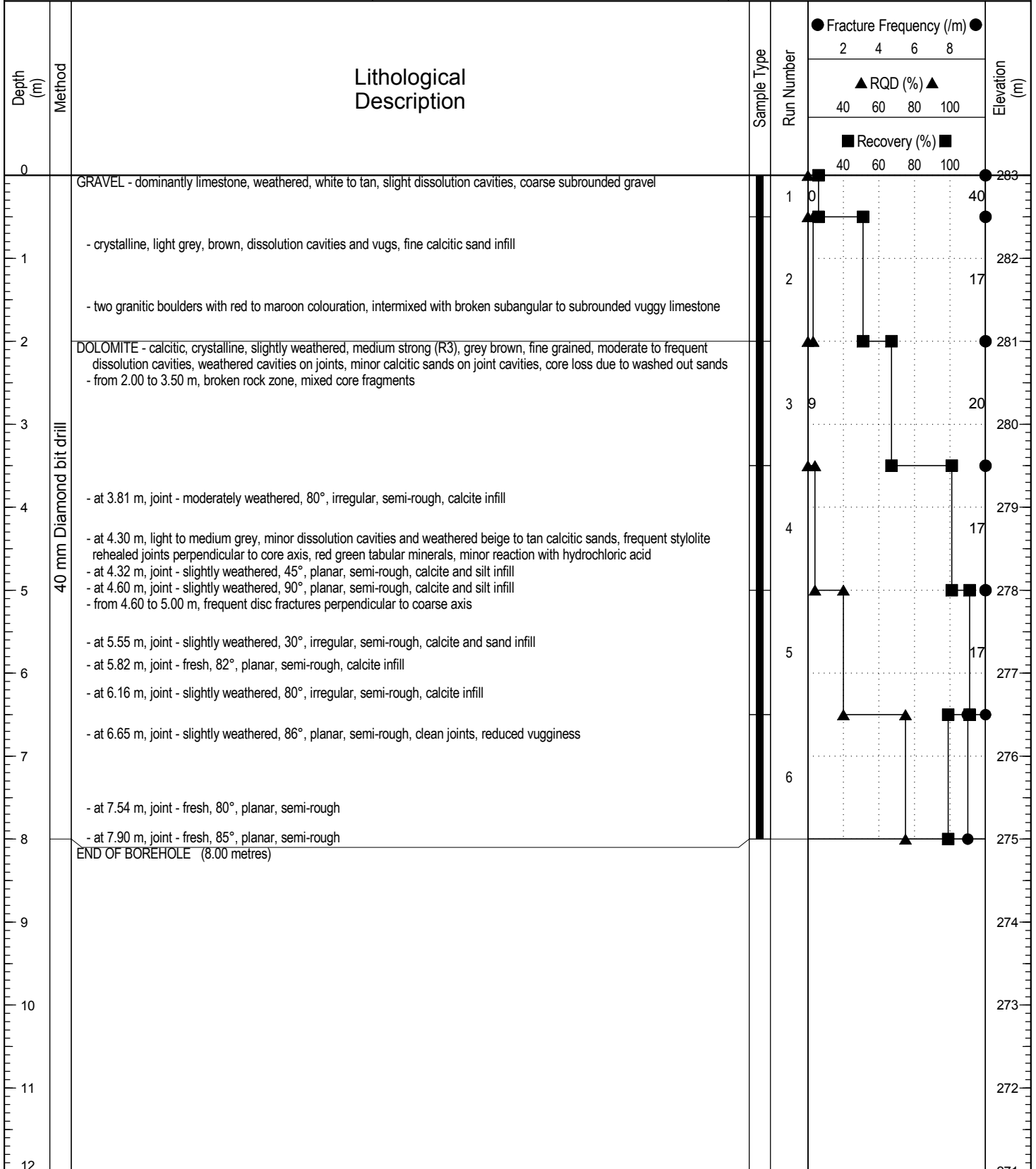
Page 1 of 1



Borehole No: P86-06

Project: TASR Granular & Bedrock Sources
 Location: Prospect 86
 2017 Summer Geotechnical Investigation

Project No: ENG.YARC03107-01
 Ground Elev: 283 m
 UTM: 503263 E; 6989192 N; Z 11



Contractor: Northtech Drilling
 Drilling Rig Type: NT550
 Logged By: SK
 Reviewed By: EG

Completion Depth: 8 m
 Start Date: 2017 July 15
 Completion Date: 2017 July 15
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Borehole No: P98-01

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 98

Ground Elev: 280 m

2017 Summer Geotechnical Investigation

UTM: 501346 E; 6995237 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	150 mm Auger	GRAVEL - some sand to sandy, some silt, trace clay, damp, brown, gravel to 50 mm diameter - (Gravel - 71%; Sand - 16%; Silt - 13%)	Unfrozen		4.4	280
0.40		END OF BOREHOLE (0.40 metres)				
1						279
2						278
3						277
4						276
5						275
6						274
7						273
7.5						

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.4 m

Drilling Rig Type: NT550

Start Date: 2017 July 20

Logged By: THS

Completion Date: 2017 July 20

Reviewed By: EG

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Borehole No: P98-07

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 98

Ground Elev: 2788 m

2017 Summer Geotechnical Investigation

UTM: 501388 E; 6995269 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	150 mm Auger	SILT - some clay, trace sand, damp, low plastic, brown, (200 mm thick)	Unfrozen			2788
		GRAVEL - trace silt, trace sand, damp, brown, rounded gravel to 50 mm diameter - (Gravel - 87%; Sand - 5%; Silt - 8%)				
		END OF BOREHOLE (0.60 metres) Note: Stopped due to refusal on cobbles				
1						2787
2						2786
3						2785
4						2784
5						2783
6						2782
7						2781
7.5						

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.6 m

Drilling Rig Type: NT550

Start Date: 2017 July 20

Logged By: THS

Completion Date: 2017 July 20

Reviewed By: EG

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Borehole No: P98-08

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 98

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 501292 E; 6995229 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	150 mm Auger	GRAVEL AND SILT - some sand, damp, brown, gravel to 25 mm diameter	Unfrozen			274
0.30		- boulder END OF BOREHOLE (0.30 metres) Note: Stopped due to refusal on boulders and cobbles			3.1	
1						273
2						272
3						271
4						270
5						269
6						268
7						267
7.5						

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.3 m

Drilling Rig Type: NT550

Start Date: 2017 July 20

Logged By: THS

Completion Date: 2017 July 20

Reviewed By: EG

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Borehole No: P98-11

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 98

Ground Elev: 279 m

2017 Summer Geotechnical Investigation

UTM: 501330 E; 6995185 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0				Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	279
0	100 mm Auger	SILT - gravelly, damp, brown, some boulders near surface, (200 mm thick) GRAVEL - silty, rounded gravel to 75 mm diameter END OF BOREHOLE (0.20 metres) Note: Stopped due to refusal on cobbles and coarse gravel	Unfrozen		
1					278
2					277
3					276
4					275
5					274
6					273
7					272
7.5					

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.2 m

Drilling Rig Type: NT550

Start Date: 2017 July 20

Logged By: THS

Completion Date: 2017 July 20

Reviewed By: EG

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Borehole No: P98-12

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 98

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 501313 E; 6995311 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						274
0	100 mm Auger	SILT - gravelly, dry to damp, brown	Unfrozen		0.8	274
0.3		GRAVEL - silty, some sand, gravel to 75 mm diameter				
0.3		END OF BOREHOLE (0.30 metres) Note: Stopped due to refusal on cobbles				
1						273
2						272
3						271
4						270
5						269
6						268
7						267
7.5						

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.3 m

Drilling Rig Type: NT550

Start Date: 2017 July 20

Logged By: THS

Completion Date: 2017 July 20

Reviewed By: EG

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Borehole No: P98-13

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 98

Ground Elev: 282 m

2017 Summer Geotechnical Investigation

UTM: 501301 E; 6995427 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
				Plastic Limit Moisture Content Liquid Limit 20 40 60 80	
0	100 mm Auger	SILT - gravelly, some sand, damp, brown	Unfrozen		282
		END OF BOREHOLE (0.20 metres) Note: Stopped due to refusal on cobbles			
1					281
2					280
3					279
4					278
5					277
6					276
7					275
7.5					

Issued for Review



Contractor: Northtech Drilling

Completion Depth: 0.2 m

Drilling Rig Type: NT550

Start Date: 2017 July 20

Logged By: THS

Completion Date: 2017 July 20

Reviewed By: EG

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Borehole No: P98-01N

Project: TASR Granular & Bedrock Sources

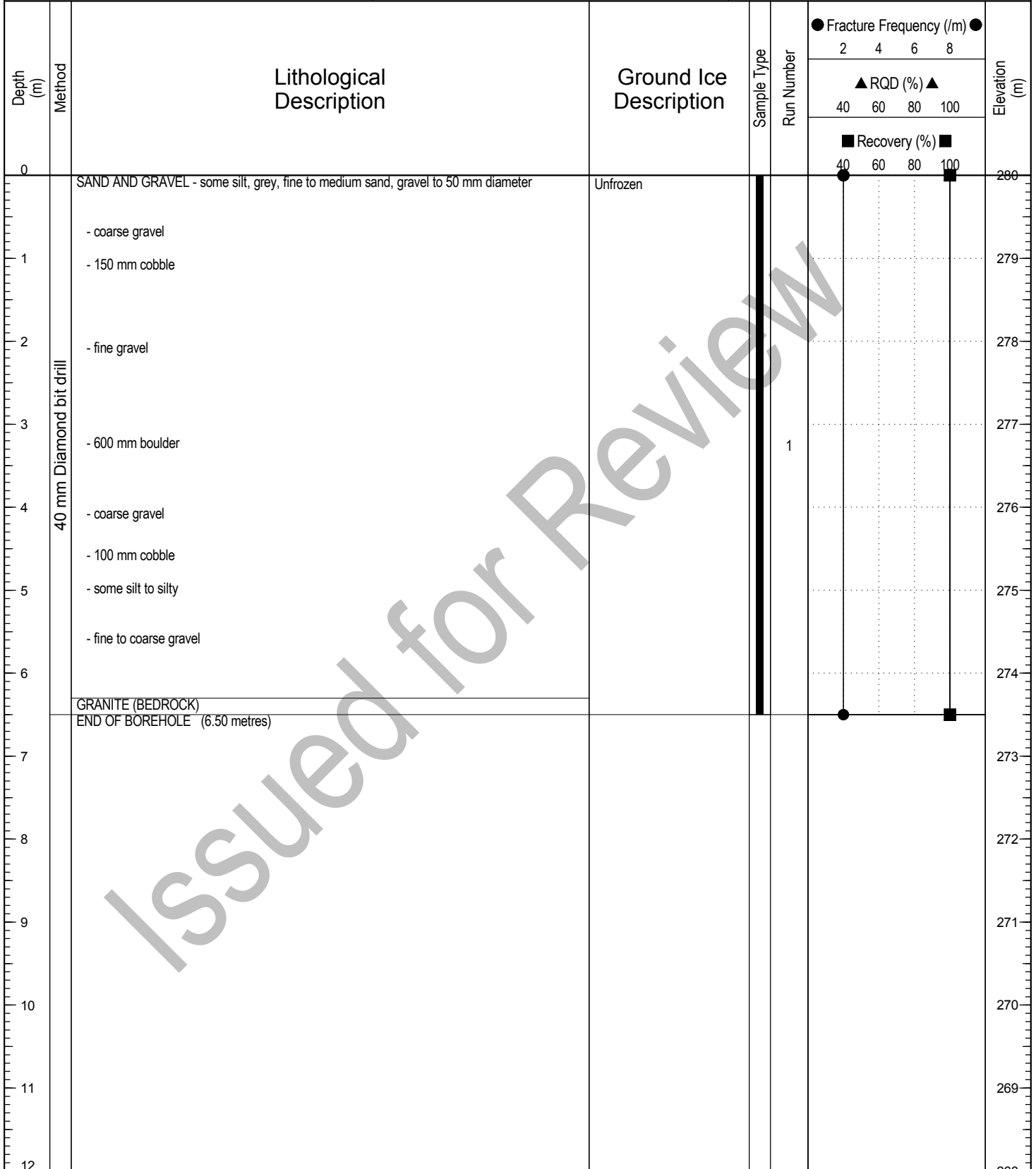
Project No: ENG.YARC03107-01

Location: Prospect 69

Ground Elev: 280 m

2017 Summer Geotechnical Investigation

UTM: 501311 E; 6995357 N; Z 11



Issued for Review



Contractor: Northtech Drilling

Completion Depth: 6.5 m

Drilling Rig Type: NT550

Start Date: 2017 July 25

Logged By: THS

Completion Date: 2017 July 25

Reviewed By: EG

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Testpit No: P98-13

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 98

Ground Elev: 282 m

2017 Summer Geotechnical Investigation

UTM: 501301 E; 6995427 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Hand Excavated	GRAVEL AND COBBLES - some silt, damp, brown, cobbles to 170 mm diameter	Unfrozen			282
0.55		END OF TESTPIT (0.55 metres) Note: Stopped due to refusal on cobbles				281
1						281
2						280
3						279
4						278
5						277
6						276
7						275
7.5						

Issued for Review



Contractor: Tetra Tech

Completion Depth: 0.55 m

Drilling Rig Type:

Start Date: 2017 July 21

Logged By: THS

Completion Date: 2017 July 21

Reviewed By: EG

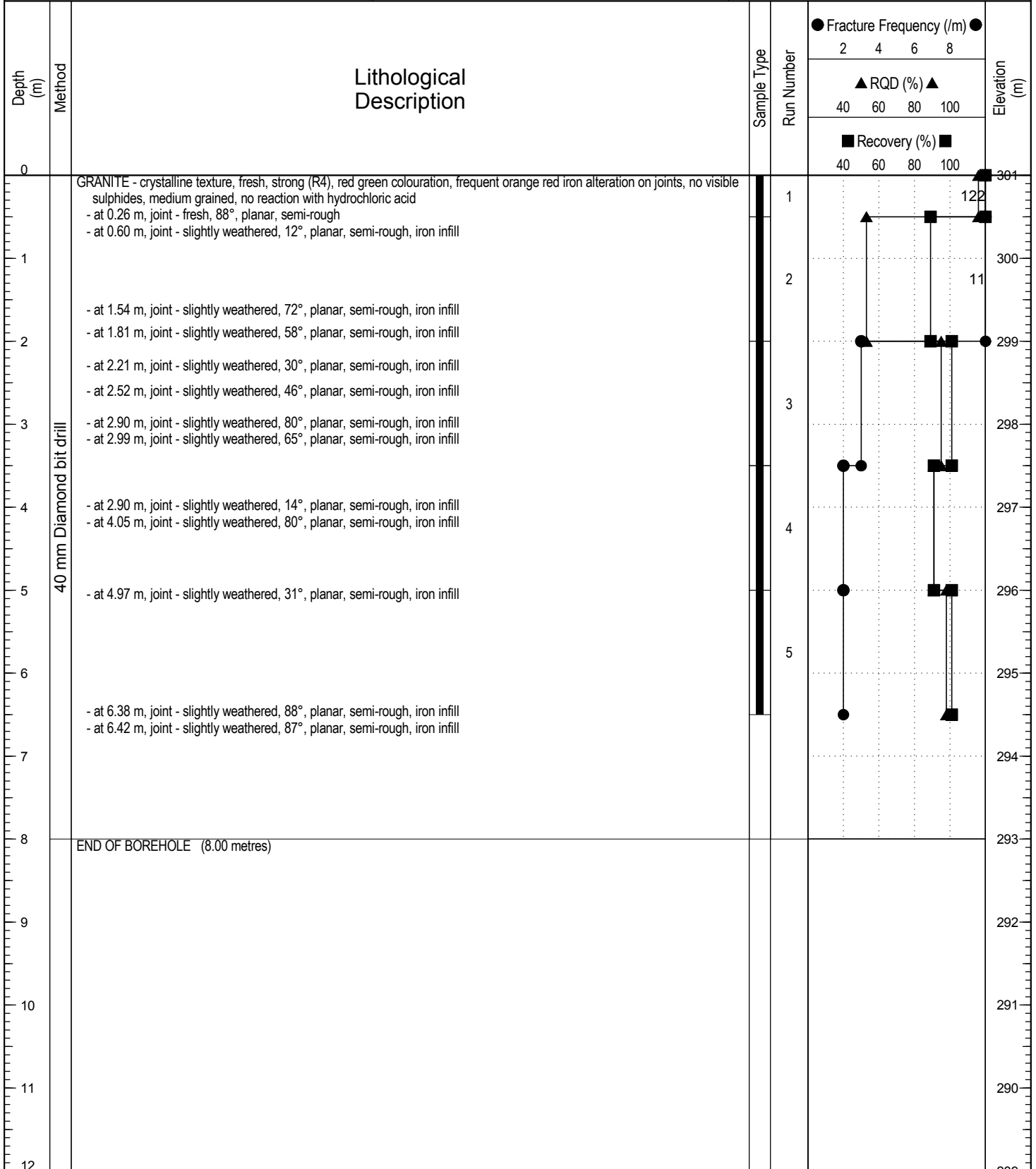
Page 1 of 1



Borehole No: P105-01

Project: TASR Granular & Bedrock Sources
 Location: Prospect 105
 2017 Summer Geotechnical Investigation

Project No: ENG.YARC03107-01
 Ground Elev: 301 m
 UTM: 502213 E; 7001585 N; Z 11



Contractor: Northtech Drilling
 Drilling Rig Type: NT550
 Logged By: SK
 Reviewed By: EG

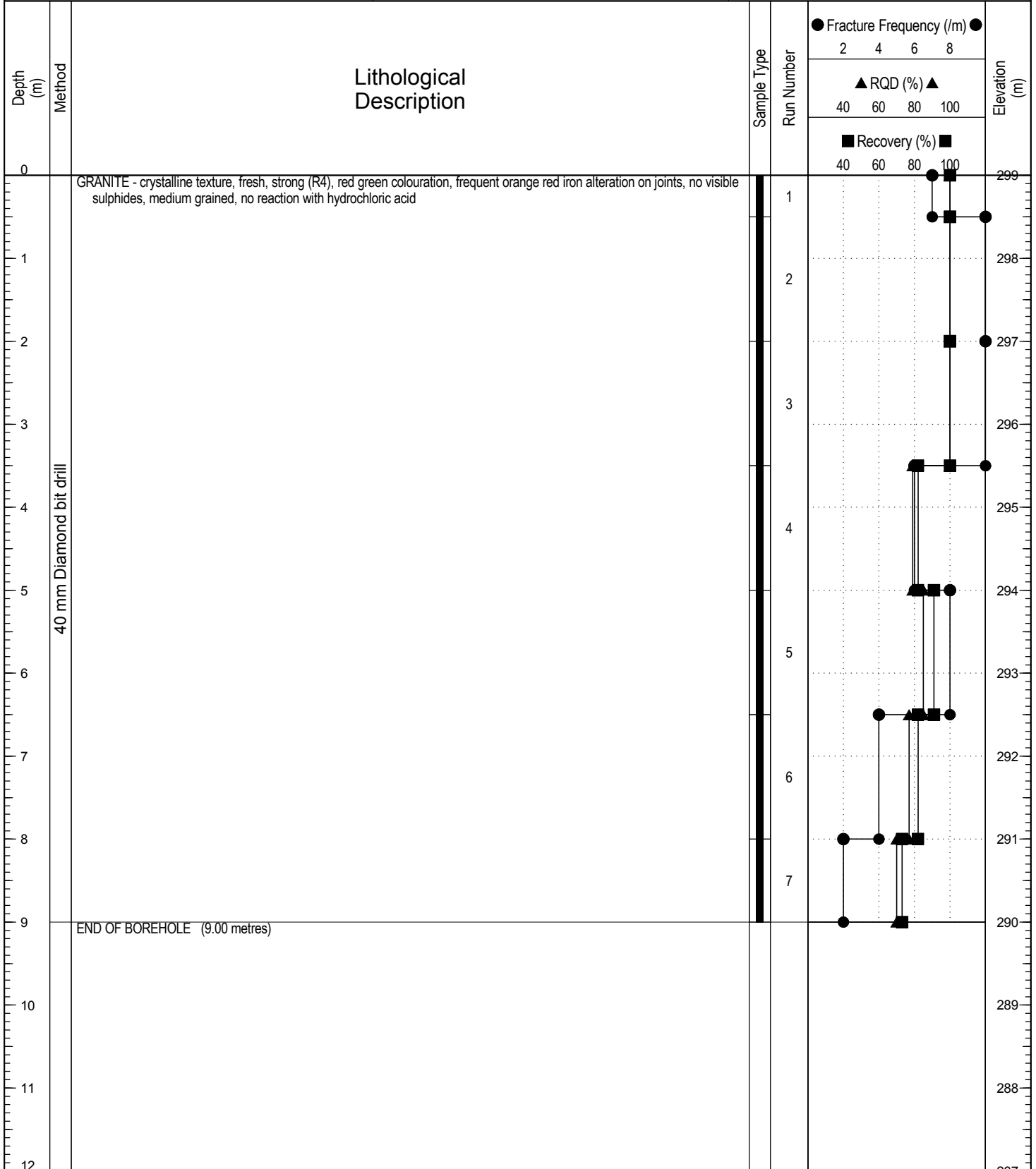
Completion Depth: 8 m
 Start Date: 2017 July 16
 Completion Date: 2017 July 17
 Page 1 of 1



Borehole No: P105-02

Project: TASR Granular & Bedrock Sources
 Location: Prospect 105
 2017 Summer Geotechnical Investigation

Project No: ENG.YARC03107-01
 Ground Elev: 299 m
 UTM: 502074 E; 7001767 N; Z 11



END OF BOREHOLE (9.00 metres)



Contractor: Northtech Drilling
 Drilling Rig Type: NT550
 Logged By: THS
 Reviewed By: EG

Completion Depth: 9 m
 Start Date: 2017 July 18
 Completion Date: 2017 July 19
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Testpit No: P116-01

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 274 m

2017 Summer Geotechnical Investigation

UTM: 495937 E; 7006054 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Excavated	SAND - silty, trace gravel, rootlets, dry, brown - trace silt - fine to coarse sand, fine gravel - gravelly, well graded, damp, grey, subrounded to subangular gravel to 75 mm diameter	Unfrozen			274
1		273				
2		272				
3		GRAVEL AND SAND - trace silt, well graded, damp - field estimate: 20% greater than 20 mm diameter - (Gravel - 58%; Sand - 41%; Silt - 1%) - moist			4.5	271
4		END OF TESTPIT (3.5 metres) slough - 0.2 metre at 0 hrs.				270
5						269
6						268
7						267
7.5						

Issued for Review



Contractor: TLICHO

Completion Depth: 3.5 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-02

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 495649 E; 7005700 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Excavated	SAND - silty, rootlets, dry, brown - trace gravel and cobbles, coarse rounded gravel to 150 mm diameter - some silt, moist, grey, fine to medium sand	Unfrozen			285
1		- fine sand - no visible gravel	Frozen Nbn			284
2						283
3						282
4		- water seepage - (Gravel - 0%; Sand - 80%; Silt - 20%)	Unfrozen		22	281
4.1		END OF TESTPIT (4.1 metres) slough - 0.0 metres at 0 hrs. water - 4.0 metres at 0 hrs.				281
5						280
6						279
7						278
7.5						278

Issued for Review



Contractor: TLICHO

Completion Depth: 4.1 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-03

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 284 m

2017 Summer Geotechnical Investigation

UTM: 495667 E; 7005547 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0		ROOTLETS - (200 mm thick)	Unfrozen		284
		SAND AND GRAVEL - trace silt, well graded, dry to damp, brown, grey			
1		SAND - trace gravel, trace silt, dry to damp, grey			283
2					282
3					281
4		END OF PIT (4.0 metres) Note: Existing pit face logged			280
5					279
6					278
7					277
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 4 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-04

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 284 m

2017 Summer Geotechnical Investigation

UTM: 495673 E; 7005403 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Excavated	SAND - trace silt, rootlets, dry, brown - some gravel, well graded, damp, brown to grey - gravel to 75 mm diameter - grey, fine to medium sand - gravel seam - gravel to 75 mm diameter - no visible gravel	Unfrozen		284
1					283
2			Frozen		282
3			Nbn		281
4					280
5		END OF TESTPIT (4.3 metres) Note: In permafrost sand			279
6					278
7					277
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 4.3 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-05

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 281 m

2017 Summer Geotechnical Investigation

UTM: 495877 E; 7005056 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)	
0	Excavated	SAND - some silt, rootlets, dry, brown - gravelly, trace silt, well graded, dry to damp, grey brown, fine to coarse sand, fine to coarse rounded gravel to 75 mm diameter - grey - trace cobbles, rounded cobbles to 150 mm diameter	Unfrozen			281	
1						280	
2		SAND AND GRAVEL - trace cobbles, trace silt, well graded, damp, grey brown - field estimate: 20% greater than 20 mm diameter	Frozen				279
3		- (Gravel - 46%; Sand - 52%; Silt - 2%)	Nbn		4.7	278	
4		END OF TESTPIT (3.5 metres) Note: Stopped due to hard digging in permafrost				277	
5						276	
6						275	
7						274	
7.5							

Issued for Review



Contractor: TLICHO

Completion Depth: 3.5 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-06

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 284 m

2017 Summer Geotechnical Investigation

UTM: 495400 E; 7005709 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
				Plastic Limit Moisture Content Liquid Limit 20 40 60 80	
0	Excavated	SAND - trace silt, rootlets, dry, brown	Unfrozen		284
1		SAND - some gravel, trace silt, well graded, damp, grey, fine to coarse sand, rounded gravel to 50 mm diameter			283
2		- gravelly to 75 mm diameter - some gravel - trace cobbles to 100 mm diameter	Frozen		282
3		- moist	Nbn		281
4		END OF TESTPIT (3.5 metres) Note: Stopped due to hard digging in permafrost			280
5					279
6					278
7					277
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 3.5 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-07

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 279 m

2017 Summer Geotechnical Investigation

UTM: 495517 E; 7006087 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0				Plastic Limit: 20 Moisture Content: 40 Liquid Limit: 80	279
0 - 1	Excavated	ROOTLETS - (100 mm thick) SAND - trace to some silt, dry, brown - some gravel, trace silt - damp, grey - trace cobbles, trace coarse gravel to 75 mm diameter, rounded cobbles to 200 mm diameter	Unfrozen		278
1 - 2	Excavated	- trace fine gravel - some silt to silty - no visible gravel	Frozen Nbn		277
3		END OF TESTPIT (2.9 metres) Note: Stopped due to hard digging in permafrost			276
4					275
5					274
6					273
7					272
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 2.9 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-08

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 280 m

2017 Summer Geotechnical Investigation

UTM: 495021 E; 7005112 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Excavated	SAND - some silt, rootlets, occasional cobble, dry, brown, cobbles to 300 mm diameter - trace silt, well graded, damp, grey, fine to coarse sand	Unfrozen		280
1			Frozen		279
2			Nbn		278
3		END OF TESTPIT (2.5 metres) Note: Stopped due to hard digging in permafrost			277
4					276
5					275
6					274
7					273
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 2.5 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-09

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 494710 E; 7005301 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		SAND AND SILT - rootlets, dry, brown, (250 mm thick) - trace silt, well graded, dry, brown, fine gravel	Unfrozen			285
1	Excavated	SAND - some gravel, trace silt, well graded, dry, grey, fine to coarse sand, fine rounded gravel - gravelly, damp				284
2		- trace cobbles, gravel to 75 mm diameter, cobbles to 150 mm diameter				283
3		GRAVEL AND SAND - trace silt, well graded, damp, brown grey, subrounded gravel - field estimate: 25% greater than 20 mm diameter - 250 mm cobble	Frozen Nbn		4.4	282
4		END OF TESTPIT (4.2 metres) Note: Stopped due to hard digging in permafrost				281
5						280
6						279
7						278
7.5						



Contractor: TLICHO

Completion Depth: 4.2 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-10

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 494519 E; 7005157 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		SAND - silty, trace gravel, rootlets, damp, brown	Unfrozen			285
1		- trace silt, grey				284
2	Excavated	SAND AND GRAVEL - trace silt, well graded, damp, grey brown, fine to medium sand, rounded gravel to 150 mm diameter				283
3		SAND - some silt, trace gravel, grey	Frozen			282
4		- (Gravel - 3%; Sand - 66%; Silt - 31%)	Nbn		9.1	281
5		END OF TESTPIT (4.2 metres) Note: Stopped due to hard digging in permafrost				280
6						279
7						278
7.5						

Issued for Review



Contractor: TLICHO

Completion Depth: 4.2 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-11

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 282 m

2017 Summer Geotechnical Investigation

UTM: 494465 E; 7005034 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		SAND AND SILT - some gravel, rootlets, dry to damp, brown, (300 mm thick)	Unfrozen			282
0		SAND AND GRAVEL - to gravelly, trace silt, well graded, damp, grey brown, fine to coarse sand, fine gravel to 20 mm diameter				
1						281
2	Excavated	- some gravel, well graded, grey			9.2	280
3						279
4						278
5		END OF TESTPIT (4.9 metres) slough - 4.7 metres at 0 hrs.			7.8	277
6						276
7						275
7.5						



Contractor: TLICHO

Completion Depth: 4.9 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-12

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 494607 E; 7005233 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0		SAND AND SILT - rootlets, dry, brown	Unfrozen			285
1	Excavated	SAND - some gravel to gravelly, well graded, damp, brown grey, fine to coarse sand, rounded gravel to 20 mm diameter	Unfrozen			284
		- gravel to 75 mm diameter				283
2		SAND AND GRAVEL - damp, grey				
	- gravel to 75 mm diameter, trace cobbles to 150 mm diameter					
	- field estimate: 25% greater than 20 mm diameter					
	- (Gravel 55%; Sand - 44%; Silt - 1%)		Frozen		4	
3			Nbn			
4		END OF TESTPIT (3.3 metres) slough - 3.2 metres at 0 hrs. Note: Stopped due to hard digging in permafrost				281
5						280
6						279
7						278
7.5						

Issued for Review



Contractor: TLICHO

Completion Depth: 3.3 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-13

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 284 m

2017 Summer Geotechnical Investigation

UTM: 494781 E; 7005175 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0	Excavated	SAND AND SILT - rootlets, dry, brown	Unfrozen			284
1		SAND - trace to some silt, damp, grey				283
2		END OF TESTPIT (1.9 metres) Note: Wetlands nearby Stopped due to hard digging in permafrost	Frozen Nbn		26.3	282
3						281
4						280
5						279
6						278
7						277
7.5						



Contractor: TLICHO

Completion Depth: 1.9 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-14

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 283 m

2017 Summer Geotechnical Investigation

UTM: 494962 E; 7005262 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Excavated	SAND - silty, rootlets, dry to damp, brown	Unfrozen		283
1		- some silt, trace clay, damp to moist - trace fine gravel			282
2		- no visible gravel - silty	Frozen Nbn		281
3		END OF TESTPIT (2.5 metres) Note: Stopped due to hard digging in permafrost			280
4					279
5					278
6					277
7					276
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 2.5 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-15

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 285 m

2017 Summer Geotechnical Investigation

UTM: 495524 E; 7005705 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						285
0 - 0.2		SAND AND SILT - rootlets, dry, brown, (200 mm thick)	Unfrozen			
0.2 - 0.5		GRAVEL AND SAND - trace silt, well graded, damp, brown to grey, fine to coarse sand, fine gravel				
0.5 - 1.5	Excavated	- (Coarse Gravel - 24%; Fine Gravel - 30%; Sand - 48%; Silt - 6%)		8		284
1.5 - 2.5		SAND - trace to some silt, trace gravel, grey, fine sand - no visible gravel	Frozen Nbn			283
2.5 - 7.5		END OF TESTPIT (2.5 metres) Note: Stopped due to hard digging in permafrost				282
						281
						280
						279
						278

Issued for Review



Contractor: TLICHO

Completion Depth: 2.5 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 17

Logged By: THS

Completion Date: 2017 July 17

Reviewed By: EG

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Testpit No: P116-16

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 280 m

2017 Summer Geotechnical Investigation

UTM: 495594 E; 7006003 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
					Plastic Limit Moisture Content Liquid Limit 20 40 60 80	
0	Excavated	SAND - some silt, rootlets, dry, brown	Unfrozen			280
		- trace silt				
		- trace gravel, well graded, damp, grey, fine to coarse sand				
1		- some gravel to gravelly, rounded gravel to 50 mm diameter				279
		- no visible gravel	Frozen Nbn			
2					8.1	278
3						277
4		END OF TESTPIT (4.0 metres) Note: Stopped due to hard digging in permafrost			14	276
5						275
6						274
7						273
7.5						

Issued for Review



Contractor: TLICHO

Completion Depth: 4 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-17

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 281 m

2017 Summer Geotechnical Investigation

UTM: 495666 E; 7005868 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						281
1	Excavated	SAND - some silt, dry, brown, (300 mm thick)	Unfrozen		3.8	280
		GRAVEL AND SAND - to gravelly, trace silt, well graded, damp, brown, fine to coarse sand, fine gravel to 25 mm diameter - (Gravel - 71%; Sand - 26%; Silt - 3%)				
1		SAND - trace silt, damp, grey, fine sand				
2		END OF TESTPIT (1.8 metres) Note: Stopped due to hard digging in permafrost	Frozen, Nbn			279
3						278
4						277
5						276
6						275
7						274
7.5						

Issued for Review



Contractor: TLICHO

Completion Depth: 1.8 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-18

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 282 m

2017 Summer Geotechnical Investigation

UTM: 495830 E; 7005314 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
0						282
0 - 1	Excavated	SAND - silty, rootlets, dry, brown	Unfrozen			
1 - 2		SAND - some gravel, trace silt, well graded, damp, brown to grey, fine to coarse sand				
2 - 3		<ul style="list-style-type: none"> - gravelly, rounded gravel to 75 mm diameter - grey - field estimate: 15% greater than 20 mm diameter - moist - occasional to trace cobbles to 150 mm diameter 				
3 - 4		<ul style="list-style-type: none"> - trace gravel - seepage 				
4		END OF TESTPIT (3.8 metres) slough - 0.5 metres at 0 hrs. water - 3.4 metres at 0 hrs.			26.8	278
5						277
6						276
7						275
7.5						

Issued for Review



Contractor: TLICHO

Completion Depth: 3.8 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-19

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 281 m

2017 Summer Geotechnical Investigation

UTM: 495882 E; 7005176 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0	Excavated	SAND - trace to some silt, rootlets, dry, brown	Unfrozen		281
1		SAND = some gravel to gravelly, trace silt, well graded, dry to damp, brown to grey, fine to coarse sand, fine rounded gravel - trace gravel - damp, grey	Frozen		280
2					279
3		- water seepage	Unfrozen		278
4		END OF TESTPIT (3.8 metres) slough - 0.3 metres at 0 hrs. water - 3.6 metres at 0 hrs.			277
5					276
6					275
7					274
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 3.8 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

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Testpit No: P116-20

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 277 m

2017 Summer Geotechnical Investigation

UTM: 495797 E; 7005881 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
				Plastic Limit Moisture Content Liquid Limit 20 40 60 80	
0	Excavated	SAND - some silt, rootlets, dry, brown	Unfrozen		277
		SAND - some gravel, trace silt, well graded, damp, grey - gravelly			
1		SAND AND GRAVEL - subrounded gravel to 75 mm diameter - trace cobbles to 200 mm diameter			
2		SAND - some gravel to gravelly, trace silt, well graded, damp, grey - trace gravel	Frozen Nbn		275
3		- some gravel to 20 mm diameter, water	Unfrozen		274
4		END OF TESTPIT (3.5 metres) water - 3.4 metres at 0 hrs. Note: Stopped due to hard digging in permafrost			273
5					272
6					271
7					270
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 3.5 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

Page 1 of 1



Testpit No: P116-21

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 282 m

2017 Summer Geotechnical Investigation

UTM: 494448 E; 7004857 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Sample Type	Moisture Content (%)	Elevation (m)
					Plastic Limit Moisture Content Liquid Limit 20 40 60 80	
0	Excavated	SAND AND SILT - rootlets, dry, brown, (200 mm thick)	Unfrozen			282
		SAND - some silt, damp, brown				
1		- trace silt, trace gravel, well graded, damp, rounded gravel				281
2		- moist	Frozen Nbn			280
3				16.5	279	
4		END OF TESTPIT (3.2 metres) Note: Stopped due to hard digging in permafrost				278
5						277
6						276
7						275
7.5						

Issued for Review



Contractor: TLICHO

Completion Depth: 3.2 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

Page 1 of 1



Testpit No: P116-22

Project: TASR Granular & Bedrock Sources

Project No: ENG.YARC03107-01

Location: Prospect 116

Ground Elev: 281 m

2017 Summer Geotechnical Investigation

UTM: 495719 E; 7005282 N; Z 11

Depth (m)	Method	Soil Description	Ground Ice Description	Moisture Content (%)	Elevation (m)
0		SAND - trace to some silt, dry, brown	Unfrozen		281
1	Excavated	SAND - some gravel, trace silt, well graded, dry to damp, brown to grey, fine to coarse sand, fine gravel - 800 mm boulder - 400 mm boulder			280
2		SAND - trace gravel, damp, grey, fine sand	Frozen Nbn		279
3		END OF TESTPIT (3.2 metres) Note: Stopped due to hard digging in permafrost			278
4					277
5					276
6					275
7					274
7.5					

Issued for Review



Contractor: TLICHO

Completion Depth: 3.2 m

Drilling Rig Type: CAT 320D Excavator

Start Date: 2017 July 18

Logged By: THS

Completion Date: 2017 July 18

Reviewed By: EG

Page 1 of 1

APPENDIX C1

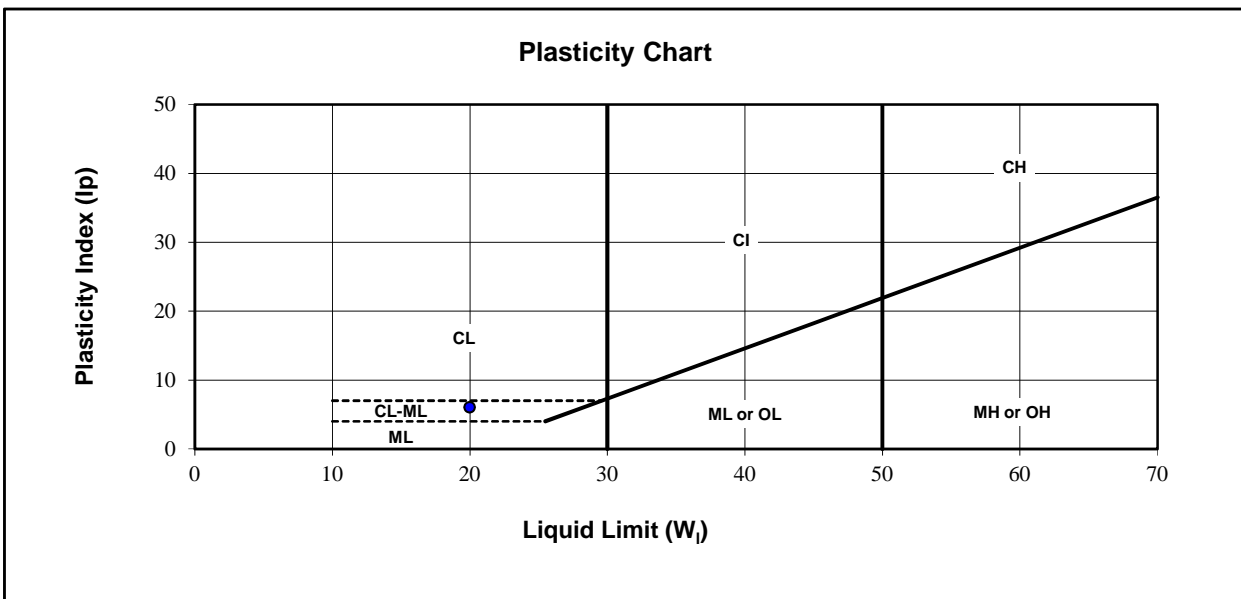
GRANULAR MATERIAL LABORATORY INDEX TESTING

ATTERBERG LIMITS TEST REPORT

ASTM D4318

Project: <u>TASR Geotechnical Investigation</u> Project No: <u>YARC03107-01</u> Client: <u>GNWT-INF</u> Attention: _____ Email: _____	Sample Number: <u>6527</u> Sample Location: <u>P76-05</u> Depth: <u>2.0 - 2.5 m</u> Sampled By: <u>TS</u> Tested By: <u>JPC</u> Date Sampled: _____ Date Tested: <u>August 18, 2017</u>
---	--

Sample Description: _____



Liquid Limit (W ₁) :	<u>20</u>	Natural Moisture (%)	<u>14.6</u>
Plastic Limit :	<u>14</u>	Soil Plasticity:	<u>Low</u>
Plasticity Index (Ip) :	<u>6</u>	Mod.USCS Symbol:	<u>CL-ML</u>

Remarks: _____

Reviewed By: _____ ASc.T.

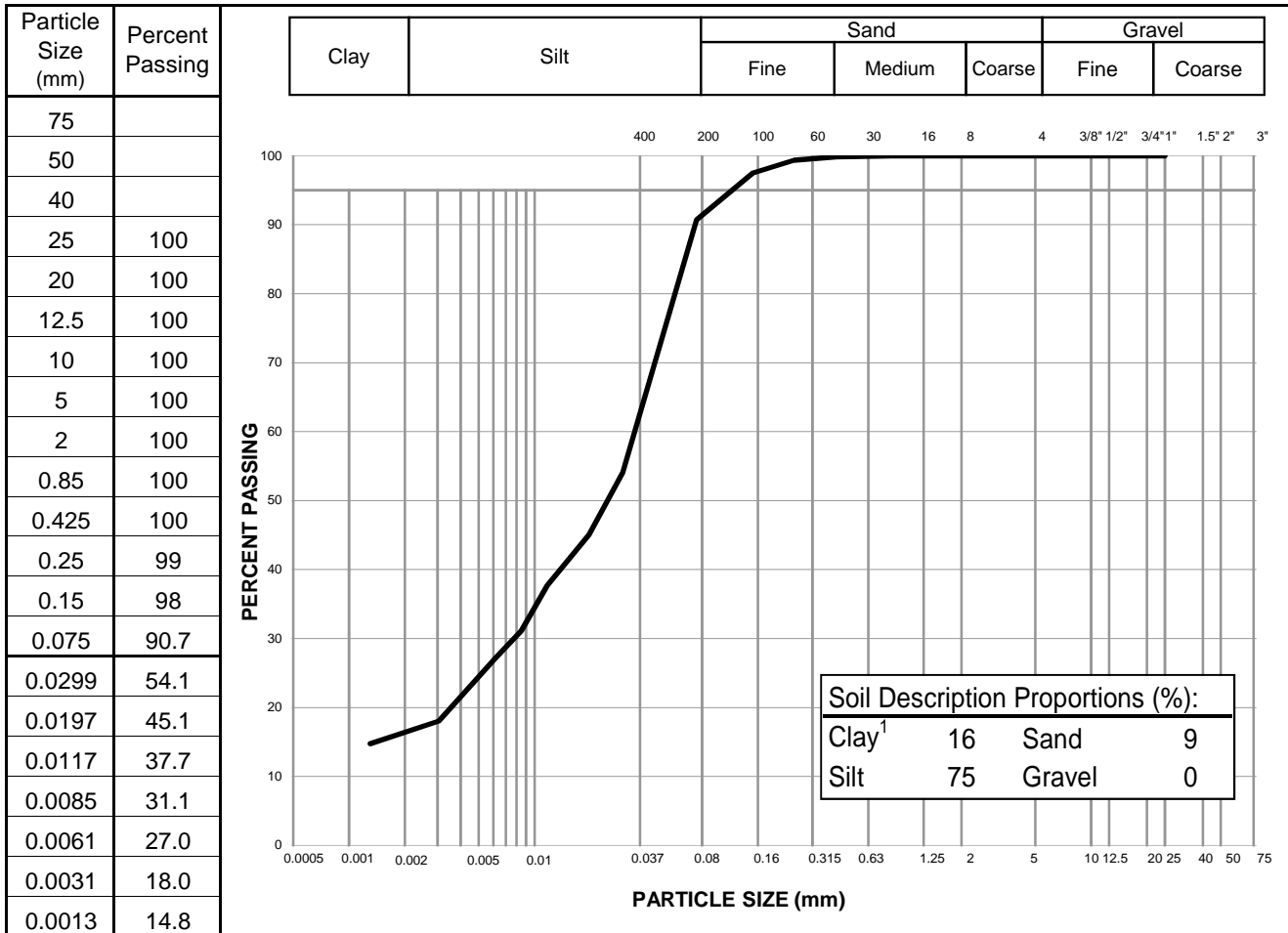
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PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	TASR Geotechnical Investigation	Sample No.:	6527
Project No.:	YARC03107-01	Material Type:	
Site:		Sample Loc.:	P76-05
Client:	GNWT-INF	Sample Depth:	2.0 - 2.5 m
Client Rep.:		Sampling Method:	
Date Tested:	August 16, 2017	By:	JRC
Soil Description ² :	SILT, some clay, trace sand	Date sampled:	
		Sampled By:	TS
		USC Classification:	ML Cu: #N/A
Moisture Content:	14.7%		Cc: #N/A



Notes: ¹ The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
² The description is visually based & subject to Tetra Tech description protocols

Specification: _____

Remarks: _____

Reviewed By: _____ P.Eng.

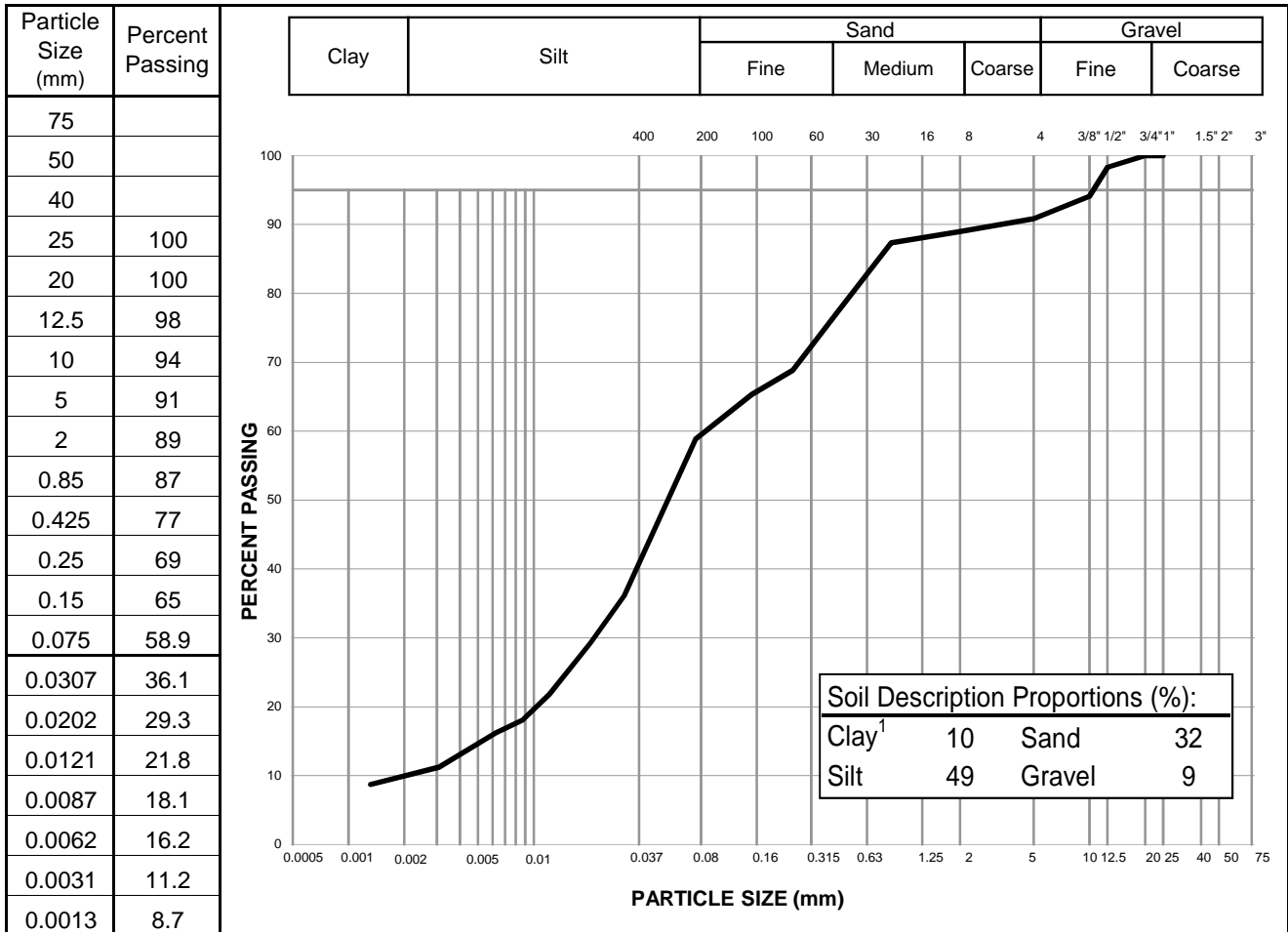
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PARTICLE SIZE ANALYSIS REPORT

ASTM D422, C136 & C117

Project:	TASR Geotechnical Investigation	Sample No.:	6527
Project No.:	YARC03107-01	Material Type:	
Site:		Sample Loc.:	P76-06
Client:	GNWT-INF	Sample Depth:	0.6-1.0 m
Client Rep.:		Sampling Method:	
Date Tested:	August 16, 2017	By:	JRC
Date Tested:		Date sampled:	
Soil Description ² :	SILT, sandy, some clay, trace gravel	Sampled By:	TS
		USC Classification:	ML Cu: 39.6
Moisture Content:	8.0%		Cc: 2.3



Notes: ¹ The upper clay size of 2 um, per the Canadian Foundation Engineering Manual
² The description is visually based & subject to Tetra Tech description protocols

Specification: _____

Remarks: _____

Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P1-02

Depth: 2.0-2.4 m

Soil Description: SAND and GRAVEL, some fines

Cu: 13.1

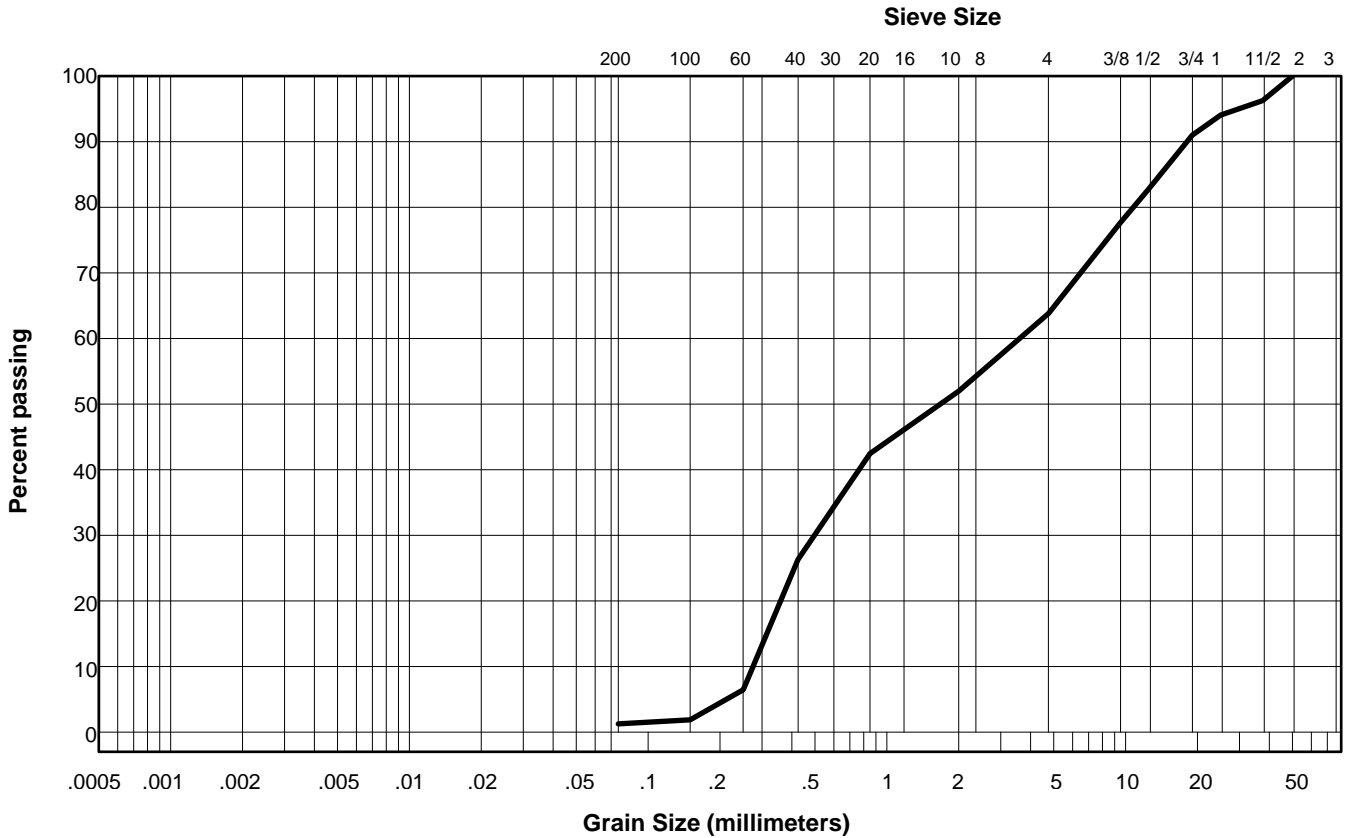
Cc: 0.3

Natural Moisture Content: 9.3%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	100
37.500	96
25.000	94
19.000	91
12.500	83
9.500	78
4.750	64
2.000	52
0.850	42
0.425	26
0.250	6
0.150	2
0.075	1.3

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tong Yabayan* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P1-05

Depth: 0.5-0.6 m

Soil Description: SAND, trace fines

Cu: 2.2

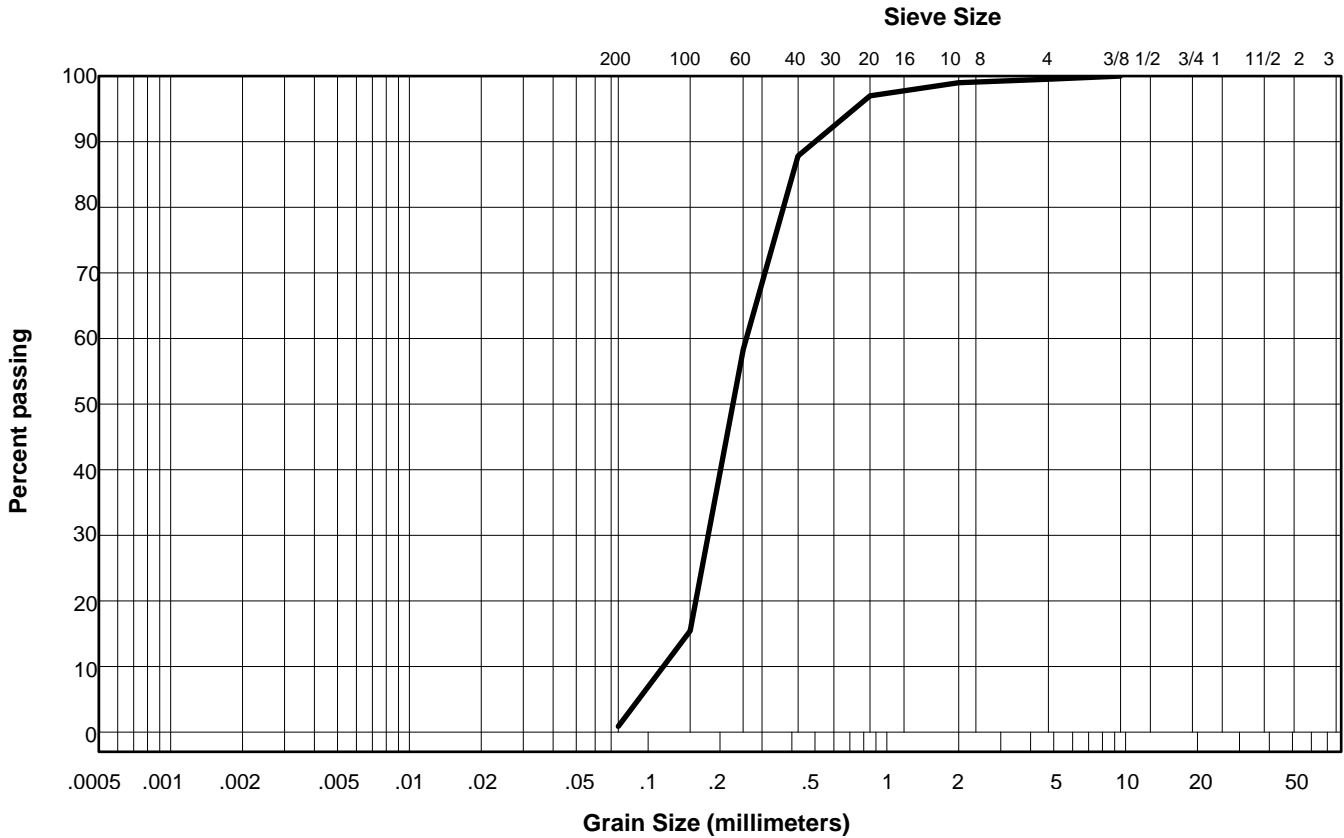
Cc: 1.1

Natural Moisture Content: 2.4%

Remarks: _____

Sieve Size (mm)	Percent Passing
9.500	100
4.750	100
2.000	99
0.850	97
0.425	88
0.250	58
0.150	15
0.075	0.9

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Fong Mokayom* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P1-06

Depth: 2.0-3.0 m

Soil Description: SAND, trace fines, trace gravel

Cu: 2.1

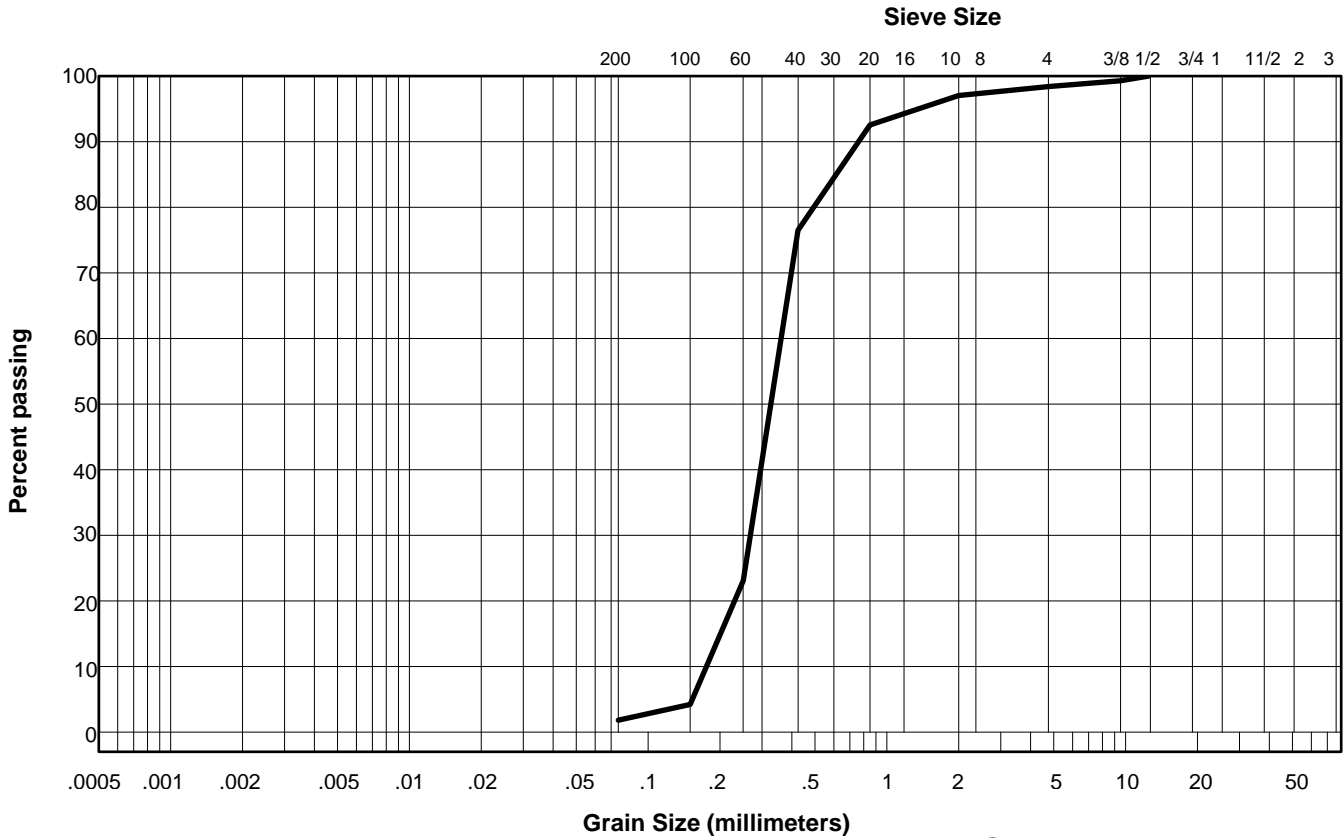
Cc: 1.1

Natural Moisture Content: 11.5%

Remarks: _____

Sieve Size (mm)	Percent Passing
12.500	100
9.500	99
4.750	98
2.000	97
0.850	93
0.425	77
0.250	23
0.150	4
0.075	1.8

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Jong Mokyan* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P1-18

Depth: 3.0-3.5 m

Soil Description: SAND, trace gravel, trace fines

Cu: 2.4

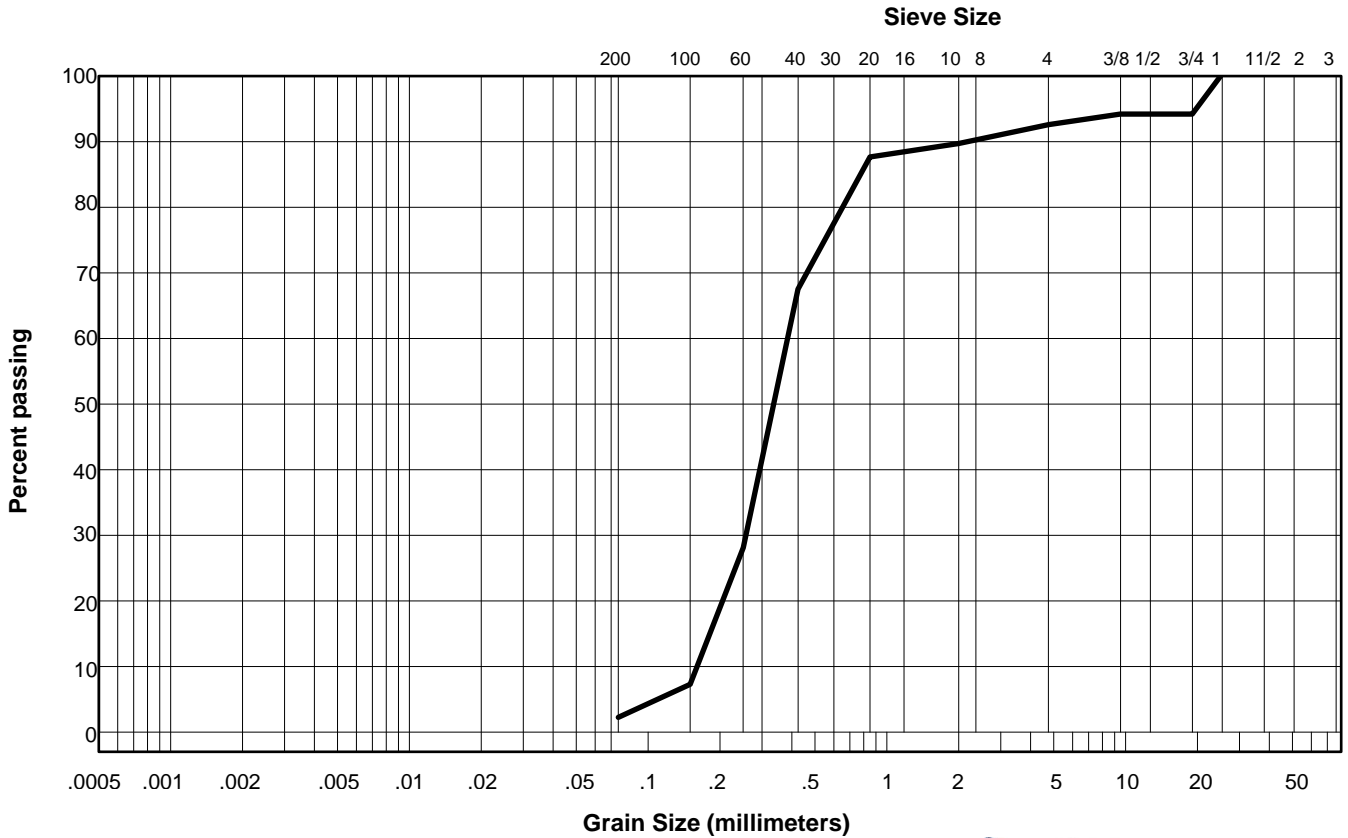
Cc: 1.1

Natural Moisture Content: 4.3%

Remarks: _____

Sieve Size (mm)	Percent Passing
25.000	100
19.000	94
12.500	94
9.500	94
4.750	93
2.000	90
0.850	88
0.425	68
0.250	28
0.150	7
0.075	2.3

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Jong Yohann* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P13B-06.1

Depth: 0.8-1.0 m

Soil Description: SAND

Cu: 2.0

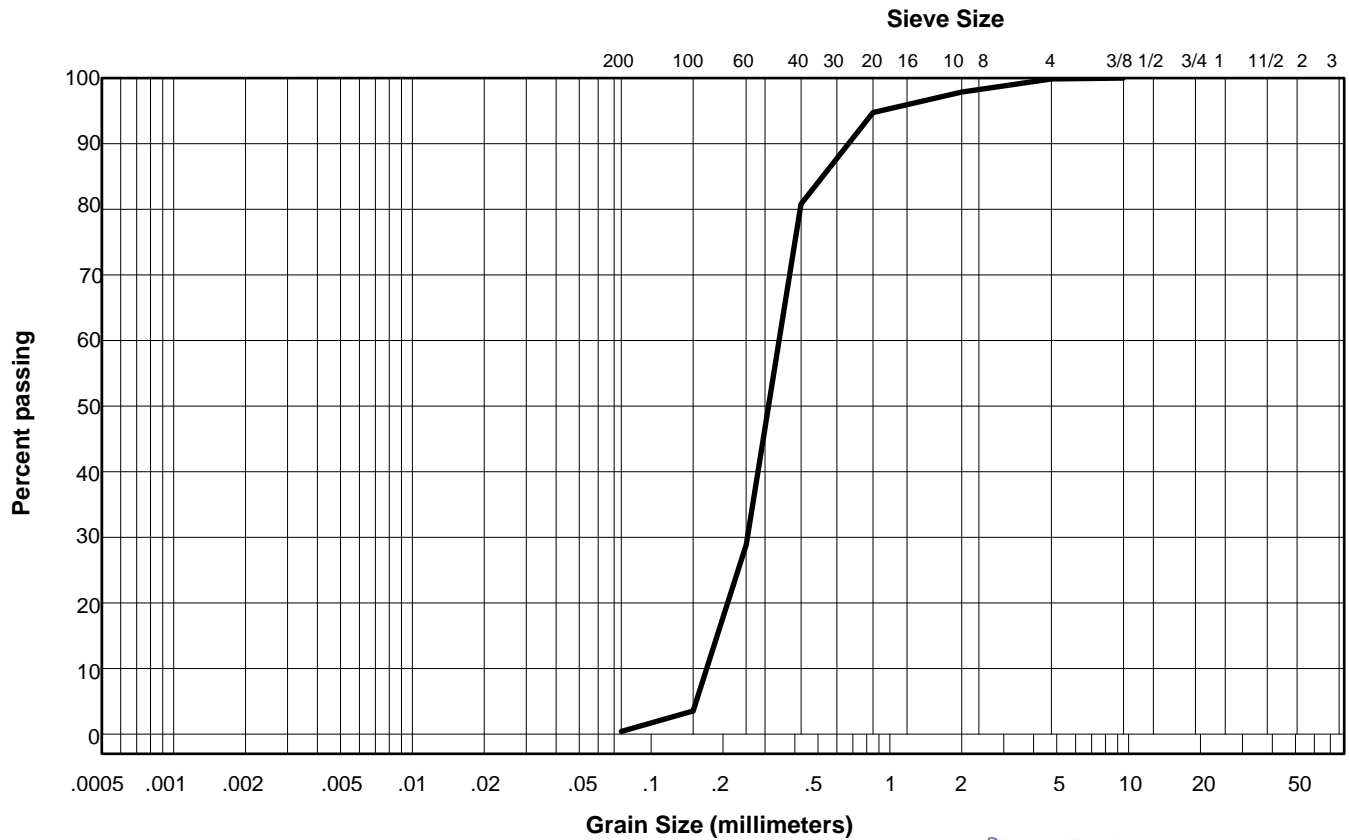
Cc: 1.1

Natural Moisture Content: 1.8%

Remarks: _____

Sieve Size (mm)	Percent Passing
9.500	100
4.750	100
2.000	98
0.850	95
0.425	81
0.250	29
0.150	4
0.075	0.4

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tong Yohannan* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P13B-07.1

Depth: 0.9-1.1 m

Soil Description: SAND, trace gravel, trace fines

Cu: 1.8

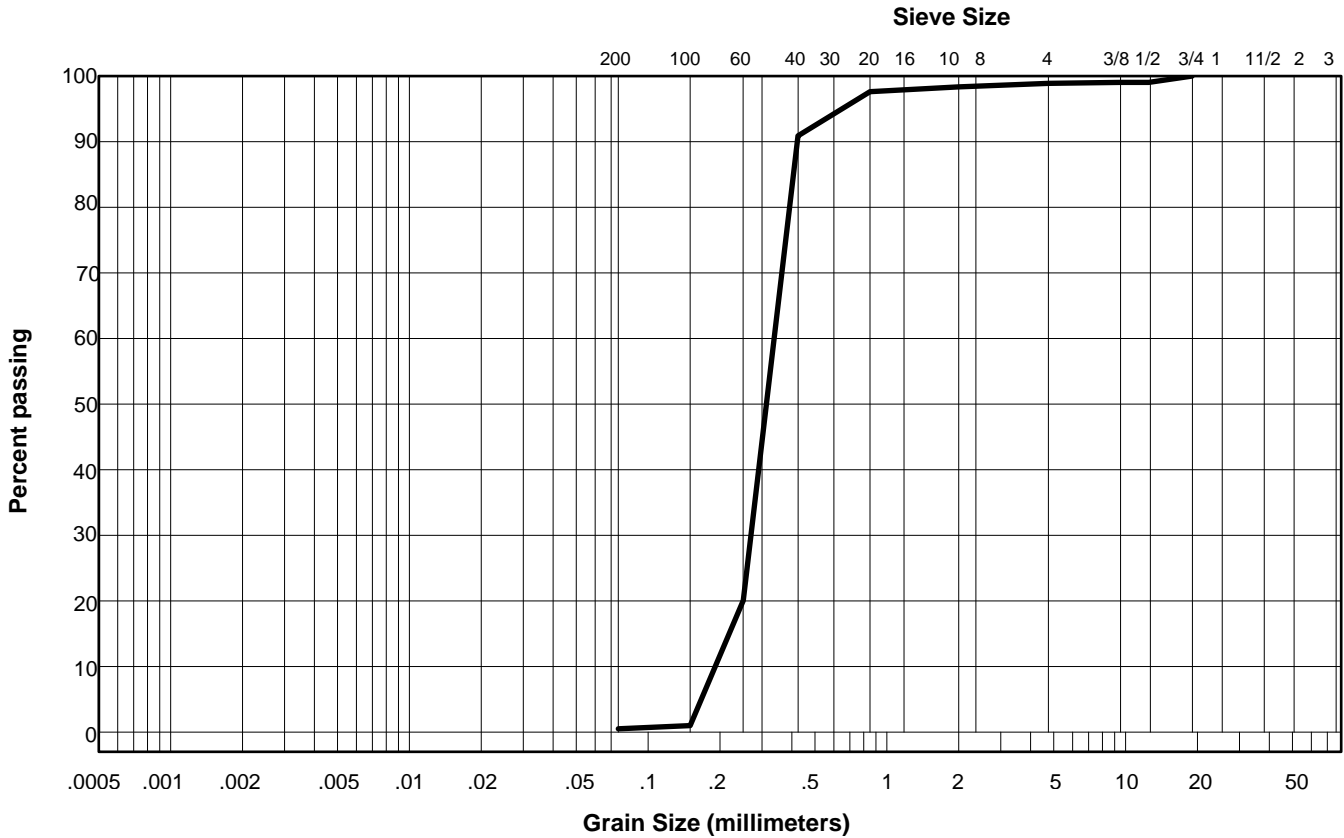
Cc: 1.1

Natural Moisture Content: 2.3%

Remarks: _____

Sieve Size (mm)	Percent Passing
19.000	100
12.500	99
9.500	99
4.750	99
2.000	98
0.850	98
0.425	91
0.250	20
0.150	1
0.075	0.5

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tong Yoban* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P13B-09.2

Depth: 3.7-3.9 m

Soil Description: FINES, some sand

Cu: _____

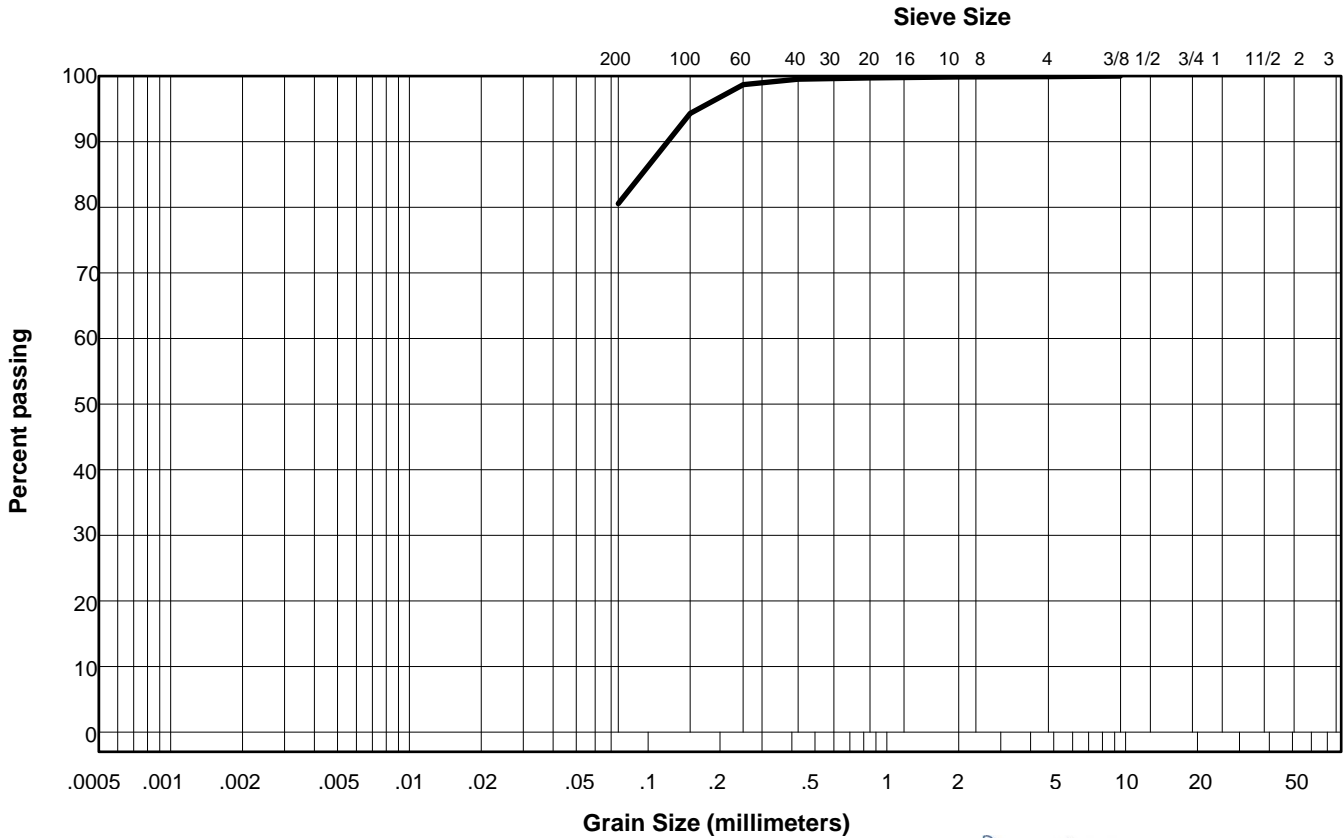
Cc: _____

Natural Moisture Content: 19.0%

Remarks: _____

Sieve Size (mm)	Percent Passing
9.500	100
4.750	100
2.000	100
0.850	100
0.425	100
0.250	99
0.150	94
0.075	80.6

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tony Yohanna* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P13C-01

Depth: 2.5-3.5 m

Soil Description: SAND, trace fines

Cu: 2.3

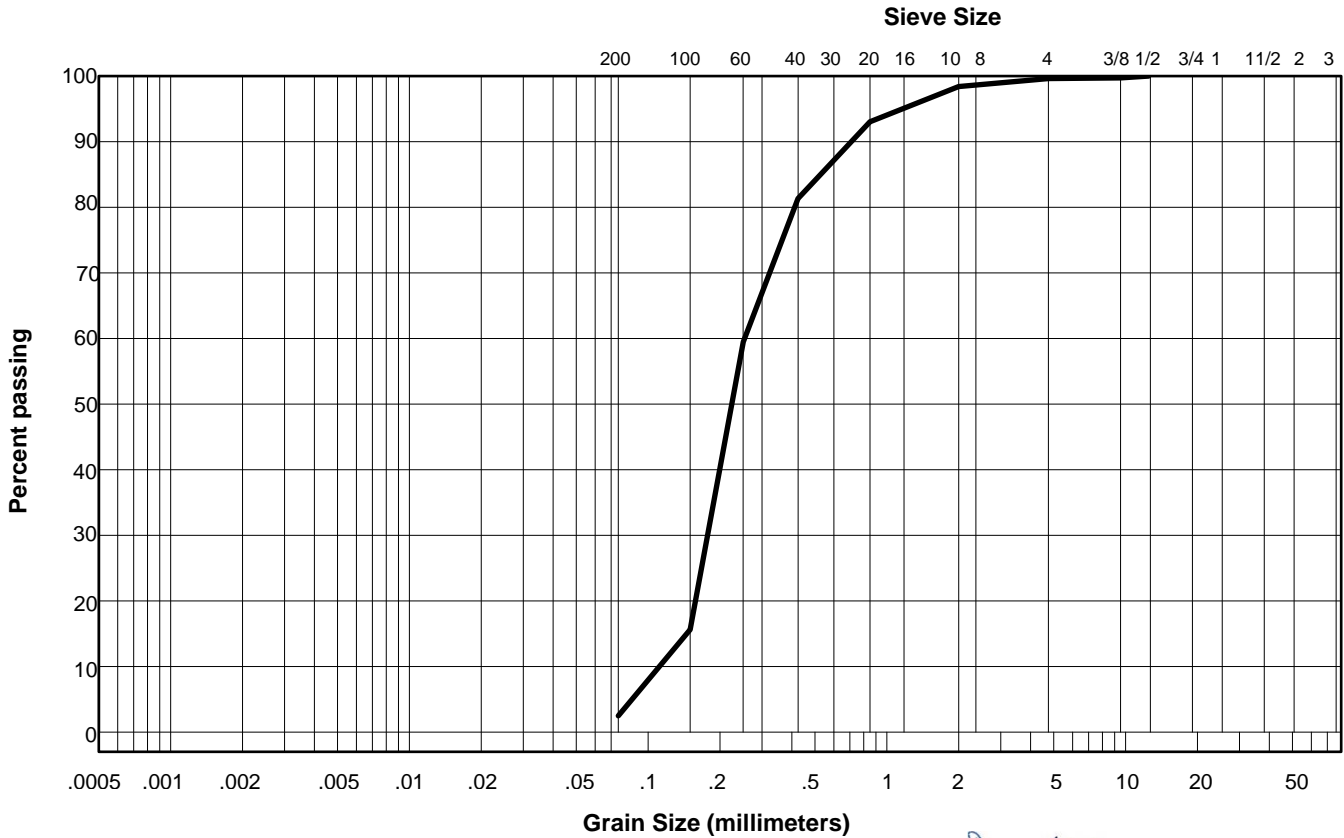
Cc: 1.1

Natural Moisture Content: 4.6%

Remarks: _____

Sieve Size (mm)	Percent Passing
12.500	100
9.500	100
4.750	100
2.000	98
0.850	93
0.425	81
0.250	59
0.150	16
0.075	2.5

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tong M. Yeh* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P69-03

Depth: 0.1-0.2

Soil Description: GRAVEL, trace fines, trace sand

Cu: 2.5

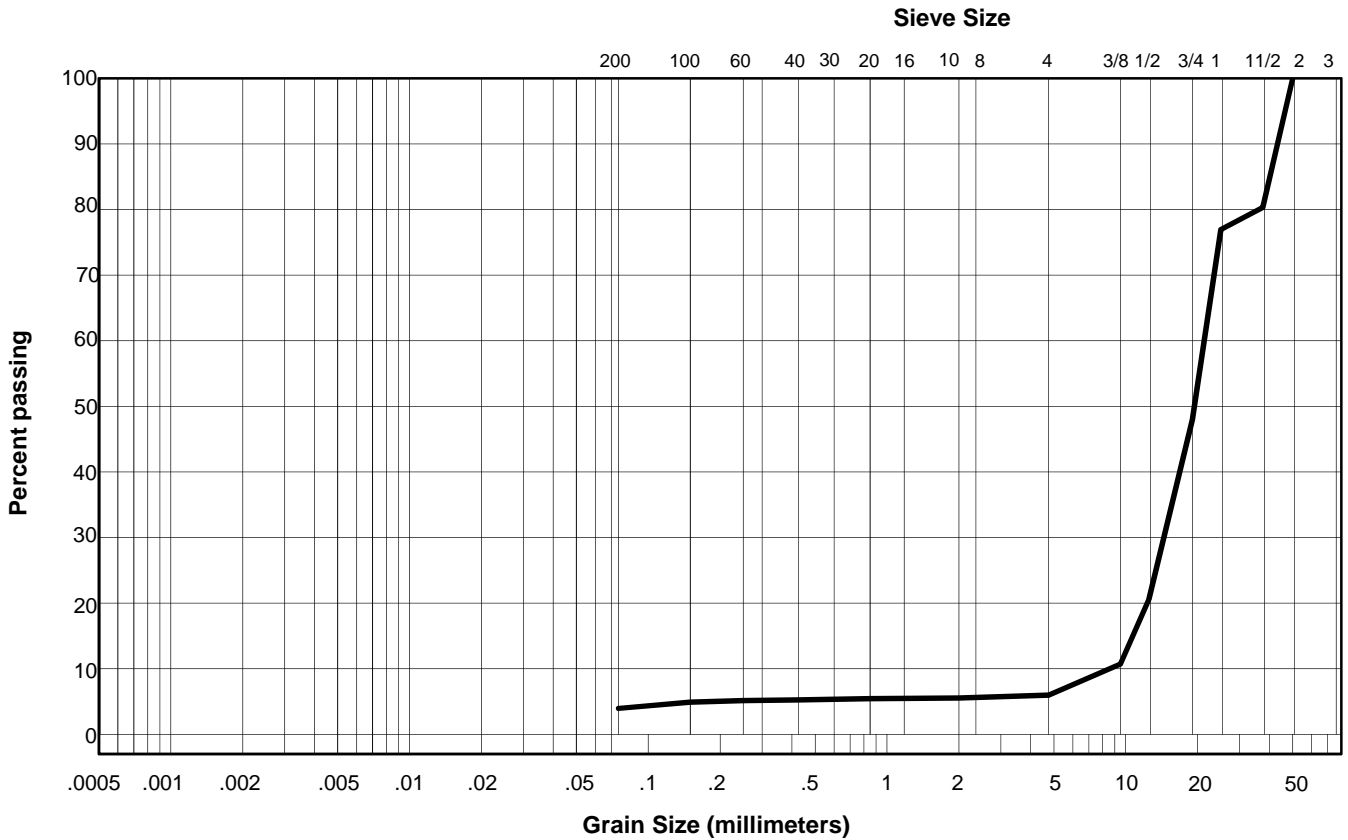
Cc: 1.1

Natural Moisture Content: 0.9%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	100
37.500	80
25.000	77
19.000	48
12.500	21
9.500	11
4.750	6
2.000	6
0.850	5
0.425	5
0.250	5
0.150	5
0.075	3.9

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P69-04

Depth: 0.0-0.2

Soil Description: GRAVEL, some sand, trace fines

Cu: 339.6

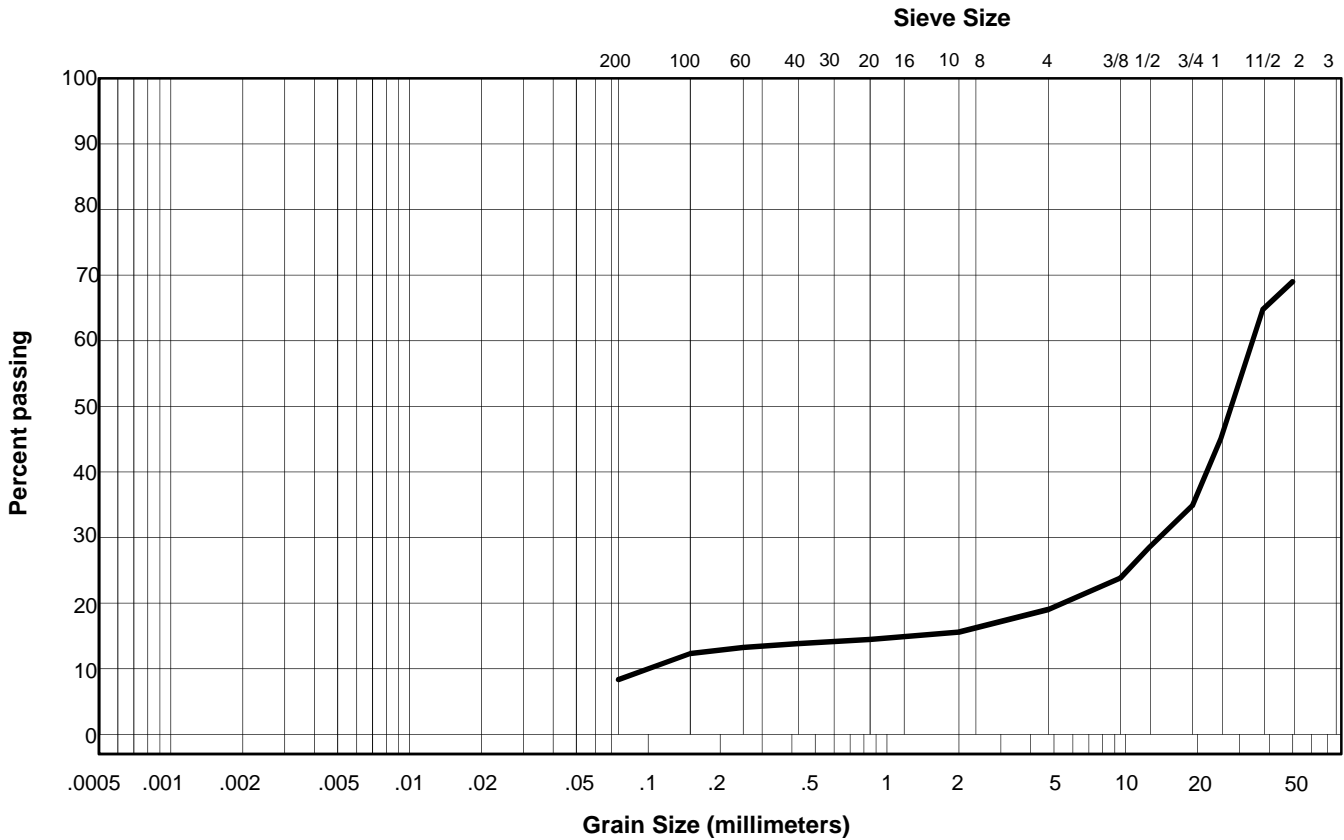
Cc: 56.5

Natural Moisture Content: 2.3%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	69
37.500	65
25.000	45
19.000	35
12.500	28
9.500	24
4.750	19
2.000	16
0.850	14
0.425	14
0.250	13
0.150	12
0.075	8.4

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P69-05

Depth: 0.0-7.2

Soil Description: GRAVEL, trace sand, trace fines

Cu: 289.3

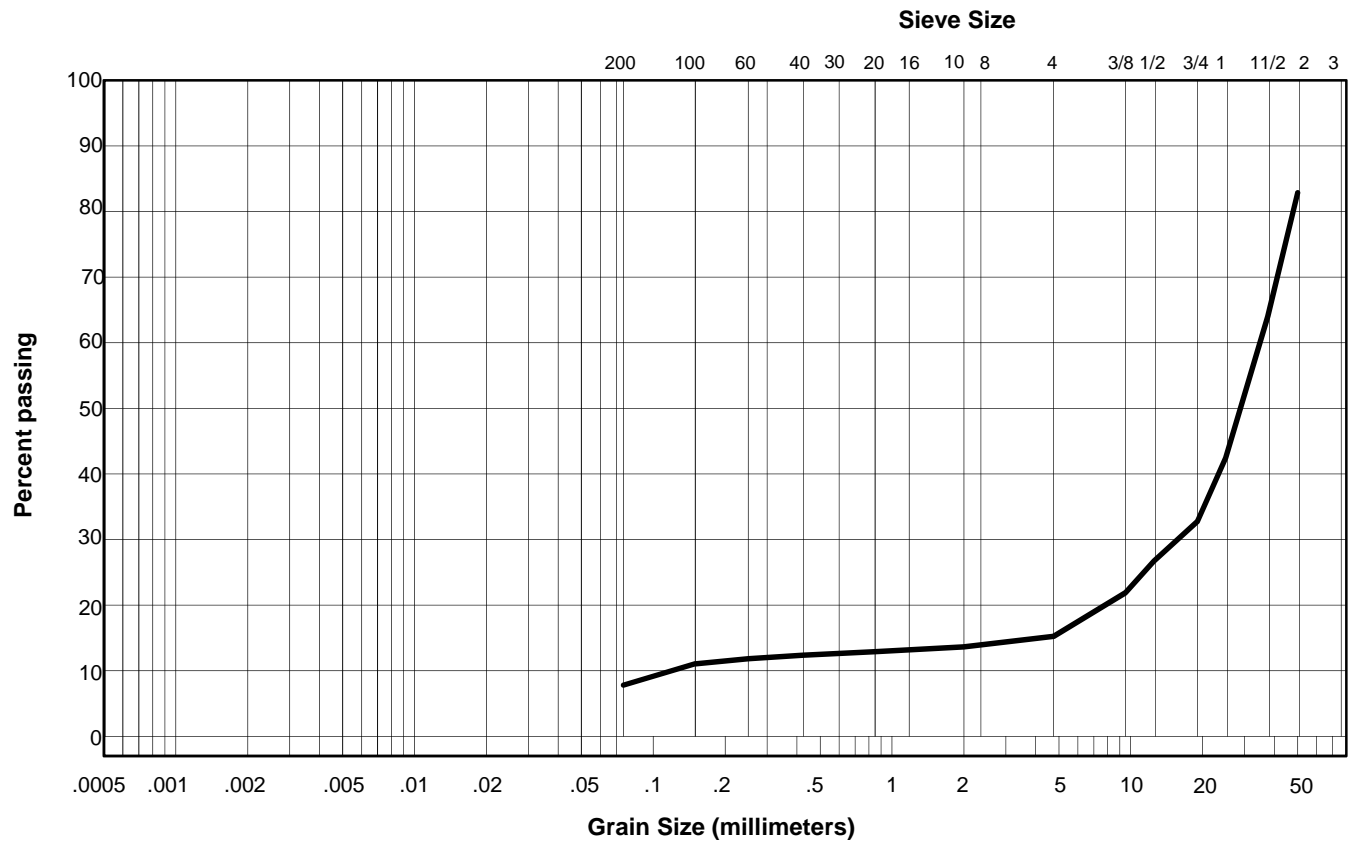
Cc: 59.1

Natural Moisture Content: 2.8%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	83
37.500	64
25.000	42
19.000	33
12.500	27
9.500	22
4.750	15
2.000	14
0.850	13
0.425	12
0.250	12
0.150	11
0.075	7.8

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P76-04

Depth: 0.1-0.4

Soil Description: SAND and FINES

Cu: _____

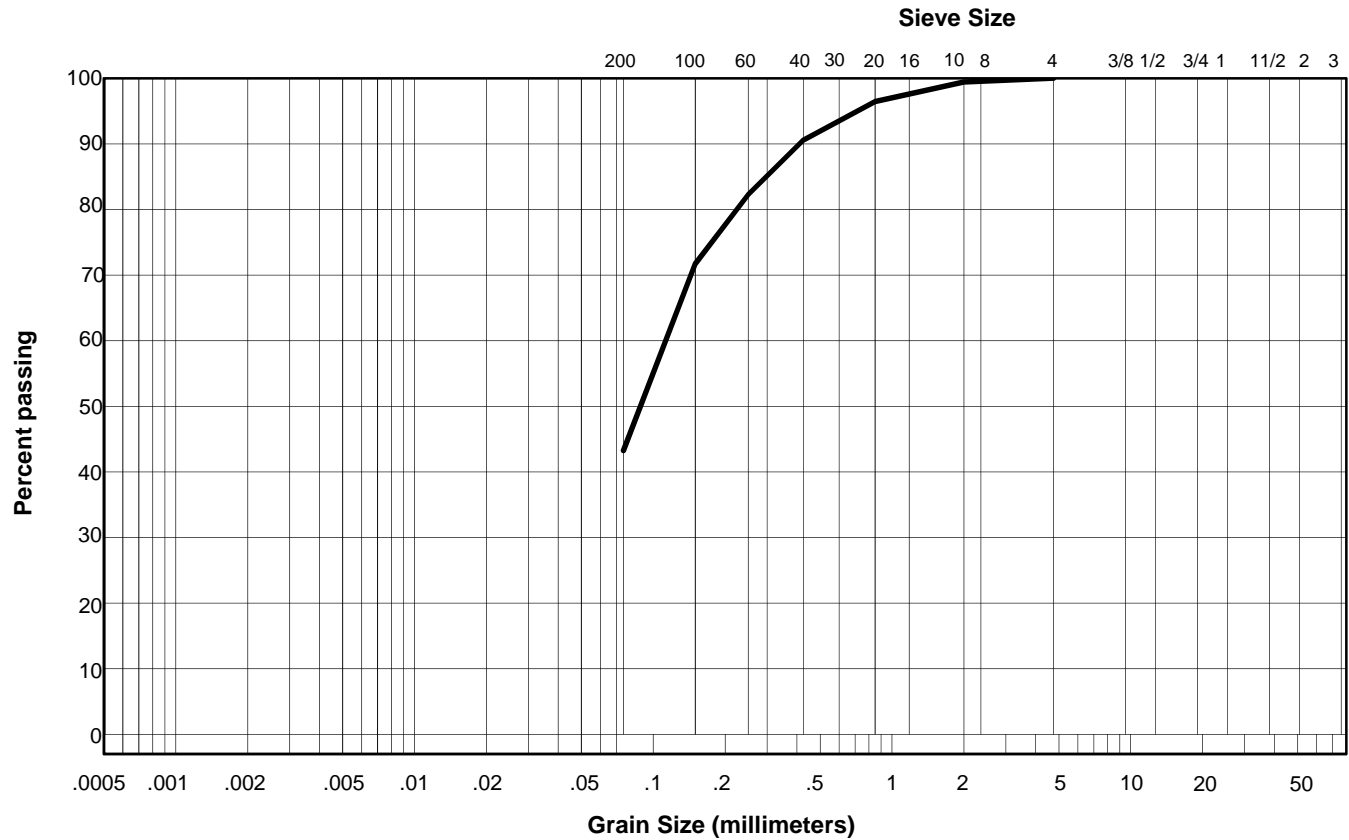
Cc: _____

Natural Moisture Content: 8.1%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	#N/A
37.500	#N/A
25.000	#N/A
19.000	#N/A
12.500	#N/A
9.500	#N/A
4.750	100
2.000	99
0.850	96
0.425	91
0.250	82
0.150	72
0.075	43.2

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P76-05

Depth: 0.3-0.6

Soil Description: FINES, sandy

Cu: _____

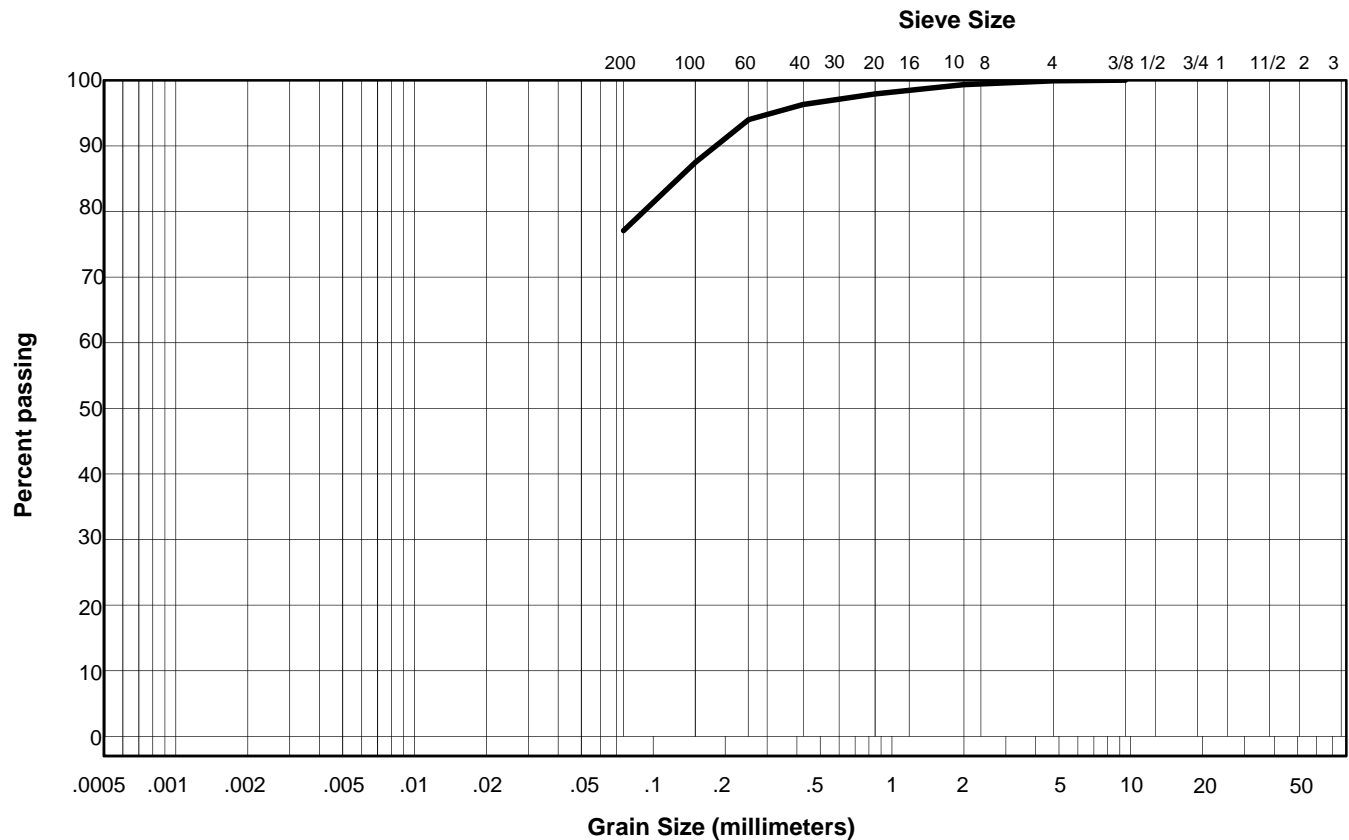
Cc: _____

Natural Moisture Content: 13.4%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	#N/A
37.500	#N/A
25.000	#N/A
19.000	#N/A
12.500	#N/A
9.500	100
4.750	100
2.000	99
0.850	98
0.425	96
0.250	94
0.150	87
0.075	77.1

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P76-07.1

Depth: 0.1-0.4

Soil Description: SAND, some fines, trace gravel

Cu: _____

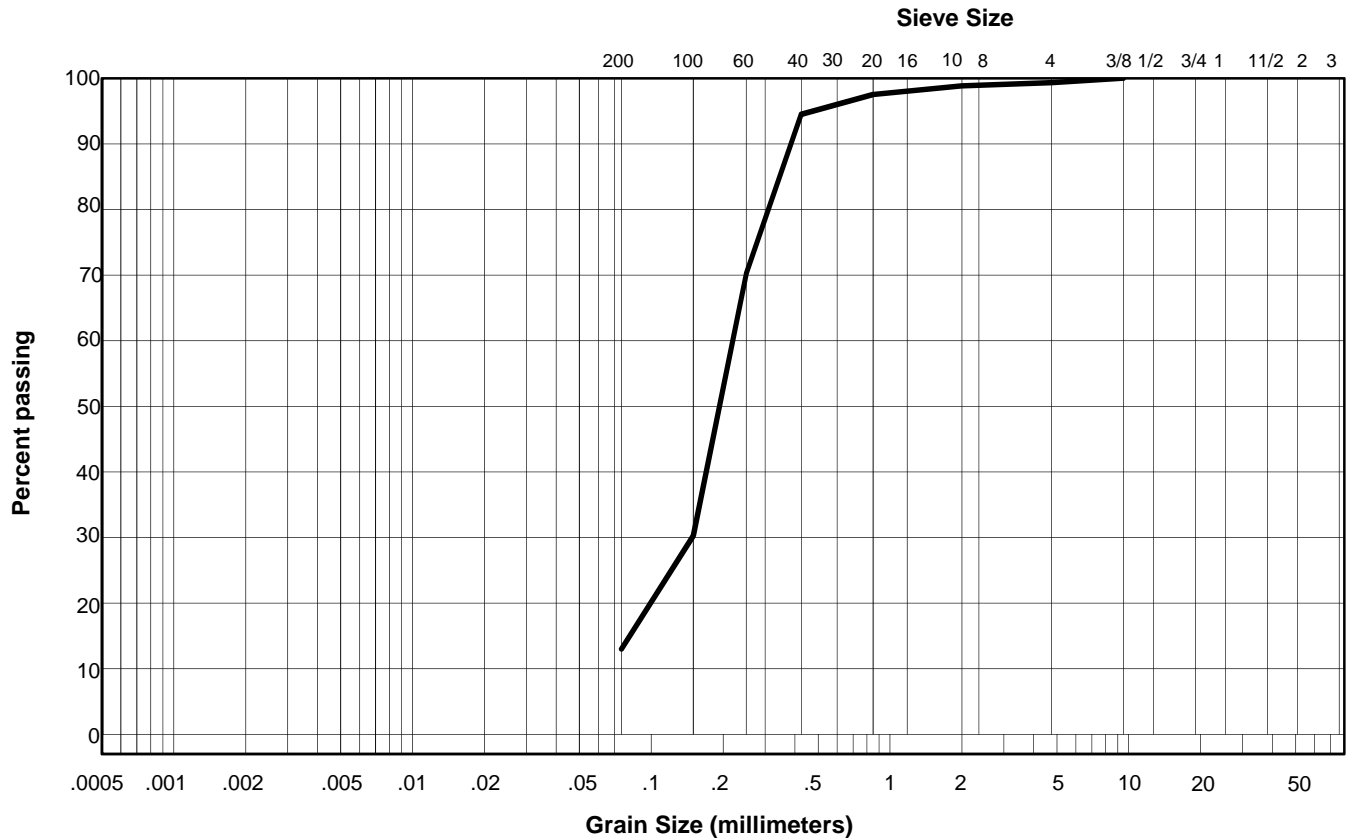
Cc: _____

Natural Moisture Content: 4.4%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	#N/A
37.500	#N/A
25.000	#N/A
19.000	#N/A
12.500	#N/A
9.500	100
4.750	99
2.000	99
0.850	98
0.425	94
0.250	70
0.150	30
0.075	13.0

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P76-07.3

Depth: 1.4-1.5

Soil Description: FINES, sandy, trace gravel

Cu: _____

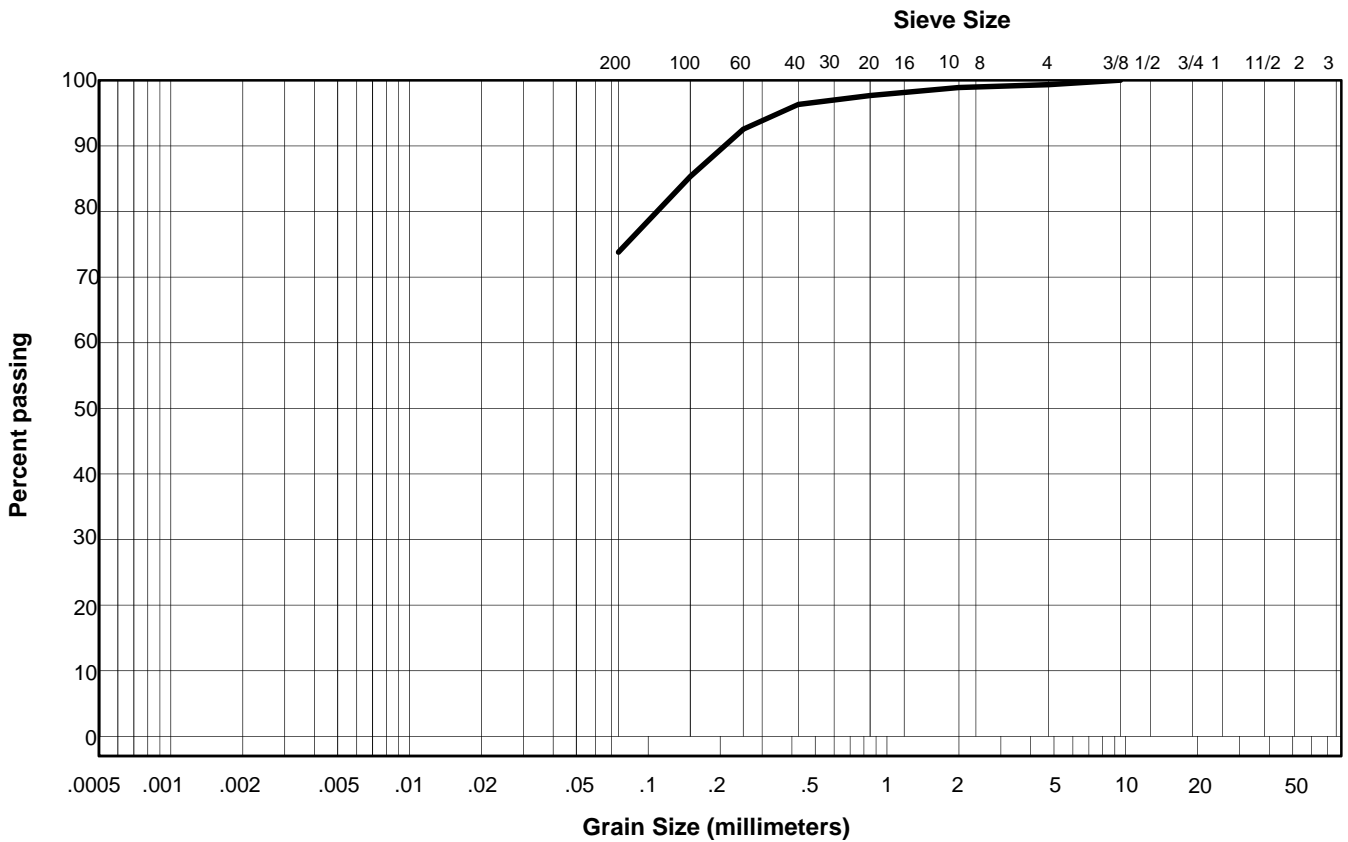
Cc: _____

Natural Moisture Content: 14.4%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	#N/A
37.500	#N/A
25.000	#N/A
19.000	#N/A
12.500	#N/A
9.500	100
4.750	99
2.000	99
0.850	98
0.425	96
0.250	93
0.150	85
0.075	73.8

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P76-08

Depth: 0.0-0.2

Soil Description: FINES, some sand, trace gravel

Cu: _____

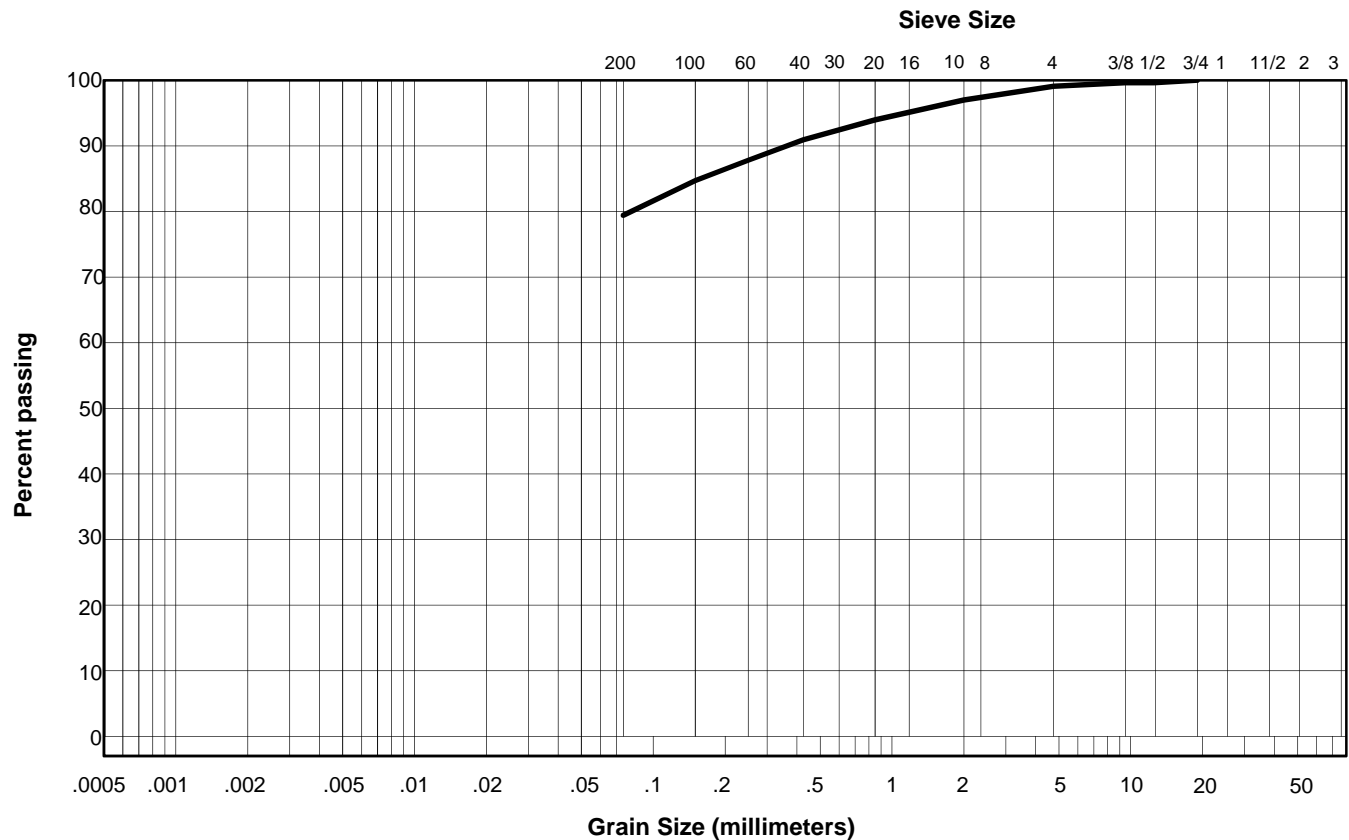
Cc: _____

Natural Moisture Content: 5.2%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	#N/A
37.500	#N/A
25.000	#N/A
19.000	100
12.500	100
9.500	100
4.750	99
2.000	97
0.850	94
0.425	91
0.250	88
0.150	85
0.075	79.4

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P98-01

Depth: 0.0-0.2

Soil Description: GRAVEL, some sand, some fines

Cu: _____

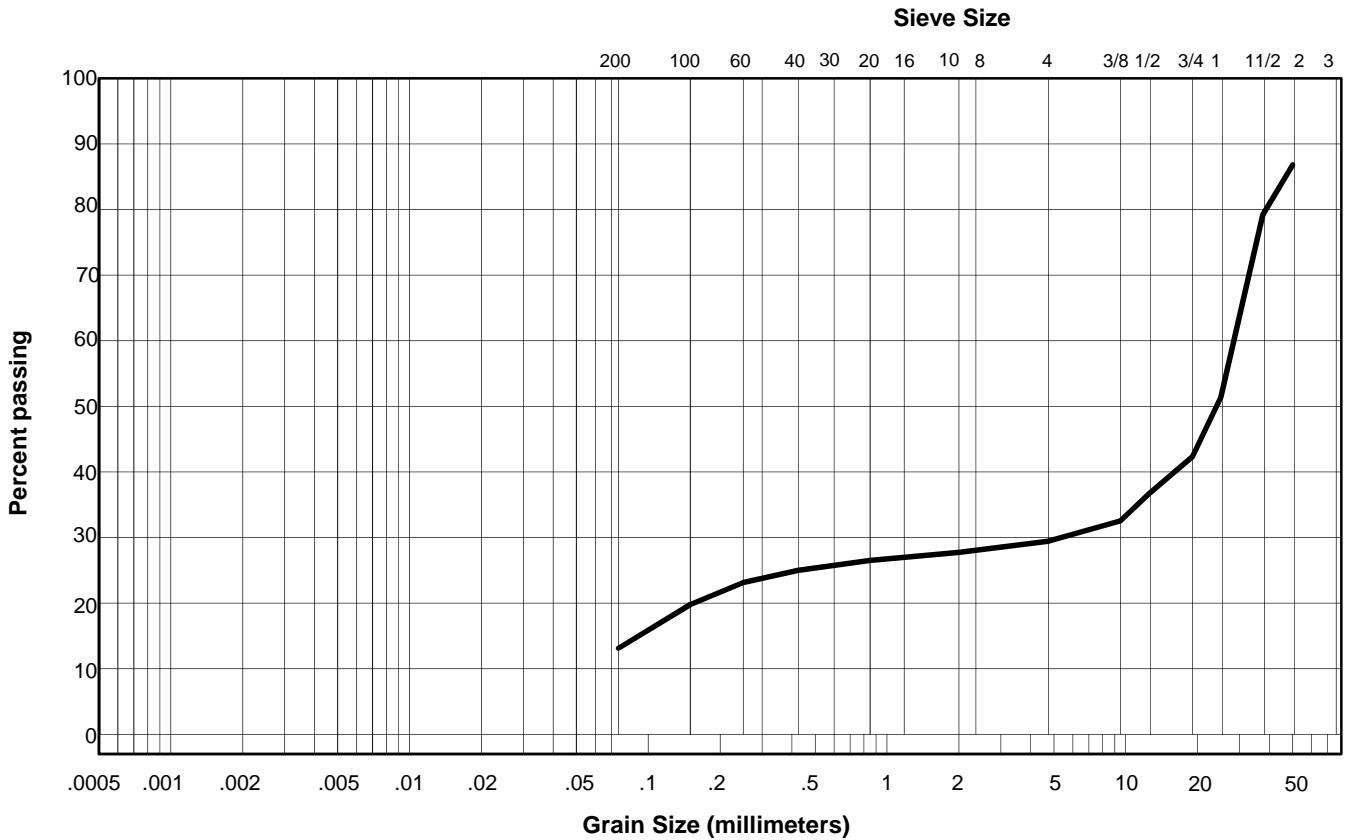
Cc: _____

Natural Moisture Content: 4.4%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	87
37.500	79
25.000	51
19.000	42
12.500	37
9.500	33
4.750	29
2.000	28
0.850	27
0.425	25
0.250	23
0.150	20
0.075	13.1

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TSAR Geotechnical Investigation

Project Number: ENG.YARC03017-01

Date Tested: August 12, 2017

Borehole Number: P98-07

Depth: 0.3-0.6 m

Soil Description: GRAVEL, trace fines, trace sand

Cu: 67.9

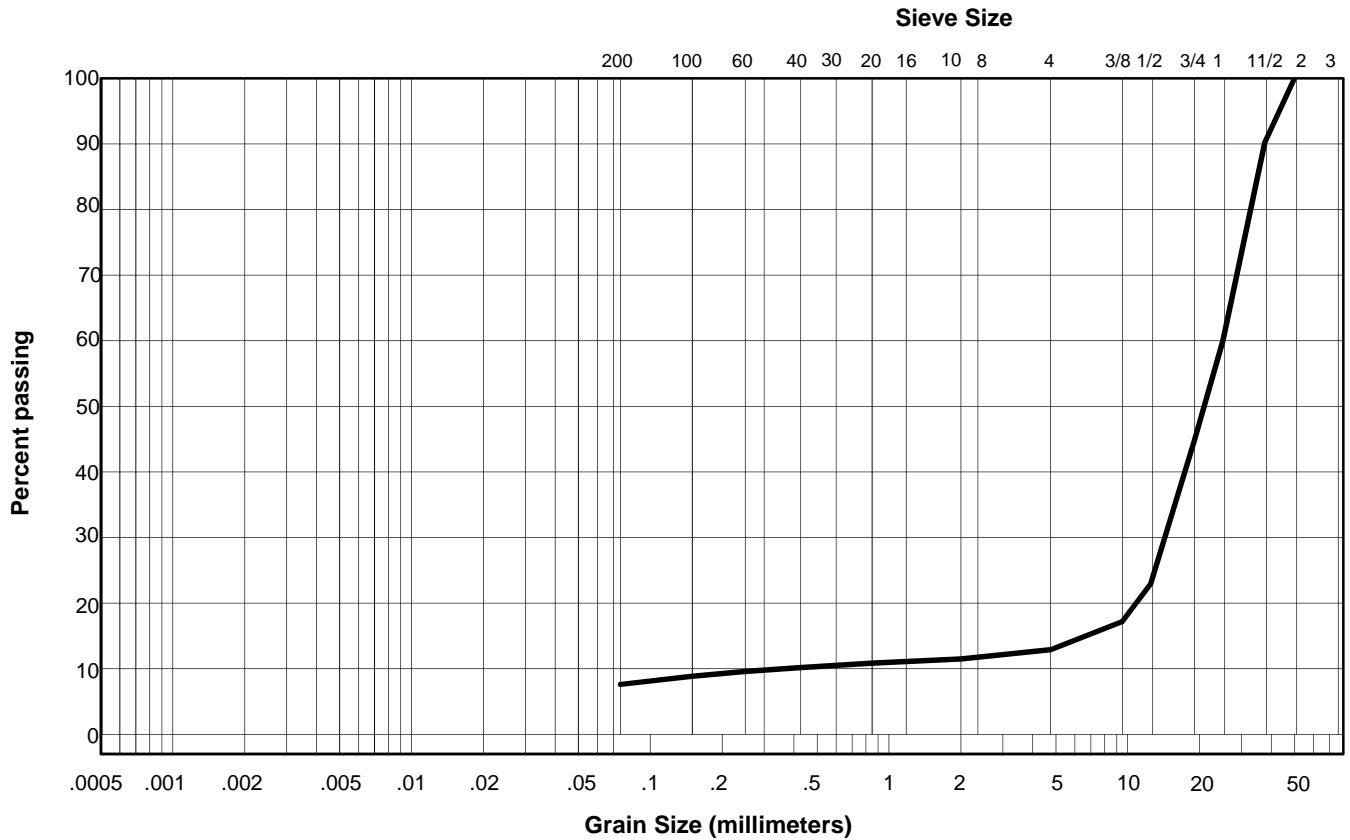
Cc: 22.2

Natural Moisture Content: 1.3%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	100
37.500	90
25.000	60
19.000	45
12.500	23
9.500	17
4.750	13
2.000	11
0.850	11
0.425	10
0.250	10
0.150	9
0.075	7.6

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: _____ P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P116-01

Depth: 2.8-3.3

Soil Description: GRAVEL and SAND, trace fines

Cu: 12.6

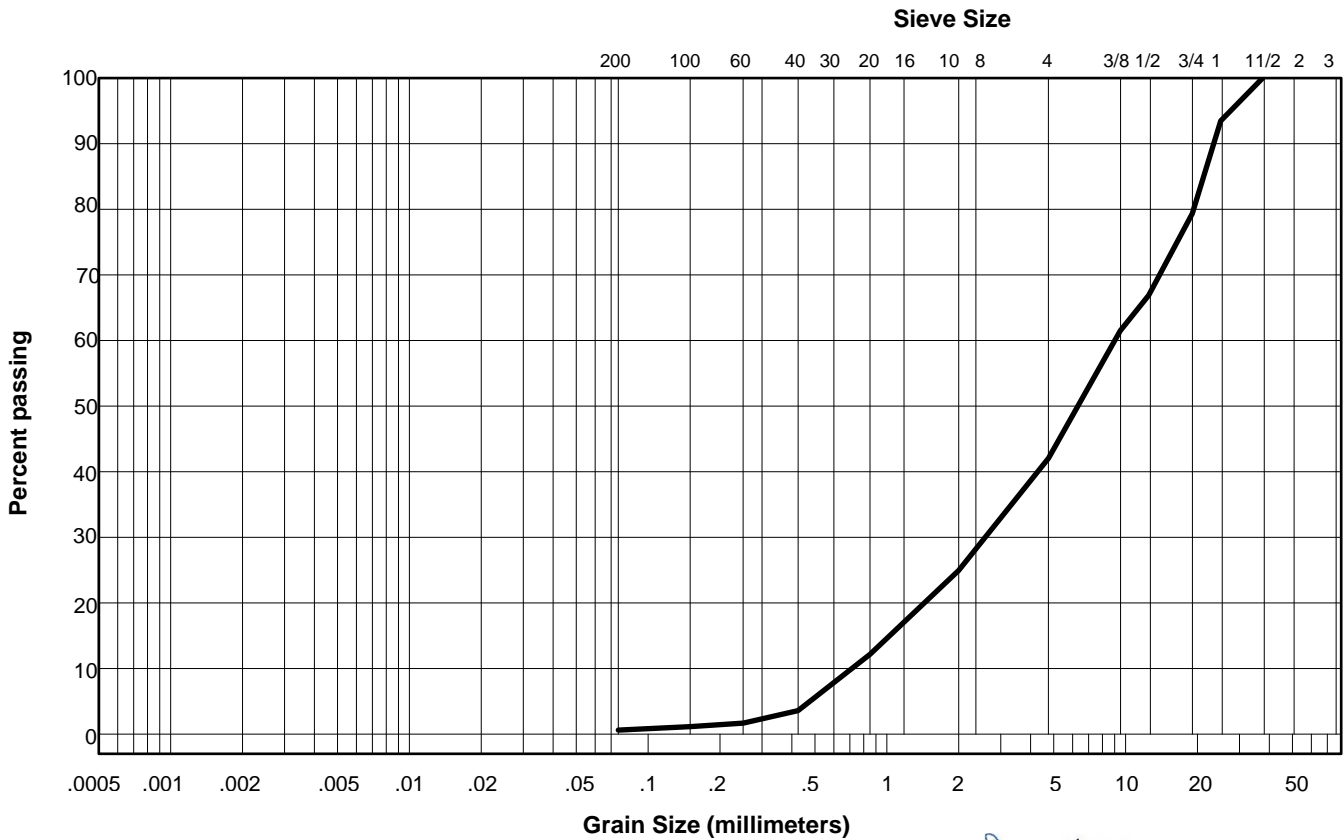
Cc: 1.0

Natural Moisture Content: 4.5%

Remarks: _____

Sieve Size (mm)	Percent Passing
37.500	100
25.000	93
19.000	79
12.500	67
9.500	62
4.750	42
2.000	25
0.850	12
0.425	4
0.250	2
0.150	1
0.075	0.6

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Jong Mahayon* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P116-02

Depth: 3.6-4.0 m

Soil Description: SAND, some fines

Cu: _____

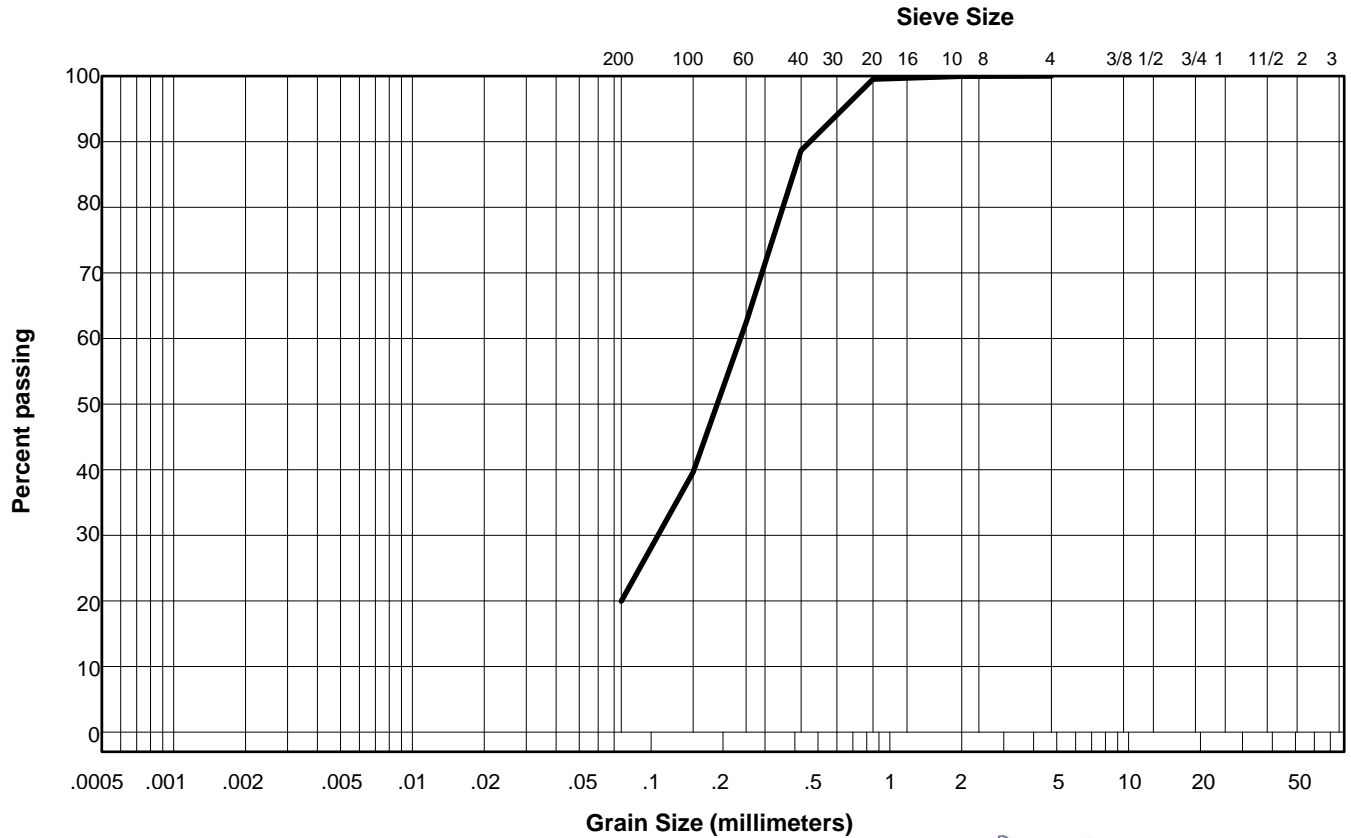
Cc: _____

Natural Moisture Content: 22.0%

Remarks: _____

Sieve Size (mm)	Percent Passing
4.750	100
2.000	100
0.850	100
0.425	89
0.250	63
0.150	40
0.075	20.0

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: Tony Yohann P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P116-05

Depth: 3.0-3.5

Soil Description: SAND and GRAVEL, trace fines

Cu: 14.6

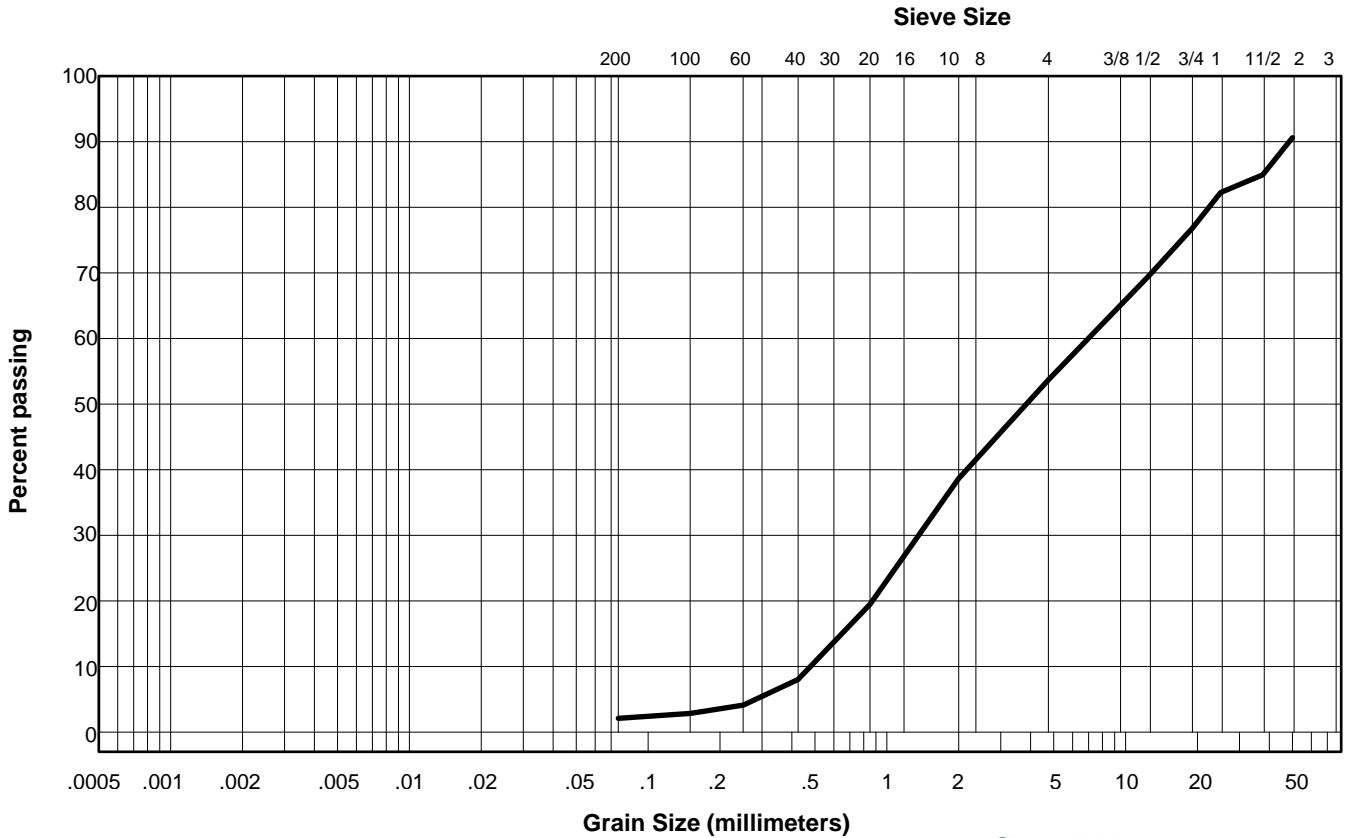
Cc: 0.6

Natural Moisture Content: 4.7%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	91
37.500	85
25.000	82
19.000	77
12.500	70
9.500	65
4.750	54
2.000	39
0.850	20
0.425	8
0.250	4
0.150	3
0.075	2.1

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Jay Yobanan* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P116-10

Depth: 3.0-3.5 m

Soil Description: SAND, silty, trace gravel

Cu: _____

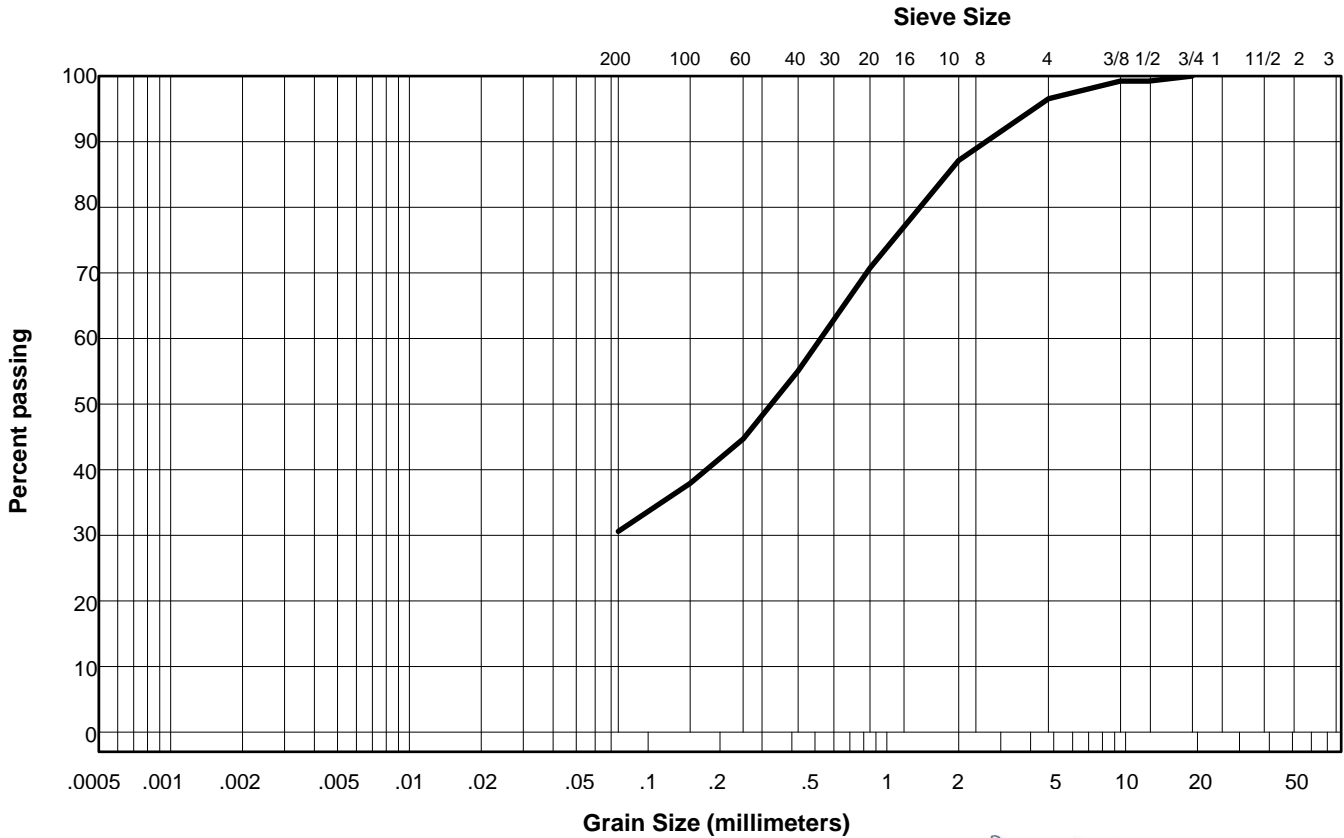
Cc: _____

Natural Moisture Content: 9.1%

Remarks: _____

Sieve Size (mm)	Percent Passing
19.000	100
12.500	99
9.500	99
4.750	97
2.000	87
0.850	71
0.425	55
0.250	45
0.150	38
0.075	30.6

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tong Yohann* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P116-12

Depth: 2.4-2.8 m

Soil Description: GRAVEL and SAND, trace fines

Cu: 17.4

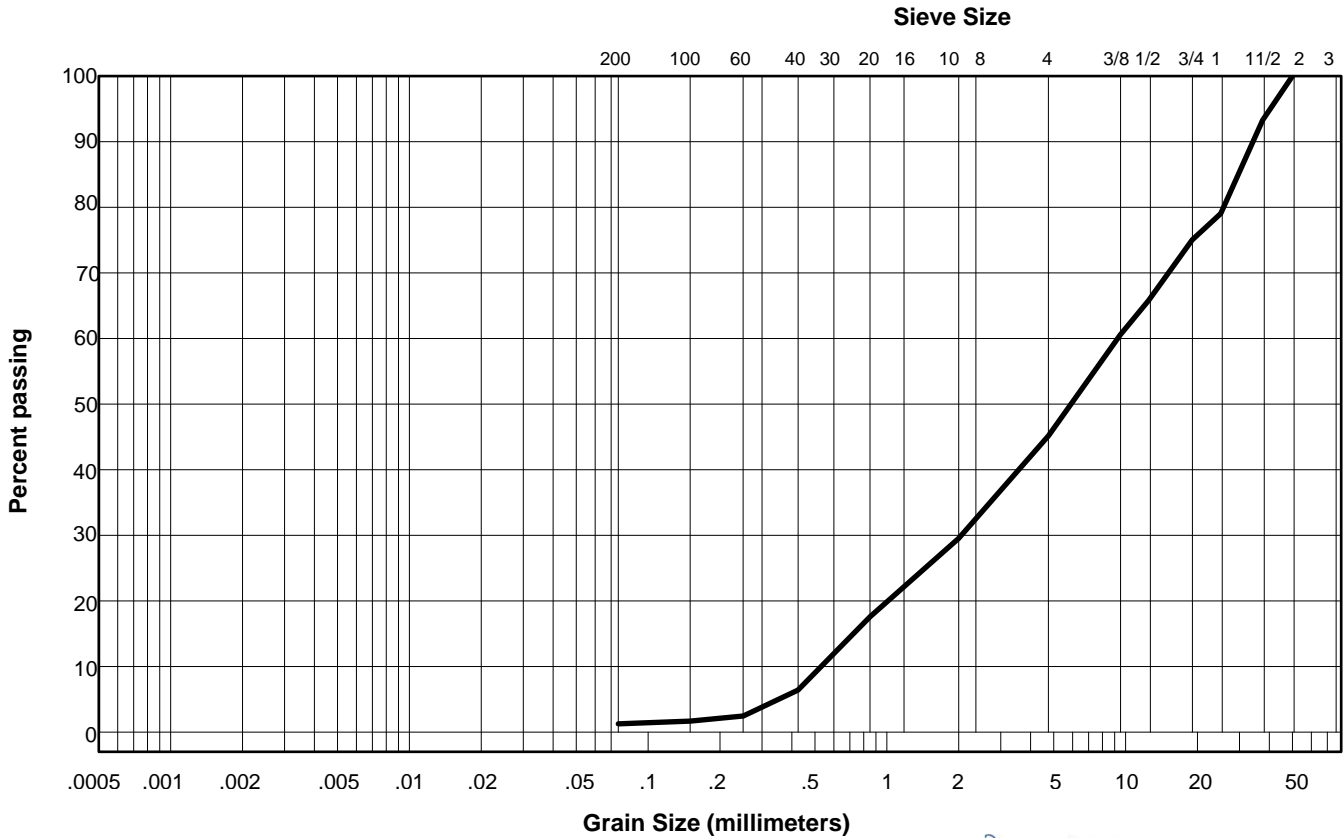
Cc: 0.9

Natural Moisture Content: 4.0%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	100
37.500	93
25.000	79
19.000	75
12.500	66
9.500	61
4.750	45
2.000	30
0.850	18
0.425	6
0.250	2
0.150	2
0.075	1.3

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tong Yohannan* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P116-15

Depth: 1.0-1.1 m

Soil Description: SAND and GRAVEL, trace fines

Cu: 30.2

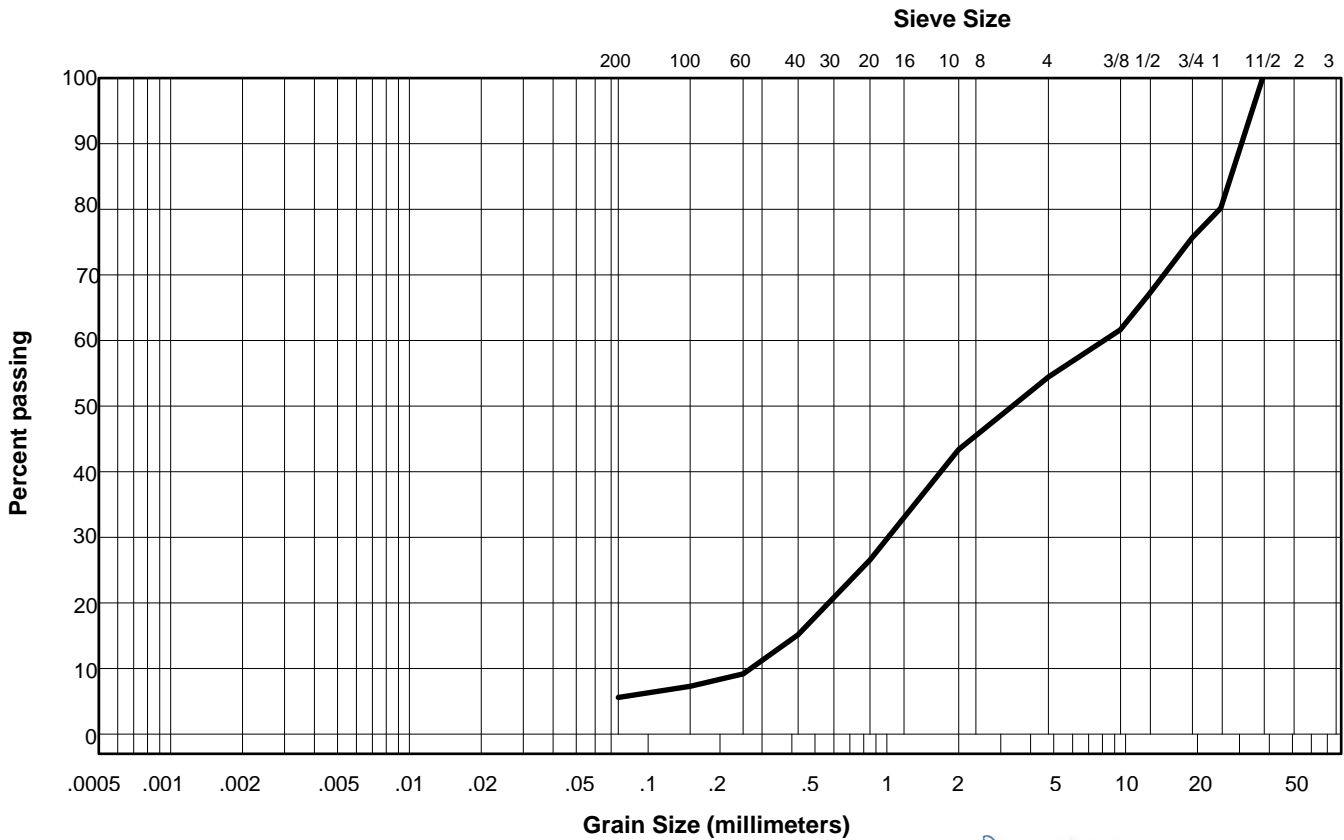
Cc: 0.5

Natural Moisture Content: 8.0%

Remarks: _____

Sieve Size (mm)	Percent Passing
37.500	100
25.000	80
19.000	76
12.500	67
9.500	62
4.750	54
2.000	43
0.850	27
0.425	15
0.250	9
0.150	7
0.075	5.6

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tong Yolkun* P.Eng.

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PARTICLE SIZE ANALYSIS REPORT

ASTM C136 & C117

Project: TASR Geotechnical Investigation

Project Number: ENG.YAR03107-01

Date Tested: July 22, 2017

Borehole Number: P116-17

Depth: 0.6-0.8 m

Soil Description: GRAVEL, sandy, trace fines

Cu: 31.9

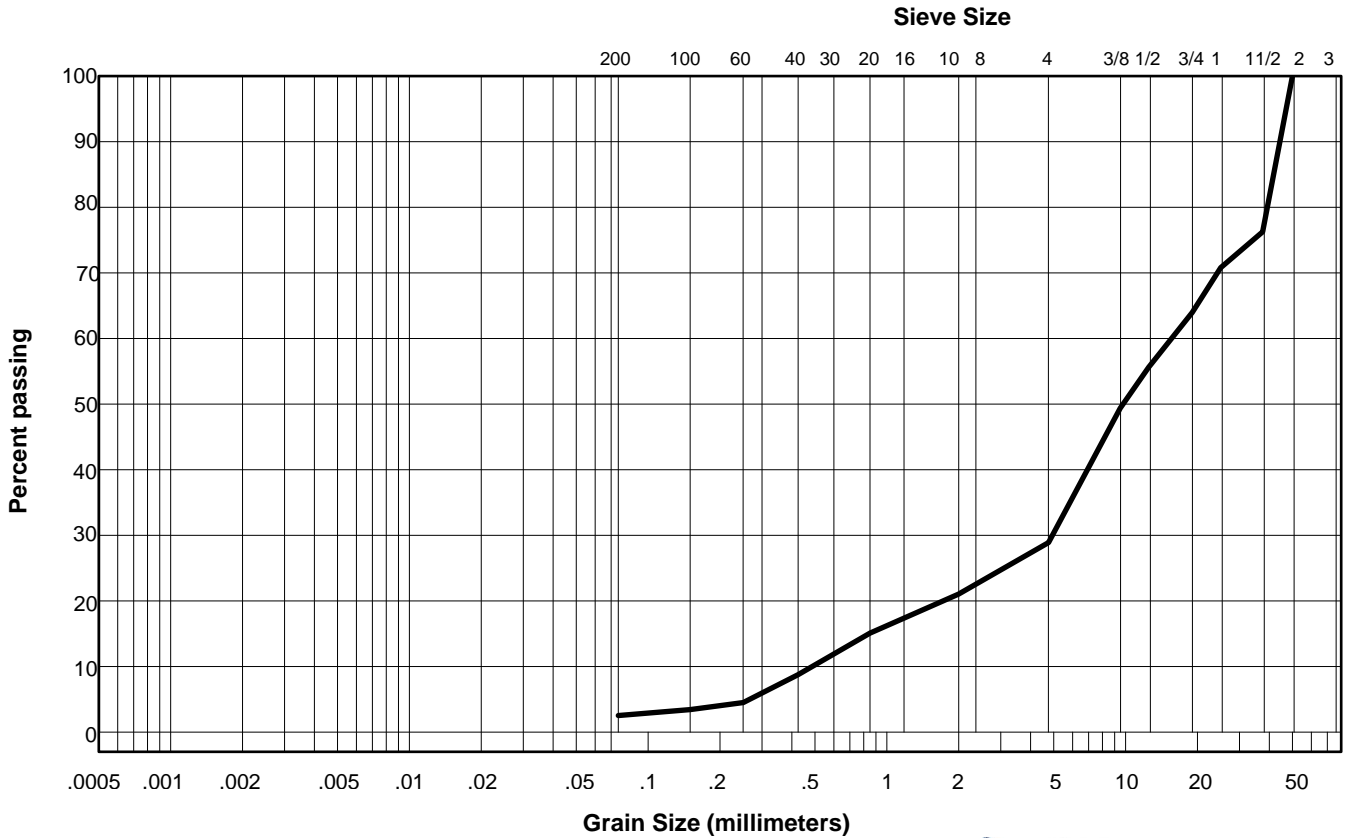
Cc: 3.2

Natural Moisture Content: 3.8%

Remarks: _____

Sieve Size (mm)	Percent Passing
50.000	100
37.500	76
25.000	71
19.000	64
12.500	56
9.500	49
4.750	29
2.000	21
0.850	15
0.425	9
0.250	5
0.150	3
0.075	2.5

Clay	Silt	Sand			Gravel	
		Fine	Medium	Coarse	Fine	Coarse



Reviewed By: *Tony M. Johnson* P.Eng.

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APPENDIX C2

LOS ANGELES ABRASION AND FLAT-ELONGATED RESULTS

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.1</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P29-03

Sample Location: 0.0-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.1	20.0	12.5	12.0	2.9	0.7	6.7	89.7
	12.5	10.0	75.0	4.0	0.0	6.9	89.0
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **6.9%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ _____ P. Eng.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.2</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P29-05

Sample Location: 0.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.2	20.0	12.5	12.0	2.7	0.0	7.4	89.8
	12.5	10.0	75.0	6.3	4.2	7.8	81.7
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **7.7%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.3</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P29-04

Sample Location: 0.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.3	20.0	12.5	12.0	2.6	1.0	6.4	90.0
	12.5	10.0	75.0	7.4	2.8	4.5	85.2
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

4.7%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.4</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P13D-05

Sample Location: 0.0-9.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.4	20.0	12.5	12.0	2.8	3.1	8.9	85.2
	12.5	10.0	75.0	5.4	5.0	12.3	77.3
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **11.9%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.5</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P13D-03

Sample Location: 0.5-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.5	20.0	12.5	12.0	1.4	0.0	1.8	96.8
	12.5	10.0	75.0	3.2	0.7	12.3	83.7
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **10.9%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ _____ P. Eng.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.6</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P13D-02

Sample Location: 0.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.6	20.0	12.5	12.0	5.2	0.0	10.4	84.4
	12.5	10.0	75.0	4.0	1.5	6.7	87.8
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **7.2%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.7</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P33a-10

Sample Location: 0.5-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.7	20.0	12.5	12.0	1.1	0.0	5.4	93.5
	12.5	10.0	75.0	5.5	0.3	5.9	88.2
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				
Weighted Average (2.5 mm retained)*						5.8%	3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ _____ P. Eng.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.8</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P33a-04

Sample Location: 2.82-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.8	20.0	12.5	12.0	6.4	0.7	6.5	86.5
	12.5	10.0	75.0	7.4	2.3	14.1	76.2
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **13.0%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.10</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P33a-02

Sample Location: 2.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.1	20.0	12.5	12.0	4.3	0.0	8.2	87.5
	12.5	10.0	75.0	4.9	4.8	12.9	77.4
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				
Weighted Average (2.5 mm retained)*						12.3%	3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.11</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P33a-07

Sample Location: 0.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.11	20.0	12.5	12.0	1.5	0.0	6.3	92.2
	12.5	10.0	75.0	4.8	1.3	6.1	87.8
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				
Weighted Average (2.5 mm retained)*						6.1%	3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.12</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P86-02 & P86-01A Combined

Sample Location: 0.0-9.5 m & 0.0-5.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.12	20.0	12.5	12.0	1.1	2.7	0.0	96.2
	12.5	10.0	75.0	3.8	4.4	6.6	85.3
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				
Weighted Average (2.5 mm retained)*						5.7%	3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.13</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P86-04 & P86-06 Combined

Sample Location: 0.0-5.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.13	20.0	12.5	12.0	1.4	0.0	1.8	96.8
	12.5	10.0	75.0	1.7	2.2	4.5	91.6
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				
Weighted Average (2.5 mm retained)*						4.1%	3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.14</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P86-04 & P86-06 Combined

Sample Location: 5.0-8.8 m & 5.0-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.14	20.0	12.5	12.0	3.0	1.2	7.5	88.3
	12.5	10.0	75.0	4.7	8.2	7.6	79.4
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				
Weighted Average (2.5 mm retained)*						7.6%	3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.15</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>13-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P105-01

Sample Location: 0.0-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.15	20.0	12.5	12.0	3.8	0.0	5.4	90.7
	12.5	10.0	75.0	6.0	0.7	13.2	80.2
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **12.1%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____  P. Eng.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.16</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>13-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P105-02

Sample Location: 0.0-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.16	20.0	12.5	12.0	6.5	0.0	5.1	88.4
	12.5	10.0	75.0	3.3	1.9	11.1	83.7
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				
Weighted Average (2.5 mm retained)*						10.3%	3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: AS P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.4
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 10, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P13D-05
Sample Location: 0.0-9.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.4
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2502.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,004.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,004.0	3,915.0	1,089.0	22

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  _____ P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.5
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 11, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P13D-03
Sample Location: 0.5-8.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.5
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,002.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,002.0	3,878.0	1,124.0	22

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.6</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 13, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P13D-02
Sample Location: 0.0-9.5 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.6
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,002.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,002.0	3,845.0	1,157.0	23

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.7
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 10, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P33a-10
Sample Location: 0.5-9.5 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.7
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2504.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,005.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,005.0	3,665.0	1,340.0	27

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____  P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.8
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 10, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P33a-04
Sample Location: 2.82-9.5 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.8
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2503.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,004.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,004.0	3,853.0	1,151.0	23

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.10
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 13, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P33a-02
Sample Location: 2.0-9.5 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.1
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,003.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,003.0	3,774.0	1,229.0	25

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____  P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.11</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 10, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P33a-07
Sample Location: 0.0-9.5 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.11
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,003.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,003.0	3,508.0	1,495.0	30

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.12
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 13, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P86-02 & P86-01A Combined
Sample Location: 0.0-9.5 m & 0.0-5.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.12
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2500.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,000.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,000.0	4,002.0	998.0	20

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____  P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.13
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 13, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P86-04 & P86-06 Combined
Sample Location: 0.0-5.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.13
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2500.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,000.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,000.0	4,114.0	886.0	18

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.14</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 13, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P86-04 & P86-06 Combined
Sample Location: 5.0-8.8 m & 5.0-8.0 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.14
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2502.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,004.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,004.0	4,073.0	931.0	19

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.15
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 13, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P105-01
Sample Location: 0.0-8.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.15
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,003.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,003.0	4,141.0	862.0	17

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.16
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 13, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P105-02
Sample Location: 0.0-8.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.16
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,002.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,002.0	4,151.0	851.0	17

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  P. Eng.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.15</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 19, 2017</u>
Source: <u>P105-01, 0-8.0 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		0.0	0.0		0.0
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite, potassium feldspar	1		99.3	99.6		99.5
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Carbonate	3		0.0	0.0		0.0
Potassium feldspar granite, weathered	3		0.7	0.4		0.5
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	101	101	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 101

Weighted Average Chert Content: **0.0 %**

Weighted Average Ironstone Content: **0.0 %**

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: Fine to medium grained potassium feldspar granite



Petrographer: *SM* P.Geol.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1859</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>10-Sep-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
Attention: <u>Sandy Murray</u> Fax: _____	Date Tested: <u>12-Sep-17</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Tested By: <u>MA</u>
	Office: <u>Edmonton</u>

Description: 75 mm GRAVEL(pitrun)- Lab crushed to minus 20 mm

Source: P116-03 Existing Pit

Sample Location: 0.0-4.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1859	20.0	12.5	12.0	2.7	1.7	3.4	92.2
	12.5	10.0	75.0	2.0	4.1	5.0	88.9
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

4.7%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1859</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>September 10, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 12, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 75 mm GRAVEL(pitrun) - Lab crushed to minus 20 mm
Source: P116-03 Existing Pit
Sample Location: 0.0-4.0 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1859
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2500.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,000.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,000.0	3,416.0	1,584.0	32

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: AS P. Eng.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: TASR Geotechnical Investigation	Sample No.: 1859
Client: GNWT - INF	Date Received: September 10, 2017
Project No.: ENG.YARC03107-01	Date Tested: September 19, 2017
Source: P116-03 Existing Pit, 0-4.0 m	Petrographer: Shirley McCuaig
Description: 75 mm GRAVEL (pitrun) - lab crushed to	Office: Edmonton

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		31.5	37.2		34.4
Chert	1		0.0	0.0		0.0
Sandstone	1		25.6	34.5		30.1
Granite	1		1.8	5.0		3.4
Breccia	1		0.2	0.3		0.3
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone, some bitumen	3		2.4	3.0		2.7
Siltstone	3		24.3	11.9		18.1
Encrustation, calcite	3		12.1	7.3		9.7
Cementation	3		0.0	0.0		0.0
Carbonate, some bitumen	3		2.0	0.8		1.4
Bitumen	3		0.0	0.0		0.0
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	182	146	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 164

Weighted Average Chert Content: **0.0 %**

Weighted Average Ironstone Content: **0.0 %**

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Well bonded calcite encrustations on all rock samples



Petrographer: P.Geol.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.1</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P29-03

Sample Location: 0.0-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.1	20.0	12.5	12.0	2.9	0.7	6.7	89.7
	12.5	10.0	75.0	4.0	0.0	6.9	89.0
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

6.9%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.2</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P29-05

Sample Location: 0.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.2	20.0	12.5	12.0	2.7	0.0	7.4	89.8
	12.5	10.0	75.0	6.3	4.2	7.8	81.7
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* 7.7% **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.3</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P29-04

Sample Location: 0.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.3	20.0	12.5	12.0	2.6	1.0	6.4	90.0
	12.5	10.0	75.0	7.4	2.8	4.5	85.2
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* 4.7% **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.4</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P13D-05

Sample Location: 0.0-9.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.4	20.0	12.5	12.0	2.8	3.1	8.9	85.2
	12.5	10.0	75.0	5.4	5.0	12.3	77.3
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

11.9%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.5</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P13D-03

Sample Location: 0.5-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.5	20.0	12.5	12.0	1.4	0.0	1.8	96.8
	12.5	10.0	75.0	3.2	0.7	12.3	83.7
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **10.9%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.6</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P13D-02

Sample Location: 0.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.6	20.0	12.5	12.0	5.2	0.0	10.4	84.4
	12.5	10.0	75.0	4.0	1.5	6.7	87.8
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* 7.2% **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.7</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P33a-10

Sample Location: 0.5-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.7	20.0	12.5	12.0	1.1	0.0	5.4	93.5
	12.5	10.0	75.0	5.5	0.3	5.9	88.2
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

5.8%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.8</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P33a-04

Sample Location: 2.82-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.8	20.0	12.5	12.0	6.4	0.7	6.5	86.5
	12.5	10.0	75.0	7.4	2.3	14.1	76.2
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **13.0%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.10</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P33a-02

Sample Location: 2.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.1	20.0	12.5	12.0	4.3	0.0	8.2	87.5
	12.5	10.0	75.0	4.9	4.8	12.9	77.4
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

12.3%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.11</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P33a-07

Sample Location: 0.0-9.5 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.11	20.0	12.5	12.0	1.5	0.0	6.3	92.2
	12.5	10.0	75.0	4.8	1.3	6.1	87.8
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* **6.1%** **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.12</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P86-02 & P86-01A Combined

Sample Location: 0.0-9.5 m & 0.0-5.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.12	20.0	12.5	12.0	1.1	2.7	0.0	96.2
	12.5	10.0	75.0	3.8	4.4	6.6	85.3
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

5.7%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.13</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>11-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P86-04 & P86-06 Combined

Sample Location: 0.0-5.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.13	20.0	12.5	12.0	1.4	0.0	1.8	96.8
	12.5	10.0	75.0	1.7	2.2	4.5	91.6
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

4.1%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: ENG.YARC03107-01	Sample No.: 1857.14
Project: TAsR Geotechnical Investigation	Date Sampled: 15-Aug-17
Client: GNWT - INF	Sampled By: Client
	Date Tested: 11-Sep-17
Attention: Sandy Murray Fax: _____	Tested By: MA
Email: Alexander_Murray@gov.nt.ca	Office: Edmonton

Description: 20 mm CRUSHED GRAVEL

Source: P86-04 & P86-06 Combined

Sample Location: 5.0-8.8 m & 5.0-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.14	20.0	12.5	12.0	3.0	1.2	7.5	88.3
	12.5	10.0	75.0	4.7	8.2	7.6	79.4
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)* 7.6% **3:1 Ratio**

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.15</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>13-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P105-01

Sample Location: 0.0-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.15	20.0	12.5	12.0	3.8	0.0	5.4	90.7
	12.5	10.0	75.0	6.0	0.7	13.2	80.2
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

12.1%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

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PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.16</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>15-Aug-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>13-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL

Source: P105-02

Sample Location: 0.0-8.0 m

Supplier: _____

Flat: Ratio of width to thickness greater 3

Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1857.16	20.0	12.5	12.0	6.5	0.0	5.1	88.4
	12.5	10.0	75.0	3.3	1.9	11.1	83.7
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

10.3%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: AS P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01	Sample No.: 1857.1
Project: TASR Geotechnical Investigation	Date Received: August 15, 2017
Client: GNWT - INF	Sampled By: Client
	Date Tested: September 10, 2017
Attention: Sandy Murray	Tested By: MA
Email: Alexander_Murray@gov.nt.ca	Office: Edmonton
Fax:	

Description: 20 mm CRUSHED GRAVEL
Source: P29-03
Sample Location: 0.0-8.0 m
Supplier:

Test Grading		Mass of Indicated Sizes , g				
Sieve Size (mm)		Grading A	Grading B	Grading C	Grading D	Sample 1857.1
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2500.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,000.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,000.0	3,811.0	1,189.0	24

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.2</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 10, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P29-05
Sample Location: 0.0-9.5 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
Sieve Size (mm)		Grading A	Grading B	Grading C	Grading D	Sample 1857.2
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2502.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,004.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,004.0	3,760.0	1,244.0	25

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.3</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 10, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P29-04
Sample Location: 0.0-9.5 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.3
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2502.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,003.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,003.0	3,880.0	1,123.0	22

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.4
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 10, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P13D-05
Sample Location: 0.0-9.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.4
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2502.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,004.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,004.0	3,915.0	1,089.0	22

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  _____ P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.5
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 11, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P13D-03
Sample Location: 0.5-8.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.5
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,002.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,002.0	3,878.0	1,124.0	22

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.6</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 13, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P13D-02
Sample Location: 0.0-9.5 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.6
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,002.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,002.0	3,845.0	1,157.0	23

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.7</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 10, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P33a-10
Sample Location: 0.5-9.5 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.7
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2504.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,005.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,005.0	3,665.0	1,340.0	27

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.8</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 10, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P33a-04
Sample Location: 2.82-9.5 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.8
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2501.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2503.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,004.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,004.0	3,853.0	1,151.0	23

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.10</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 13, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P33a-02
Sample Location: 2.0-9.5 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
Sieve Size (mm)		Grading A	Grading B	Grading C	Grading D	Sample 1857.1
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,003.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,003.0	3,774.0	1,229.0	25

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.11
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 10, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P33a-07
Sample Location: 0.0-9.5 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.11
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,003.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,003.0	3,508.0	1,495.0	30

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.12
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 13, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P86-02 & P86-01A Combined
Sample Location: 0.0-9.5 m & 0.0-5.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.12
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2500.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,000.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,000.0	4,002.0	998.0	20

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  _____ P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.13</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 13, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P86-04 & P86-06 Combined
Sample Location: 0.0-5.0 m
Supplier: _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.13
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2500.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,000.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,000.0	4,114.0	886.0	18

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.14</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 13, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P86-04 & P86-06 Combined
Sample Location: 5.0-8.8 m & 5.0-8.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
Sieve Size (mm)		Grading A	Grading B	Grading C	Grading D	Sample 1857.14
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2502.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,004.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,004.0	4,073.0	931.0	19

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: _____ P. Eng.

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Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1857.15</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>August 15, 2017</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>September 13, 2017</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 20 mm CRUSHED GRAVEL
Source: P105-01
Sample Location: 0.0-8.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
Sieve Size (mm)		Grading A	Grading B	Grading C	Grading D	Sample 1857.15
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2501.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,003.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,003.0	4,141.0	862.0	17

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  _____ P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1857.16
Date Received: August 15, 2017
Sampled By: Client
Date Tested: September 13, 2017
Tested By: MA
Office: Edmonton

Description: 20 mm CRUSHED GRAVEL
Source: P105-02
Sample Location: 0.0-8.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1857.16
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2502.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,002.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,002.0	4,151.0	851.0	17

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By:  P. Eng.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.3</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 25, 2017</u>
Source: <u>P29-04, 0-9.5 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Limestone, tr. calcite, grey	1		89.8	93.3		91.5
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite	1		0.0	0.0		0.0
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Cementation	3		0.0	0.0		0.0
Limestone, weathered, grey	3		10.2	6.7		8.5
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	120	113	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 117

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: _____



Petrographer: Shirley McCuaig P.Geol.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: TASR Geotechnical Investigation

Sample No.: 1857.10

Client: GNWT - INF

Date Received: August 15, 2017

Project No.: ENG.YARC03107-01

Date Tested: September 20, 2017

Source: P33a-02, 2.0-9.5 m

Petrographer: Shirley McCuaig

Description: 20 mm CRUSHED GRAVEL

Office: Edmonton

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Sandy limestone, trace calcite, grey	1		8.9	12.9		10.9
Limestone, trace calcite, grey	1		69.9	65.5		67.7
Chert	1		0.0	0.0		0.0
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Limestone, tan	3		14.0	15.8		14.9
Limestone, weathered, some slickensides, tan	3		7.2	5.9		6.5
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	142	143	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 143

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: _____



Petrographer: _____

SM

P.Geol.

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Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.11</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 25, 2017</u>
Source: <u>P33a-07, 0-9.5 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		0.0	0.0		0.0
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite	1		0.0	0.0		0.0
Limestone, trace calcite, grey and tan	1		74.7	77.1		75.9
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Limestone, tan	3		7.1	10.0		8.5
Limestone, weathered, grey and tan	3		18.3	13.0		15.6
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	151	146	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 148

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: _____



Petrographer: _____ P.Geol.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.12</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 19, 2017</u>
Source: <u>P86-02 & P86-01A Combined, 0-9.5 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		0.0	0.0		0.0
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite	1		0.0	0.0		0.0
Dolostone, some vugs	1		88.3	81.0		84.7
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Cementation	3		0.0	0.0		0.0
Carbonate	3		0.0	0.0		0.0
Dolostone, very vuggy	3		11.7	19.0		15.3
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	123	138	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 131

Weighted Average Chert Content: **0.0 %**

Weighted Average Ironstone Content: **0.0 %**

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: Dolostone, vuggy, with calcite fill, (crushed rock)



Petrographer: *SM* P.Geol.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: TASR Geotechnical Investigation	Sample No.: 1857.14
Client: GNWT - INF	Date Received: August 15, 2017
Project No.: ENG.YARC03107-01	Date Tested: September 19, 2017
Source: P86-04 & P86-06 Combined, 5.0-8.8 m	Petrographer: Shirley McCuaig
Description: 20 mm CRUSHED GRAVEL	Office: Edmonton

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Dolostone, minor calcite	1		97.8	95.9		96.8
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite	1		0.0	0.0		0.0
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Cementation	3		0.0	0.0		0.0
Dolostone	3		2.2	4.1		3.2
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	104	108	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 106
Weighted Average Chert Content: 0.0 % **Weighted Average Ironstone Content: 0.0 %**

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: _____



Petrographer: *SM* P.Geol.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.15</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 19, 2017</u>
Source: <u>P105-01, 0-8.0 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		0.0	0.0		0.0
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite, potassium feldspar	1		99.3	99.6		99.5
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Carbonate	3		0.0	0.0		0.0
Potassium feldspar granite, weathered	3		0.7	0.4		0.5
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	101	101	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 101

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: Fine to medium grained potassium feldspar granite



Petrographer: SM P.Geol.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: TASR Geotechnical Investigation	Sample No.: 1857.16
Client: GNWT - INF	Date Received: August 15, 2017
Project No.: ENG.YARC03107-01	Date Tested: September 19, 2017
Source: P105-02, 0-8.0 m	Petrographer: Shirley McCuaig
Description: 20 mm CRUSHED GRAVEL	Office: Edmonton

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		0.0	0.0		0.0
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite, potassium feldspar, fine to medium grained	1 0		100.0	98.7		99.4
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Carbonate	3		0.0	0.0		0.0
Potassium feldspar granite, weathered, fine to medium grained	3		0.0	1.3		0.6
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	100	103	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 101

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: _____



Petrographer: _____ P.Geol.

PERCENTAGE OF FLAT & ELONGATED PARTICLES

ASTM D 4791 - 05

Project No: <u>ENG.YARC03107-01</u>	Sample No.: <u>1859</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Sampled: <u>10-Sep-17</u>
Client: <u>GNWT - INF</u>	Sampled By: <u>Client</u>
	Date Tested: <u>12-Sep-17</u>
Attention: <u>Sandy Murray</u> Fax: _____	Tested By: <u>MA</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Office: <u>Edmonton</u>

Description: 75 mm GRAVEL(pitrun)- Lab crushed to minus 20 mm
Source: P116-03 Existing Pit
Sample Location: 0.0-4.0 m
Supplier: _____

Flat: Ratio of width to thickness greater 3
Elongated: Ratio of length to width greater than 3

Sample No.	Size Fraction (mm)		Proportion of Sample in Size Fraction (%)	Percentage by mass of sample (%)			
				flat	elongated	flat and elongated	neither flat nor elongated
1859	20.0	12.5	12.0	2.7	1.7	3.4	92.2
	12.5	10.0	75.0	2.0	4.1	5.0	88.9
	10.0	8.0	0.0				
	8.0	6.3	0.0				
	6.3	5.0	0.0				
	5.0	2.50	0.0				

Weighted Average (2.5 mm retained)*

4.7%

3:1 Ratio

* Size fractions which have not been analysed are not included for the calculation

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: AS P. Eng.

Los Angeles Abrasion of Small-Size Coarse Aggregate

ASTM C131 / AASTHO T-96

Project No: ENG.YARC03107-01
Project: TASR Geotechnical Investigation
Client: GNWT - INF
Attention: Sandy Murray **Fax:** _____
Email: Alexander_Murray@gov.nt.ca

Sample No.: 1859
Date Sampled: September 10, 2017
Sampled By: Client
Date Tested: September 12, 2017
Tested By: MA
Office: Edmonton

Description: 75 mm GRAVEL(pitrun) - Lab crushed to minus 20 mm
Source: P116-03 Existing Pit
Sample Location: 0.0-4.0 m
Supplier _____

Test Grading		Mass of Indicated Sizes , g				
		Grading A	Grading B	Grading C	Grading D	Sample 1859
Sieve Size (mm)						
Passing	Retained					
40	25	1250 ± 25	--	--	--	
25	20	1250 ± 25	--	--	--	
20	12.5	1250 ± 10	2500 ± 10	--	--	2500.0
12.5	10	1250 ± 10	2500 ± 10	--	--	2500.0
10	6.3	--	--	2500 ± 10	--	
6.3	5	--	--	2500 ± 10	--	
5	2.5	--	--	--	5,000 ± 10	
Total:		5,000 ± 10				5,000.0

Test Grading	Initial Mass (g)	Final Mass (g)	Mass Loss (g)	Loss (%)
B	5,000.0	3,416.0	1,584.0	32

Remarks: Sample was lab crushed to minus 20 mm prior to testing

Reviewed By: AS P. Eng.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: TASR Geotechnical Investigation	Sample No.: 1859
Client: GNWT - INF	Date Received: September 10, 2017
Project No.: ENG.YARC03107-01	Date Tested: September 19, 2017
Source: P116-03 Existing Pit, 0-4.0 m	Petrographer: Shirley McCuaig
Description: 75 mm GRAVEL (pitrun) - lab crushed to	Office: Edmonton

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		31.5	37.2		34.4
Chert	1		0.0	0.0		0.0
Sandstone	1		25.6	34.5		30.1
Granite	1		1.8	5.0		3.4
Breccia	1		0.2	0.3		0.3
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone, some bitumen	3		2.4	3.0		2.7
Siltstone	3		24.3	11.9		18.1
Encrustation, calcite	3		12.1	7.3		9.7
Cementation	3		0.0	0.0		0.0
Carbonate, some bitumen	3		2.0	0.8		1.4
Bitumen	3		0.0	0.0		0.0
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	182	146	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 164

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: Sample was lab crushed to minus 20 mm prior to testing



Well bonded calcite encrustations on all rock samples

Petrographer: P.Geol.

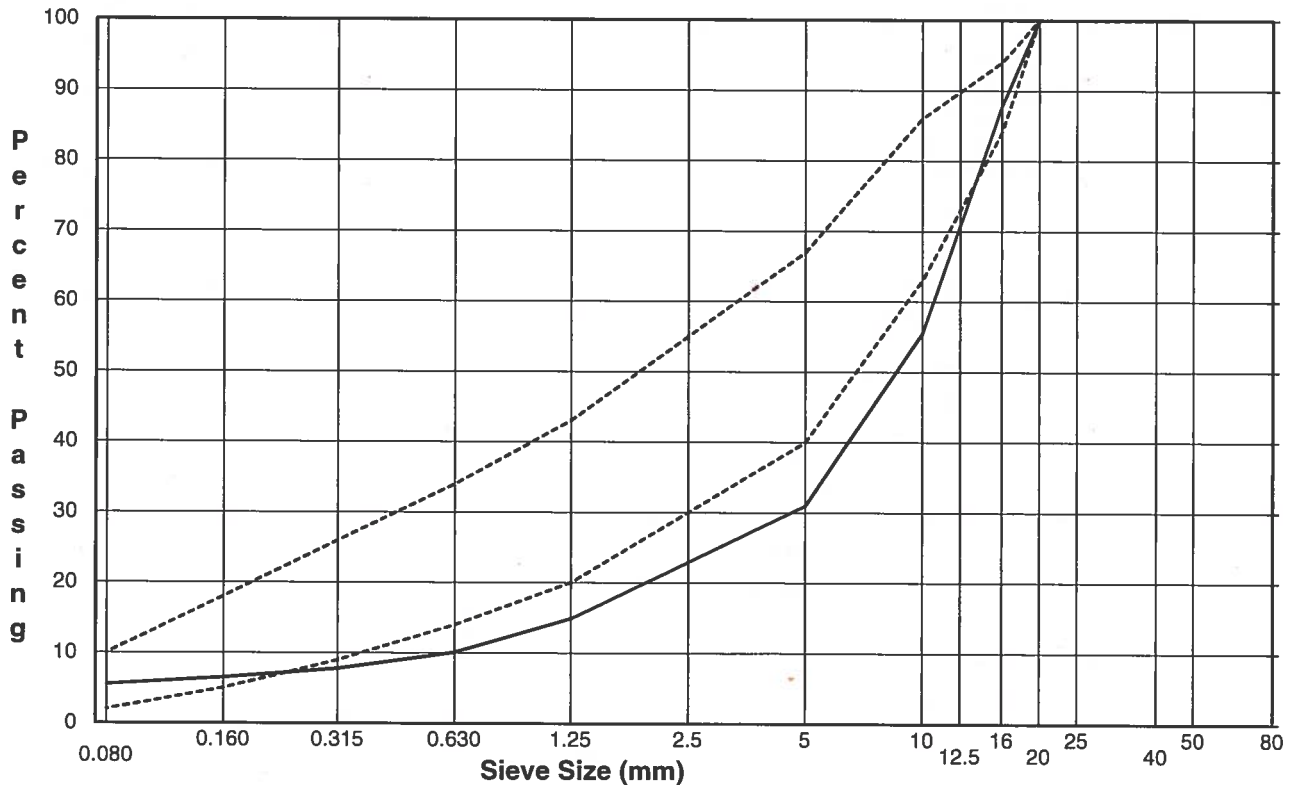
SIEVE ANALYSIS REPORT

Washed Sieve: ASTM C136 and C117

Project No.: <u>ENG.YARC03107-01</u>	Sample No.: <u>1859</u>
Project: <u>TASR Geotechnical Investigation</u>	Date Received: <u>September 10, 2017</u>
Client: <u>GNWT - INF</u>	Sampled by: <u>Client</u>
Attention: <u>Sandy Murray</u>	Date Tested: <u>September 12, 2017</u>
Email: <u>Alexander_Murray@gov.nt.ca</u>	Tested by: <u>MA</u> Office: <u>Edmonton</u>
Description: <u>75 mm GRAVEL (pitrun) - lab crushed to minus 20 mm</u>	Moisture Content (as received): <u>1.9%</u>
Source: <u>P116-03 Existing Pit</u>	No. Crushed Faces: <u>Two (2) or Three (3)</u>
Sample Location: <u>0.0-4.0 m</u>	By Particle Mass: _____
Specification: <u>AT D2-C20 Base Course Aggregate</u>	Reviewed By: <u>AS</u> P.Eng.

Aggregate Gradation (% Passing)

Sieve Size (mm)	50	40	25	20	16	12.5	10	5	2.5	1.25	0.630	0.315	0.160	0.080
Upper Limit	100			100	94		86	67		43	34	26	18	10
Lower Limit				100	84		63	40		20	14	9	5	2
Test Result				100	88	72	55	31	22	15	10	8	7	5.5



Remarks: Sample was lab crushed to minus 20 mm prior to testing Only specified sieves have been plotted

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APPENDIX C3

PETROGRAPHIC ANALYSIS RESULTS

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.3</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 25, 2017</u>
Source: <u>P29-04, 0-9.5 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Limestone, tr. calcite, grey	1		89.8	93.3		91.5
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite	1		0.0	0.0		0.0
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Cementation	3		0.0	0.0		0.0
Limestone, weathered, grey	3		10.2	6.7		8.5
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	120	113	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 117

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: _____



Petrographer: P.Geol.

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Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: TASR Geotechnical Investigation

Sample No.: 1857.10

Client: GNWT - INF

Date Received: August 15, 2017

Project No.: ENG.YARC03107-01

Date Tested: September 20, 2017

Source: P33a-02, 2.0-9.5 m

Petrographer: Shirley McCuaig

Description: 20 mm CRUSHED GRAVEL

Office: Edmonton

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Sandy limestone, trace calcite, grey	1		8.9	12.9		10.9
Limestone, trace calcite, grey	1		69.9	65.5		67.7
Chert	1		0.0	0.0		0.0
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Limestone, tan	3		14.0	15.8		14.9
Limestone, weathered, some slickensides, tan	3		7.2	5.9		6.5
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	142	143	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 143

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: _____



Petrographer: _____

SM

P.Geol.

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Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.12</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 19, 2017</u>
Source: <u>P86-02 & P86-01A Combined, 0-9.5 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		0.0	0.0		0.0
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite	1		0.0	0.0		0.0
Dolostone, some vugs	1		88.3	81.0		84.7
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Cementation	3		0.0	0.0		0.0
Carbonate	3		0.0	0.0		0.0
Dolostone, very vuggy	3		11.7	19.0		15.3
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	123	138	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 131

Weighted Average Chert Content: **0.0 %**

Weighted Average Ironstone Content: **0.0 %**

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: Dolostone, vuggy, with calcite fill, (crushed rock)



Petrographer: P.Geol.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.14</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 19, 2017</u>
Source: <u>P86-04 & P86-06 Combined, 5.0-8.8 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Dolostone, minor calcite	1		97.8	95.9		96.8
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite	1		0.0	0.0		0.0
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Cementation	3		0.0	0.0		0.0
Dolostone	3		2.2	4.1		3.2
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	104	108	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 106

Weighted Average Chert Content: **0.0 %**

Weighted Average Ironstone Content: **0.0 %**

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: _____



Petrographer: *SM* P.Geol.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: <u>TASR Geotechnical Investigation</u>	Sample No.: <u>1857.15</u>
Client: <u>GNWT - INF</u>	Date Received: <u>August 15, 2017</u>
Project No.: <u>ENG.YARC03107-01</u>	Date Tested: <u>September 19, 2017</u>
Source: <u>P105-01, 0-8.0 m</u>	Petrographer: <u>Shirley McCuaig</u>
Description: <u>20 mm CRUSHED GRAVEL</u>	Office: <u>Edmonton</u>

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		0.0	0.0		0.0
Chert	1		0.0	0.0		0.0
Sandstone	1		0.0	0.0		0.0
Granite, potassium feldspar	1		99.3	99.6		99.5
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone	3		0.0	0.0		0.0
Siltstone	3		0.0	0.0		0.0
Encrustation	3		0.0	0.0		0.0
Carbonate	3		0.0	0.0		0.0
Potassium feldspar granite, weathered	3		0.7	0.4		0.5
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	101	101	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 101

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: Fine to medium grained potassium feldspar granite



Petrographer: SM P.Geol.

Summary of Petrographic Analysis of Coarse Aggregate Test Report

CSA A23.2-15A

Project: TASR Geotechnical Investigation	Sample No.: 1859
Client: GNWT - INF	Date Received: September 10, 2017
Project No.: ENG.YARC03107-01	Date Tested: September 19, 2017
Source: P116-03 Existing Pit, 0-4.0 m	Petrographer: Shirley McCuaig
Description: 75 mm GRAVEL (pitrun) - lab crushed to	Office: Edmonton

Rock Type	Petrographic Multiplier	28 - 20 mm % in fraction	20 - 14 mm % in fraction	14 - 10 mm % in fraction	10 - 5 mm % in fraction	Weighted Average %
Good - High Strength						
Quartzite	1		0.0	0.0		0.0
Carbonate	1		31.5	37.2		34.4
Chert	1		0.0	0.0		0.0
Sandstone	1		25.6	34.5		30.1
Granite	1		1.8	5.0		3.4
Breccia	1		0.2	0.3		0.3
Fair - Medium Strength						
Quartzite	3		0.0	0.0		0.0
Sandstone, some bitumen	3		2.4	3.0		2.7
Siltstone	3		24.3	11.9		18.1
Encrustation, calcite	3		12.1	7.3		9.7
Cementation	3		0.0	0.0		0.0
Carbonate, some bitumen	3		2.0	0.8		1.4
Bitumen	3		0.0	0.0		0.0
Poor - Low Strength						
Deleterious						
Ironstone	10		0.0	0.0		0.0
Petrographic Number :		Not Tested	182	146	Not Tested	
Percent of Fraction in Sample:		0.0	50.0	50.0	0.0	

Weighted Average Petrographic Number: 164

Weighted Average Chert Content: 0.0 %

Weighted Average Ironstone Content: 0.0 %

Note: Petrographic evaluation of coarse aggregate suitability/acceptance should be confirmed by the suite of CSA Table 12 testing and AAR testing

Remarks: Sample was lab crushed to minus 20 mm prior to testing



Well bonded calcite encrustations on all rock samples

Petrographer: P.Geol.

APPENDIX D1

GEOCHEMICAL CHARACTERIZATION - ALS LABORATORY CERTIFICATES



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To: TETRA TECH CANADA INC.
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Page: 1
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 Plus Appendix Pages
 Finalized Date: 22- AUG- 2017
 Account: TGM

CERTIFICATE VA17154303

Project: ENG.YARC03107- 01

This report is for 40 Drill Core samples submitted to our lab in Vancouver, BC, Canada on 25- JUL- 2017.

The following have access to data associated with this certificate:

S. KINGSTON

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
LOG- 22	Sample login - Rcd w/o BarCode
CRU- 31	Fine crushing - 70% <2mm
SND- 01	Send samples to external laboratory
EXTRA- 01	Extra Sample received in Shipment
SPL- 21	Split sample - riffle splitter
PUL- 31	Pulverize split to 85% <75 um
SPL- 21X	Addnl Crush Split w No Analysis

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
S- GRA06a	Sulfate Sulfur (HCl leachable)	WST- SEQ
S- IR07	Sulphide Sulphur (Leco)	LECO
C- GAS05	Inorganic Carbon (CO2)	
ME- MS61	48 element four acid ICP- MS	
ME- XRF26	Whole Rock By Fusion/XRF	XRF
OA- GRA05x	LOI for XRF	WST- SEQ
OA- VOL08	Basic Acid Base Accounting	
S- IR08	Total Sulphur (Leco)	LECO
OA- ELE07	Paste pH	

To: TETRA TECH CANADA INC.
 ATTN: S. KINGSTON
 885 DUNSMUIR STREET
 VANCOUVER BC V6C 1N5

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:

Colin Ramshaw, Vancouver Laboratory Manager



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 Account: TGM

Project: ENG.YARC03107- 01

CERTIFICATE OF ANALYSIS VA17154303

Sample Description	Method Analyte Units LOR	WEI- 21	OA- VOL08	OA- VOL08	OA- VOL08	OA- VOL08	OA- VOL08	OA- ELE07	S- IR08	S- IR07	C- GAS05	C- GAS05	S- GRA06a	ME- MS61	ME- MS61	ME- MS61
		Recvd Wt. kg	FIZZ RAT Unity	MPA tCaCO3/1Kt	NNP tCaCO3/1Kt	NP tCaCO3/1Kt	Ratio (N) Unity	pH	S %	Sulphide %	C %	CO2 %	S %	Ag ppm	Al %	As ppm
P29- 01_5.10- 5.33		0.72	4	1.6	971	973	622.7	8.3	0.05	0.04	11.30	41.4	<0.01	0.01	0.19	0.3
P29- 03_6.50- 6.69		0.66	4	1.3	987	988	790.4	8.3	0.04	0.02	10.05	36.9	<0.01	<0.01	0.05	<0.2
P29- 04_8.79- 8.93		0.48	4	2.2	968	970	443.4	8.4	0.07	0.04	10.40	38.0	<0.01	<0.01	0.18	<0.2
P29- 05_2.43- 2.69		0.88	4	0.9	984	985	1050.5	8.3	0.03	0.02	11.15	40.9	<0.01	0.01	0.11	<0.2
P29- 05_4.34- 4.57		0.76	4	29.1	926	955	32.86	8.4	0.93	0.84	10.85	39.8	<0.01	<0.01	0.17	1.4
P29- 06_1.84- 2.00		0.52	4	1.6	972	974	623.4	8.3	0.05	0.03	11.25	41.2	<0.01	0.01	0.15	0.2
P29- 07_0.86- 1.00		0.80	4	0.6	974	975	1560.0	8.4	0.02	0.02	11.15	40.8	<0.01	<0.01	0.10	0.3
P29- 07_4.00- 4.27		0.88	4	0.6	973	974	1558.5	8.4	0.02	0.01	10.25	37.6	<0.01	0.01	0.16	0.2
P29- 08_3.00- 3.30		0.98	4	11.3	959	970	86.22	8.4	0.36	0.31	10.95	40.2	<0.01	0.01	0.19	1.3
P13D- 02_5.00- 5.16		0.66	4	0.9	992	993	1059.0	8.4	0.03	0.02	11.20	41.1	<0.01	0.01	0.04	<0.2
P13D- 03- 0.84- 1.02		0.58	4	3.8	953	957	255.2	8.4	0.12	0.09	10.80	39.6	<0.01	0.01	0.38	<0.2
P13D- 03_3.30- 3.50		0.64	4	5.0	942	947	189.40	8.4	0.16	0.10	9.40	34.4	<0.01	<0.01	0.45	<0.2
P13D- 04_2.63- 2.83		0.72	4	6.3	927	933	149.30	8.2	0.20	0.11	9.99	36.6	<0.01	<0.01	0.64	<0.2
P13D- 04_6.50- 6.70		0.64	4	8.8	935	944	107.90	8.3	0.28	0.19	10.50	38.5	<0.01	0.01	0.46	<0.2
P13D- 05_4.41- 4.63		0.70	4	0.9	1000	1000	1069.0	8.5	0.03	0.03	11.10	40.6	<0.01	<0.01	0.06	<0.2
P13D- 05_8.23- 8.40		0.58	4	1.3	978	979	783.2	8.3	0.04	0.03	10.65	39.0	<0.01	<0.01	0.05	<0.2
P33A- 01_3.24- 3.40		0.48	4	0.6	1030	1030	1649.5	9.1	0.02	0.02	11.60	42.5	0.01	0.01	0.16	0.6
P33A- 01_7.50- 7.69		0.64	4	2.2	1040	1045	476.8	9.2	0.07	0.06	11.55	42.3	<0.01	<0.01	0.09	0.7
P33A- 02_4.20- 4.38		0.54	4	0.6	1040	1045	1669.0	9.1	0.02	0.02	11.95	43.9	<0.01	<0.01	0.17	<0.2
P33A- 02_5.08- 5.25		0.56	4	3.1	977	980	313.6	8.4	0.10	0.07	10.50	38.5	<0.01	<0.01	0.15	<0.2
P33A- 03_6.06- 6.31		0.86	4	1.6	1020	1020	654.1	9.1	0.05	0.03	11.25	41.3	<0.01	<0.01	0.17	<0.2
P33A- 03_9.15- 9.39		0.84	4	1.3	1055	1055	843.2	9.0	0.04	0.02	12.05	44.2	<0.01	0.01	0.12	1.0
P33A- 04_5.46- 5.71	Not Recvd															
P33A- 04_9.12- 9.30		0.58	4	3.4	1010	1010	294.1	9.1	0.11	0.08	10.85	39.7	<0.01	0.01	0.22	<0.2
P33A- 06_0.50- 0.80		0.60	4	0.9	972	973	1038.0	9.1	0.03	0.02	10.50	38.4	<0.01	0.01	0.42	0.5
P33A- 07_2.50- 2.71		0.64	4	0.3	1030	1030	3302	9.2	0.01	0.01	11.80	43.2	<0.01	0.01	0.14	0.5
P33A- 07_6.25- 6.41		0.56	4	1.3	1030	1035	826.4	9.1	0.04	0.03	11.65	42.6	<0.01	<0.01	0.06	0.3
P33A- 08_3.50- 4.30		0.66	4	1.3	936	937	749.6	8.8	0.04	0.03	10.65	39.0	<0.01	0.03	0.53	0.7
P33A- 08_8.80- 9.01		0.62	4	2.5	1020	1020	408.4	8.9	0.08	0.05	11.50	42.1	<0.01	<0.01	0.09	0.9
P33A- 10_1.00- 1.23		0.70	4	1.6	958	960	614.4	8.4	0.05	0.03	10.70	39.2	<0.01	0.01	0.26	<0.2
P33A- 10_8.83- 9.00		0.58	4	4.1	955	959	236.1	8.4	0.13	0.03	11.00	40.3	0.07	0.01	0.15	0.4
P86- 01A_0.31- 050		0.60	4	<0.3	1065	1065	6810	8.7	<0.01	<0.01	12.30	45.1	<0.01	0.01	0.09	0.3
P86- 02_3.95- 4.16		0.74	4	<0.3	1060	1060	6784	8.8	<0.01	<0.01	12.30	45.1	<0.01	0.01	0.11	<0.2
P86- 02_8.09- 8.30		0.72	4	6.3	956	962	153.90	8.9	0.20	0.17	10.60	38.9	<0.01	0.01	0.74	1.3
P86- 04_6.17- 6.36		0.68	4	3.1	1025	1030	329.0	8.7	0.10	0.04	10.15	37.1	<0.01	0.01	0.48	1.0
P86- 04_8.36- 8.55		0.62	4	8.1	1010	1015	125.05	8.7	0.26	0.12	10.20	37.3	<0.01	0.01	0.59	1.4
P86- 06_3.50- 3.80		0.70	4	<0.3	1060	1060	6784	8.9	<0.01	<0.01	10.70	39.1	<0.01	0.01	0.14	<0.2
P86- 06_5.60- 5.82		0.80	4	1.3	1025	1025	820.0	8.9	0.04	0.02	11.45	42.0	<0.01	0.01	0.36	<0.2
P86- 06_6.76- 6.93		0.62	4	2.8	1010	1015	360.5	8.9	0.09	0.04	10.95	40.0	0.02	<0.01	0.44	0.4
P13D- 02_1.25- 144		0.56	4	0.3	991	991	3171	8.5	0.01	<0.01	11.65	42.6	<0.01	<0.01	0.08	0.2



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Project: ENG.YARC03107- 01

CERTIFICATE OF ANALYSIS VA17154303

Sample Description	Method Analyte Units LOR	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	
		Ba ppm	Be ppm	Bi ppm	Ca %	Cd ppm	Ce ppm	Co ppm	Cr ppm	Cs ppm	Cu ppm	Fe %	Ga ppm	Ge ppm	Hf ppm	In ppm
		10	0.05	0.01	0.01	0.02	0.01	0.1	1	0.05	0.2	0.01	0.05	0.05	0.1	0.005
P29- 01_5.10- 5.33		50	0.37	0.03	35.5	<0.02	1.35	0.5	6	0.22	2.9	0.09	0.54	0.05	0.1	<0.005
P29- 03_6.50- 6.69		120	0.22	0.02	37.4	<0.02	1.03	0.4	2	0.11	1.4	0.03	0.17	0.06	<0.1	<0.005
P29- 04_8.79- 8.93		110	0.07	0.02	37.5	<0.02	1.58	0.6	3	0.10	1.5	0.06	0.51	0.06	0.1	<0.005
P29- 05_2.43- 2.69		20	0.05	0.02	37.3	<0.02	1.25	0.4	2	0.06	1.2	0.07	0.27	0.05	<0.1	<0.005
P29- 05_4.34- 4.57		30	0.06	0.02	35.0	<0.02	1.52	0.5	3	0.10	1.5	0.81	0.43	<0.05	0.1	<0.005
P29- 06_1.84- 2.00		210	0.06	0.02	35.7	<0.02	1.51	1.8	2	0.10	6.0	0.07	0.49	<0.05	0.1	<0.005
P29- 07_0.86- 1.00		40	0.05	0.02	35.8	<0.02	1.66	1.6	2	0.06	5.7	0.07	0.34	<0.05	<0.1	<0.005
P29- 07_4.00- 4.27		130	0.07	0.02	37.1	0.02	1.40	1.7	3	0.11	6.7	0.07	0.55	<0.05	0.1	<0.005
P29- 08_3.00- 3.30		10	0.10	0.02	34.4	0.02	3.02	2.6	4	0.11	6.5	0.39	0.58	<0.05	0.1	<0.005
P13D- 02_5.00- 5.16		10	<0.05	0.05	38.1	0.04	0.94	1.6	2	<0.05	9.7	0.05	0.24	<0.05	<0.1	<0.005
P13D- 03- 0.84- 1.02		20	0.15	0.02	36.2	<0.02	5.57	2.3	6	0.23	5.8	0.20	1.03	<0.05	0.1	<0.005
P13D- 03_3.30- 3.50		30	0.22	0.02	35.7	0.13	5.40	2.5	7	0.26	5.9	0.21	1.22	<0.05	0.2	<0.005
P13D- 04_2.63- 2.83		40	0.21	0.03	35.6	<0.02	7.87	2.7	11	0.39	6.2	0.25	1.67	<0.05	0.3	<0.005
P13D- 04_6.50- 6.70		210	0.16	0.02	34.2	<0.02	4.96	2.5	9	0.28	5.8	0.29	1.32	<0.05	0.2	<0.005
P13D- 05_4.41- 4.63		30	0.06	0.01	34.2	<0.02	1.60	1.6	2	<0.05	4.8	0.08	0.33	<0.05	<0.1	<0.005
P13D- 05_8.23- 8.40		10	<0.05	0.01	35.8	<0.02	1.50	1.6	2	<0.05	4.4	0.04	0.32	<0.05	<0.1	<0.005
P33A- 01_3.24- 3.40		20	0.13	0.02	21.7	<0.02	2.54	1.2	3	0.09	4.6	0.09	0.85	0.21	0.1	<0.005
P33A- 01_7.50- 7.69		70	0.10	0.01	23.1	<0.02	2.36	1.3	2	0.05	4.6	0.07	0.73	0.24	<0.1	<0.005
P33A- 02_4.20- 4.38		20	0.08	0.01	21.9	<0.02	2.05	1.2	3	0.09	4.1	0.09	0.86	0.25	0.1	<0.005
P33A- 02_5.08- 5.25		260	0.07	0.01	35.3	<0.02	2.96	1.7	3	0.09	4.5	0.07	0.73	0.09	0.1	<0.005
P33A- 03_6.06- 6.31		10	0.07	0.01	21.5	<0.02	2.48	1.2	3	0.10	4.0	0.09	0.86	0.20	0.1	<0.005
P33A- 03_9.15- 9.39		<10	0.06	0.01	21.4	<0.02	1.91	1.2	1	0.08	3.6	0.07	0.84	0.24	<0.1	<0.005
P33A- 04_5.46- 5.71																
P33A- 04_9.12- 9.30		160	0.08	0.01	22.7	<0.02	2.77	1.2	4	0.12	3.8	0.18	0.98	0.20	0.2	<0.005
P33A- 06_0.50- 0.80		70	0.13	0.04	21.5	0.02	9.41	0.6	2	0.09	4.1	0.17	1.11	0.14	0.5	0.006
P33A- 07_2.50- 2.71		20	0.05	0.03	23.3	<0.02	2.02	0.4	2	0.07	4.4	0.09	0.37	0.18	0.1	<0.005
P33A- 07_6.25- 6.41		70	<0.05	0.03	25.5	<0.02	1.01	0.3	1	0.05	1.8	0.03	0.22	0.21	<0.1	<0.005
P33A- 08_3.50- 4.30		90	0.12	0.04	28.5	0.02	5.27	1.7	9	0.24	4.6	0.29	1.42	0.20	0.2	<0.005
P33A- 08_8.80- 9.01		20	0.07	0.03	22.6	<0.02	3.69	0.5	2	0.06	2.2	0.17	0.33	0.23	<0.1	<0.005
P33A- 10_1.00- 1.23		50	0.10	0.03	35.1	0.03	2.84	0.8	4	0.16	2.5	0.12	0.74	0.18	0.1	<0.005
P33A- 10_8.83- 9.00		3680	0.05	0.03	34.4	<0.02	2.11	0.5	2	0.16	1.9	0.15	0.49	0.14	0.1	<0.005
P86- 01A_0.31- 050		10	0.07	0.03	21.0	<0.02	1.54	0.3	2	0.07	1.5	0.19	0.27	0.23	<0.1	<0.005
P86- 02_3.95- 4.16		10	0.06	0.03	21.5	<0.02	2.09	0.4	2	0.09	1.0	0.16	0.36	0.28	<0.1	<0.005
P86- 02_8.09- 8.30		60	0.27	0.03	19.20	<0.02	7.90	0.6	7	0.64	0.7	0.50	1.78	0.20	0.4	0.006
P86- 04_6.17- 6.36		50	0.19	0.03	20.3	<0.02	5.62	0.5	7	0.42	0.8	0.33	1.19	0.25	0.2	0.005
P86- 04_8.36- 8.55		20	0.21	0.03	20.0	<0.02	7.99	0.7	6	0.49	1.7	0.49	1.43	0.23	0.3	0.007
P86- 06_3.50- 3.80		10	0.08	0.03	20.8	<0.02	1.95	0.5	2	0.11	1.3	0.16	0.44	0.23	0.1	<0.005
P86- 06_5.60- 5.82		20	0.19	0.02	20.5	<0.02	4.84	0.5	4	0.30	1.3	0.26	0.88	0.25	0.2	0.005
P86- 06_6.76- 6.93		20	0.17	0.02	20.8	<0.02	4.82	0.5	5	0.37	0.7	0.34	1.08	0.25	0.2	<0.005
P13D- 02_1.25- 1.44		10	0.06	0.02	36.9	<0.02	1.09	0.4	1	<0.05	0.9	0.06	0.24	0.19	<0.1	<0.005

***** See Appendix Page for comments regarding this certificate *****



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CERTIFICATE OF ANALYSIS VA17154303

Sample Description	Method Analyte Units LOR	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61
		K %	La ppm	Li ppm	Mg %	Mn ppm	Mo ppm	Na %	Nb ppm	Ni ppm	P ppm	Pb ppm	Rb ppm	Re ppm	S %	Sb ppm
P29- 01_5.10- 5.33		0.08	0.6	13.5	1.35	47	0.30	0.02	0.5	2.2	20	1.4	4.6	0.002	0.06	0.10
P29- 03_6.50- 6.69		0.02	0.5	7.9	0.64	32	0.22	0.02	0.2	0.7	10	0.6	1.8	0.002	0.04	0.06
P29- 04_8.79- 8.93		0.08	0.7	3.0	0.37	35	0.25	0.01	0.3	1.7	40	0.7	3.1	<0.002	0.07	0.09
P29- 05_2.43- 2.69		0.05	0.7	1.4	0.95	69	0.29	0.01	0.2	1.1	10	0.6	1.7	<0.002	0.04	0.07
P29- 05_4.34- 4.57		0.08	0.7	2.3	1.30	47	0.20	0.01	0.3	1.1	30	0.8	2.8	<0.002	0.96	0.08
P29- 06_1.84- 2.00		0.07	0.8	2.1	0.39	39	0.26	0.01	0.3	2.7	20	1.5	3.0	<0.002	0.07	0.05
P29- 07_0.86- 1.00		0.04	1.1	1.3	0.82	83	0.71	0.01	0.1	2.3	<10	1.0	1.8	<0.002	0.03	<0.05
P29- 07_4.00- 4.27		0.07	0.7	2.3	0.99	42	0.16	0.01	0.3	2.4	20	1.4	3.0	<0.002	0.03	<0.05
P29- 08_3.00- 3.30		0.09	2.0	2.1	0.74	180	1.00	0.02	0.3	7.9	170	1.9	3.5	0.005	0.40	0.14
P13D- 02_5.00- 5.16		0.01	0.6	1.1	1.55	46	0.43	0.01	0.1	2.9	10	1.4	0.7	0.003	0.04	<0.05
P13D- 03- 0.84- 1.02		0.17	4.6	2.7	0.31	173	0.19	0.02	0.6	5.0	220	2.3	7.1	<0.002	0.14	0.08
P13D- 03_3.30- 3.50		0.21	3.8	4.1	0.50	167	0.19	0.02	0.7	5.2	140	2.2	8.1	0.002	0.19	0.08
P13D- 04_2.63- 2.83		0.29	5.5	5.4	0.39	158	0.29	0.02	1.1	5.7	170	2.7	11.3	<0.002	0.22	0.07
P13D- 04_6.50- 6.70		0.21	3.3	3.5	0.58	181	0.23	0.02	0.9	7.0	260	2.3	8.3	<0.002	0.30	0.09
P13D- 05_4.41- 4.63		0.02	0.8	2.2	3.12	45	1.22	0.01	0.1	3.5	20	0.9	1.0	0.005	0.05	0.09
P13D- 05_8.23- 8.40		0.02	0.8	1.4	0.66	25	0.38	0.01	0.1	1.9	10	0.6	0.8	0.003	0.04	0.05
P33A- 01_3.24- 3.40		0.06	1.1	9.4	11.90	42	0.25	0.02	0.2	2.0	30	0.9	2.7	<0.002	0.02	0.07
P33A- 01_7.50- 7.69		0.03	1.1	6.1	12.55	45	2.44	0.02	0.1	2.2	<10	0.8	1.5	0.006	0.09	0.08
P33A- 02_4.20- 4.38		0.07	1.0	10.3	12.00	40	0.44	0.02	0.3	1.9	40	0.6	2.8	0.002	0.02	<0.05
P33A- 02_5.08- 5.25		0.06	1.4	5.8	2.30	22	0.71	0.01	0.2	3.9	20	0.6	2.7	0.002	0.11	0.06
P33A- 03_6.06- 6.31		0.07	1.2	10.2	11.65	45	0.49	0.01	0.3	1.9	20	0.8	3.1	<0.002	0.05	<0.05
P33A- 03_9.15- 9.39		0.05	1.0	3.9	13.15	37	0.80	0.02	0.2	2.2	10	0.8	2.7	0.002	0.04	<0.05
P33A- 04_5.46- 5.71																
P33A- 04_9.12- 9.30		0.09	1.3	11.0	10.35	42	0.67	0.02	0.3	1.8	20	0.6	4.2	<0.002	0.13	0.06
P33A- 06_0.50- 0.80		0.25	4.6	4.7	10.15	43	1.17	0.10	1.2	4.3	30	3.3	7.5	0.004	0.02	0.09
P33A- 07_2.50- 2.71		0.05	0.9	5.3	10.45	42	1.48	0.02	0.2	4.8	20	3.1	2.3	0.002	0.01	0.09
P33A- 07_6.25- 6.41		0.02	0.5	1.2	9.93	44	0.63	0.01	0.1	1.5	10	1.0	1.2	0.002	0.03	0.06
P33A- 08_3.50- 4.30		0.17	2.7	4.8	5.38	49	0.53	0.09	0.5	5.3	20	2.3	6.1	0.002	0.04	0.07
P33A- 08_8.80- 9.01		0.04	1.5	3.2	11.10	42	2.21	0.02	0.1	2.1	20	1.4	1.8	0.011	0.08	0.13
P33A- 10_1.00- 1.23		0.12	1.7	3.5	0.36	91	0.46	0.01	0.4	2.7	120	1.4	4.9	<0.002	0.05	0.09
P33A- 10_8.83- 9.00		0.06	1.0	3.4	1.07	54	0.88	<0.01	0.2	1.9	20	0.8	2.9	<0.002	0.14	0.29
P86- 01A_0.31- 050		0.05	1.0	2.8	13.15	193	0.48	0.02	0.2	0.5	50	1.4	1.6	<0.002	<0.01	<0.05
P86- 02_3.95- 4.16		0.06	1.2	2.9	12.95	199	0.16	0.01	0.2	0.9	150	1.4	2.0	<0.002	<0.01	<0.05
P86- 02_8.09- 8.30		0.49	4.0	12.4	12.05	201	0.85	0.02	1.4	1.9	60	0.9	14.9	<0.002	0.24	0.11
P86- 04_6.17- 6.36		0.28	3.0	7.7	12.90	206	0.31	0.02	0.8	2.0	60	0.6	9.5	<0.002	0.12	0.07
P86- 04_8.36- 8.55		0.32	4.1	9.5	12.50	231	0.64	0.02	1.1	2.8	90	2.6	11.4	0.012	0.32	0.09
P86- 06_3.50- 3.80		0.08	1.1	3.6	13.05	178	0.18	0.01	0.3	1.1	50	1.5	2.5	<0.002	<0.01	<0.05
P86- 06_5.60- 5.82		0.22	2.6	6.4	12.90	185	0.22	0.02	0.6	2.2	70	1.8	6.7	<0.002	0.06	0.06
P86- 06_6.76- 6.93		0.27	2.6	7.1	13.05	200	0.32	0.02	0.7	1.6	50	0.7	8.2	<0.002	0.13	0.07
P13D- 02_1.25- 144		0.03	0.6	2.3	0.47	76	0.17	0.01	0.1	0.5	10	<0.5	1.2	<0.002	0.02	0.05



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CERTIFICATE OF ANALYSIS VA17154303

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		Sc ppm 0.1	Se ppm 1	Sn ppm 0.2	Sr ppm 0.2	Ta ppm 0.05	Te ppm 0.05	Th ppm 0.01	Ti % 0.005	Tl ppm 0.02	U ppm 0.1	V ppm 1	W ppm 0.1	Y ppm 0.1	Zn ppm 2	Zr ppm 0.5
P29- 01_5.10- 5.33		0.3	1	0.2	240	0.12	<0.05	0.20	0.009	0.05	1.0	4	0.1	0.5	<2	2.4
P29- 03_6.50- 6.69		0.1	1	<0.2	260	0.08	<0.05	0.07	<0.005	0.03	0.7	3	<0.1	0.4	<2	0.5
P29- 04_8.79- 8.93		0.4	1	<0.2	326	<0.05	<0.05	0.23	0.009	0.02	0.8	3	0.1	0.6	<2	2.6
P29- 05_2.43- 2.69		0.2	1	<0.2	257	<0.05	<0.05	0.15	0.006	0.02	0.7	3	<0.1	0.5	<2	1.7
P29- 05_4.34- 4.57		0.3	1	<0.2	271	<0.05	<0.05	0.22	0.009	0.02	0.7	3	<0.1	0.6	2	2.5
P29- 06_1.84- 2.00		0.4	1	<0.2	283	<0.05	<0.05	0.22	0.008	0.03	0.8	3	<0.1	0.6	<2	2.2
P29- 07_0.86- 1.00		0.3	1	<0.2	290	<0.05	<0.05	0.11	<0.005	0.03	1.2	3	<0.1	0.8	<2	1.3
P29- 07_4.00- 4.27		0.4	1	<0.2	312	<0.05	<0.05	0.21	0.009	0.02	0.8	3	<0.1	0.6	2	2.5
P29- 08_3.00- 3.30		0.6	1	<0.2	308	<0.05	<0.05	0.24	0.010	0.09	1.3	3	<0.1	3.6	3	2.5
P13D- 02_5.00- 5.16		0.2	1	<0.2	228	<0.05	<0.05	0.08	<0.005	0.02	0.9	3	<0.1	0.3	6	0.7
P13D- 03- 0.84- 1.02		1.1	1	<0.2	268	<0.05	<0.05	0.50	0.018	0.04	0.9	5	0.1	8.1	2	5.0
P13D- 03_3.30- 3.50		1.1	1	0.2	356	0.05	<0.05	0.62	0.023	0.04	1.0	5	0.1	5.6	30	5.9
P13D- 04_2.63- 2.83		1.7	1	0.2	267	0.07	<0.05	0.99	0.037	0.06	1.2	8	0.1	7.6	2	9.9
P13D- 04_6.50- 6.70		1.2	1	0.2	397	0.06	<0.05	0.69	0.028	0.05	1.2	5	0.1	4.6	8	7.6
P13D- 05_4.41- 4.63		0.2	1	<0.2	278	<0.05	<0.05	0.09	<0.005	0.05	2.5	8	<0.1	0.5	<2	0.9
P13D- 05_8.23- 8.40		0.2	1	<0.2	247	<0.05	<0.05	0.08	<0.005	0.04	0.9	2	<0.1	0.4	<2	0.7
P33A- 01_3.24- 3.40		0.4	1	<0.2	143.5	<0.05	<0.05	0.22	0.007	0.03	0.8	3	<0.1	1.0	<2	2.1
P33A- 01_7.50- 7.69		0.3	1	<0.2	121.0	<0.05	<0.05	0.13	<0.005	0.13	1.5	6	<0.1	0.8	<2	1.2
P33A- 02_4.20- 4.38		0.4	1	<0.2	152.0	<0.05	<0.05	0.23	0.008	0.03	1.0	4	<0.1	0.7	<2	2.3
P33A- 02_5.08- 5.25		0.4	1	<0.2	270	<0.05	<0.05	0.21	0.008	0.06	1.8	6	0.1	0.8	<2	2.3
P33A- 03_6.06- 6.31		0.4	1	<0.2	103.5	<0.05	<0.05	0.24	0.009	0.03	1.1	4	0.1	0.9	<2	2.6
P33A- 03_9.15- 9.39		0.3	1	<0.2	95.9	<0.05	<0.05	0.18	0.006	0.06	0.9	4	<0.1	0.7	2	1.7
P33A- 04_5.46- 5.71		0.5	1	<0.2	102.5	<0.05	<0.05	0.31	0.010	0.05	2.7	6	0.1	1.0	<2	3.3
P33A- 04_9.12- 9.30		0.7	1	0.2	123.5	0.08	<0.05	1.13	0.015	0.04	1.8	6	0.1	2.5	4	17.7
P33A- 07_2.50- 2.71		0.3	1	<0.2	109.5	<0.05	<0.05	0.20	0.006	0.04	1.5	3	<0.1	0.7	4	2.3
P33A- 07_6.25- 6.41		0.1	1	<0.2	94.8	<0.05	<0.05	0.10	<0.005	0.03	1.2	2	<0.1	0.4	<2	0.9
P33A- 08_3.50- 4.30		1.1	1	<0.2	193.0	<0.05	<0.05	0.69	0.023	0.04	1.4	10	0.1	1.1	7	8.3
P33A- 08_8.80- 9.01		0.6	1	<0.2	121.5	<0.05	<0.05	0.15	<0.005	0.04	1.5	3	0.1	1.3	5	1.4
P33A- 10_1.00- 1.23		0.7	1	<0.2	310	<0.05	<0.05	0.35	0.014	0.17	1.0	4	0.1	2.1	5	4.1
P33A- 10_8.83- 9.00		0.3	1	<0.2	197.0	<0.05	<0.05	0.19	0.007	0.32	0.8	3	<0.1	0.9	<2	2.6
P86- 01A_0.31- 050		0.2	1	<0.2	55.0	<0.05	<0.05	0.15	0.006	0.02	0.3	2	0.1	1.0	2	1.4
P86- 02_3.95- 4.16		0.3	1	<0.2	48.5	<0.05	<0.05	0.18	0.006	<0.02	0.4	2	<0.1	1.2	2	1.8
P86- 02_8.09- 8.30		1.5	1	0.2	50.2	0.09	<0.05	1.22	0.040	0.05	0.8	11	0.2	2.9	2	14.4
P86- 04_6.17- 6.36		1.0	1	0.2	63.0	0.05	<0.05	0.77	0.023	0.06	0.6	6	0.2	2.5	2	7.8
P86- 04_8.36- 8.55		1.3	1	0.2	62.1	0.08	<0.05	1.01	0.030	0.19	0.9	8	0.2	3.2	5	11.8
P86- 06_3.50- 3.80		0.3	1	<0.2	46.6	<0.05	<0.05	0.23	0.008	<0.02	0.4	3	0.1	1.0	<2	2.3
P86- 06_5.60- 5.82		0.7	1	<0.2	59.0	<0.05	<0.05	0.57	0.018	0.02	0.4	4	0.1	2.2	2	5.9
P86- 06_6.76- 6.93		0.9	<1	<0.2	56.2	0.05	<0.05	0.71	0.021	0.03	0.6	5	0.1	2.2	2	7.1
P13D- 02_1.25- 144		0.2	1	<0.2	232	<0.05	<0.05	0.12	<0.005	<0.02	0.8	2	<0.1	0.4	<2	1.2



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		Al2O3 %	BaO %	CaO %	Cr2O3 %	Fe2O3 %	K2O %	MgO %	MnO %	Na2O %	P2O5 %	SO3 %	SiO2 %	SrO %	TiO2 %	Total %
P29- 01_5.10- 5.33		0.38	<0.01	51.7	<0.01	0.12	0.10	2.14	0.01	<0.01	<0.01	0.18	2.21	0.02	0.02	99.68
P29- 03_6.50- 6.69		0.12	<0.01	53.9	<0.01	0.04	0.02	0.91	<0.01	<0.01	<0.01	0.13	0.69	0.02	<0.01	99.10
P29- 04_8.79- 8.93		0.34	<0.01	53.6	<0.01	0.08	0.10	0.47	0.01	<0.01	0.01	0.22	1.95	0.03	0.02	99.33
P29- 05_2.43- 2.69		0.22	<0.01	52.8	<0.01	0.10	0.06	1.42	0.01	<0.01	<0.01	0.12	1.30	0.03	0.01	99.20
P29- 05_4.34- 4.57		0.32	<0.01	50.7	<0.01	1.23	0.10	2.08	0.01	<0.01	<0.01	2.35	2.58	0.03	0.02	100.60
P29- 06_1.84- 2.00		0.30	0.01	53.8	<0.01	0.10	0.09	0.51	0.01	<0.01	<0.01	0.20	1.74	0.03	0.02	99.65
P29- 07_0.86- 1.00		0.22	<0.01	52.3	<0.01	0.11	0.06	1.26	0.01	<0.01	<0.01	0.09	2.25	0.03	0.01	99.59
P29- 07_4.00- 4.27		0.31	0.01	52.8	<0.01	0.10	0.09	1.48	0.01	<0.01	<0.01	0.09	1.90	0.03	0.02	99.91
P29- 08_3.00- 3.30		0.39	<0.01	52.8	<0.01	0.59	0.11	1.14	0.03	<0.01	0.04	0.98	1.79	0.03	0.02	100.10
P13D- 02_5.00- 5.16		0.08	<0.01	52.7	<0.01	0.08	0.02	2.28	0.01	<0.01	<0.01	0.12	0.70	0.02	0.01	100.10
P13D- 03- 0.84- 1.02		0.72	<0.01	52.6	<0.01	0.30	0.21	0.37	0.02	<0.01	0.04	0.35	2.65	0.03	0.03	99.29
P13D- 03_3.30- 3.50		0.84	<0.01	51.6	<0.01	0.30	0.25	0.69	0.02	<0.01	0.03	0.48	3.32	0.03	0.04	99.20
P13D- 04_2.63- 2.83		1.19	<0.01	51.2	<0.01	0.36	0.35	0.49	0.02	<0.01	0.03	0.53	3.86	0.02	0.07	99.17
P13D- 04_6.50- 6.70		0.88	0.01	51.2	<0.01	0.42	0.25	0.84	0.02	<0.01	0.06	0.75	3.21	0.03	0.05	99.04
P13D- 05_4.41- 4.63		0.17	<0.01	49.5	<0.01	0.12	0.03	4.79	0.01	<0.01	<0.01	0.13	0.71	0.02	0.01	99.73
P13D- 05_8.23- 8.40		0.10	<0.01	53.3	<0.01	0.06	0.03	0.99	<0.01	<0.01	<0.01	0.15	1.29	0.02	0.01	99.36
P33A- 01_3.24- 3.40		0.30	<0.01	31.6	<0.01	0.14	0.08	18.90	0.01	<0.01	0.01	0.09	1.63	0.01	0.01	98.92
P33A- 01_7.50- 7.69		0.16	<0.01	31.5	<0.01	0.10	0.04	18.85	0.01	<0.01	<0.01	0.27	2.01	0.01	0.01	98.90
P33A- 02_4.20- 4.38		0.33	<0.01	31.5	<0.01	0.12	0.09	19.10	<0.01	<0.01	0.01	0.11	1.77	0.01	0.01	99.11
P33A- 02_5.08- 5.25		0.27	0.01	49.7	<0.01	0.09	0.08	3.46	<0.01	<0.01	<0.01	0.33	2.02	0.02	0.01	99.25
P33A- 03_6.06- 6.31		0.33	<0.01	31.2	<0.01	0.13	0.09	18.55	0.01	<0.01	0.01	0.18	3.30	0.01	0.02	99.17
P33A- 03_9.15- 9.39		0.23	<0.01	30.0	<0.01	0.09	0.07	20.5	<0.01	<0.01	<0.01	0.16	1.25	0.01	0.01	98.89
P33A- 04_5.46- 5.71																
P33A- 04_9.12- 9.30		0.42	0.01	33.2	<0.01	0.28	0.12	16.40	0.01	0.01	0.01	0.38	3.84	0.01	0.02	99.12
P33A- 06_0.50- 0.80		0.81	<0.01	32.0	<0.01	0.24	0.32	16.45	0.01	0.11	0.01	0.10	5.93	0.01	0.02	99.27
P33A- 07_2.50- 2.71		0.26	<0.01	34.2	<0.01	0.13	0.07	16.75	0.01	<0.01	0.01	0.09	2.22	0.01	0.01	99.21
P33A- 07_6.25- 6.41		0.12	<0.01	36.5	<0.01	0.04	0.03	15.35	0.01	<0.01	<0.01	0.16	0.79	0.01	0.01	99.25
P33A- 08_3.50- 4.30		1.00	<0.01	40.6	<0.01	0.42	0.21	8.33	0.01	0.09	0.01	0.15	6.90	0.02	0.04	99.28
P33A- 08_8.80- 9.01		0.18	<0.01	32.5	<0.01	0.25	0.05	17.55	0.01	<0.01	0.01	0.24	3.16	0.01	0.01	99.21
P33A- 10_1.00- 1.23		0.50	<0.01	52.5	<0.01	0.18	0.14	0.42	0.01	<0.01	0.02	0.14	2.59	0.03	0.03	99.06
P33A- 10_8.83- 9.00		0.29	0.37	51.4	<0.01	0.21	0.08	1.65	0.01	<0.01	<0.01	0.37	2.51	0.02	0.02	98.94
P86- 01A_0.31- 050		0.17	<0.01	30.1	<0.01	0.26	0.07	20.8	0.02	<0.01	0.01	0.03	0.57	<0.01	0.01	98.91
P86- 02_3.95- 4.16		0.20	<0.01	30.6	<0.01	0.23	0.08	20.4	0.03	<0.01	0.03	0.05	0.82	<0.01	0.01	99.05
P86- 02_8.09- 8.30		1.39	0.01	27.3	<0.01	0.73	0.60	19.05	0.03	<0.01	0.01	0.61	6.67	<0.01	0.07	99.05
P86- 04_6.17- 6.36		0.91	<0.01	29.1	<0.01	0.47	0.34	20.2	0.03	<0.01	0.02	0.33	2.26	<0.01	0.04	99.21
P86- 04_8.36- 8.55		1.12	<0.01	28.8	<0.01	0.72	0.39	19.95	0.03	0.01	0.02	0.81	2.63	0.01	0.06	99.31
P86- 06_3.50- 3.80		0.28	<0.01	30.1	<0.01	0.23	0.10	21.0	0.02	<0.01	0.01	0.05	0.74	<0.01	0.01	99.17
P86- 06_5.60- 5.82		0.66	<0.01	29.0	0.01	0.39	0.25	20.4	0.02	<0.01	0.02	0.16	3.24	<0.01	0.03	99.40
P86- 06_6.76- 6.93		0.79	<0.01	28.8	0.01	0.48	0.32	20.3	0.02	<0.01	0.02	0.29	3.48	<0.01	0.03	99.36
P13D- 02_1.25- 144		0.14	<0.01	54.3	<0.01	0.08	0.03	0.65	0.01	<0.01	0.01	0.04	0.61	0.02	0.01	99.38



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To: TETRA TECH CANADA INC.
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 Account: TGM

Project: ENG.YARC03107- 01

CERTIFICATE OF ANALYSIS VA17154303

Sample Description	Method Analyte Units LOR	OA- GRA05x LOI 1000 % 0.01
P29- 01_5.10- 5.33		42.78
P29- 03_6.50- 6.69		43.25
P29- 04_8.79- 8.93		42.48
P29- 05_2.43- 2.69		43.11
P29- 05_4.34- 4.57		41.14
P29- 06_1.84- 2.00		42.81
P29- 07_0.86- 1.00		43.21
P29- 07_4.00- 4.27		43.04
P29- 08_3.00- 3.30		42.14
P13D- 02_5.00- 5.16		44.07
P13D- 03- 0.84- 1.02		41.94
P13D- 03_3.30- 3.50		41.57
P13D- 04_2.63- 2.83		41.03
P13D- 04_6.50- 6.70		41.29
P13D- 05_4.41- 4.63		44.22
P13D- 05_8.23- 8.40		43.39
P33A- 01_3.24- 3.40		46.12
P33A- 01_7.50- 7.69		45.91
P33A- 02_4.20- 4.38		46.04
P33A- 02_5.08- 5.25		43.24
P33A- 03_6.06- 6.31		45.33
P33A- 03_9.15- 9.39		46.54
P33A- 04_5.46- 5.71		
P33A- 04_9.12- 9.30		44.38
P33A- 06_0.50- 0.80		43.24
P33A- 07_2.50- 2.71		45.43
P33A- 07_6.25- 6.41		46.21
P33A- 08_3.50- 4.30		41.48
P33A- 08_8.80- 9.01		45.22
P33A- 10_1.00- 1.23		42.47
P33A- 10_8.83- 9.00		41.99
P86- 01A_0.31- 050		46.82
P86- 02_3.95- 4.16		46.53
P86- 02_8.09- 8.30		42.54
P86- 04_6.17- 6.36		45.47
P86- 04_8.36- 8.55		44.70
P86- 06_3.50- 3.80		46.57
P86- 06_5.60- 5.82		45.19
P86- 06_6.76- 6.93		44.78
P13D- 02_1.25- 144		43.45



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CERTIFICATE OF ANALYSIS VA17154303

CERTIFICATE COMMENTS																					
	<p style="text-align: center;">ANALYTICAL COMMENTS</p> <p>Applies to Method: REE's may not be totally soluble in this method. ME- MS61</p>																				
	<p style="text-align: center;">LABORATORY ADDRESSES</p> <p>Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.</p> <table><tbody><tr><td>Applies to Method: C- GAS05</td><td>CRU- 31</td><td>EXTRA- 01</td><td>LOG- 22</td></tr><tr><td>ME- MS61</td><td>ME- XRF26</td><td>OA- ELE07</td><td>OA- GRA05x</td></tr><tr><td>OA- VOL08</td><td>PUL- 31</td><td>S- GRA06a</td><td>S- IR07</td></tr><tr><td>S- IR08</td><td>SND- 01</td><td>SPL- 21</td><td>SPL- 21X</td></tr><tr><td>WEI- 21</td><td></td><td></td><td></td></tr></tbody></table>	Applies to Method: C- GAS05	CRU- 31	EXTRA- 01	LOG- 22	ME- MS61	ME- XRF26	OA- ELE07	OA- GRA05x	OA- VOL08	PUL- 31	S- GRA06a	S- IR07	S- IR08	SND- 01	SPL- 21	SPL- 21X	WEI- 21			
Applies to Method: C- GAS05	CRU- 31	EXTRA- 01	LOG- 22																		
ME- MS61	ME- XRF26	OA- ELE07	OA- GRA05x																		
OA- VOL08	PUL- 31	S- GRA06a	S- IR07																		
S- IR08	SND- 01	SPL- 21	SPL- 21X																		
WEI- 21																					



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 Account: TGM

CERTIFICATE VA17154368

Project: ENG.YARC03107- 01

This report is for 1 Sand sample submitted to our lab in Vancouver, BC, Canada on 25- JUL- 2017.

The following have access to data associated with this certificate:

S. KINGSTON

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
LOG- 22	Sample login - Rcd w/o BarCode
PUL- 31	Pulverize split to 85% <75 um
SPL- 21X	Addnl Crush Split w No Analysis
SND- 01	Send samples to external laboratory

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	
ME- MS61	48 element four acid ICP- MS	
ME- XRF26	Whole Rock By Fusion/XRF	XRF
OA- GRA05x	LOI for XRF	WST- SEQ
OA- VOL08	Basic Acid Base Accounting	
S- IR08	Total Sulphur (Leco)	LECO
OA- ELE07	Paste pH	
S- GRA06a	Sulfate Sulfur (HCl leachable)	WST- SEQ
S- IR07	Sulphide Sulphur (Leco)	LECO
C- GAS05	Inorganic Carbon (CO2)	

To: TETRA TECH CANADA INC.
 ATTN: S. KINGSTON
 885 DUNSMUIR STREET
 VANCOUVER BC V6C 1N5

This is the Final Report and supersedes any preliminary report with this certificate number. Results apply to samples as submitted. All pages of this report have been checked and approved for release.

***** See Appendix Page for comments regarding this certificate *****

Signature:

Colin Ramshaw, Vancouver Laboratory Manager



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CERTIFICATE OF ANALYSIS VA17154368

Sample Description	Method Analyte Units LOR	WEI- 21 Recvd Wt. kg 0.02	OA- VOL08 FIZZ RAT Unity 1	OA- VOL08 MPA tCaCO3/1Kt 0.3	OA- VOL08 NNP tCaCO3/1Kt 1	OA- VOL08 NP tCaCO3/1Kt 1	OA- VOL08 Ratio (N) Unity 0.01	OA- ELE07 pH Unity 0.1	S- IR08 S % 0.01	S- IR07 Sulphide % 0.01	C- GAS05 C % 0.05	C- GAS05 CO2 % 0.2	S- GRA06a S % 0.01	ME- MS61 Ag ppm 0.01	ME- MS61 Al % 0.01	ME- MS61 As ppm 0.2
P86- 04 SAND		0.30	4	<0.3	920	920	5888	8.8	<0.01	0.01	10.30	37.8	<0.01	7.16	0.84	1.0



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CERTIFICATE OF ANALYSIS VA17154368

Sample Description	Method	Analyte	Units	LOR	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61			
					Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge	Hf	In
					ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
					10	0.05	0.01	0.01	0.02	0.01	0.1	1	0.05	0.2	0.01	0.05	0.05	0.1	0.005
P86- 04 SAND					70	0.24	0.04	18.65	0.02	8.80	1.3	9	0.26	14.9	0.46	1.85	0.14	0.5	0.005

***** See Appendix Page for comments regarding this certificate *****



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CERTIFICATE OF ANALYSIS VA17154368

Sample Description	Method Analyte Units LOR	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	
		K %	La ppm	Li ppm	Mg %	Mn ppm	Mo ppm	Na %	Nb ppm	Ni ppm	P ppm	Pb ppm	Rb ppm	Re ppm	S %	Sb ppm
P86- 04 SAND		0.01	0.5	0.2	0.01	5	0.05	0.01	0.1	0.2	10	0.5	0.1	0.002	0.01	0.05
		0.39	4.6	5.4	11.80	193	8.59	0.24	0.8	4.0	120	2.9	13.2	<0.002	<0.01	0.06

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CERTIFICATE OF ANALYSIS VA17154368

Sample Description	Method Analyte Units LOR	ME- MS61 Sc ppm 0.1	ME- MS61 Se ppm 1	ME- MS61 Sn ppm 0.2	ME- MS61 Sr ppm 0.2	ME- MS61 Ta ppm 0.05	ME- MS61 Te ppm 0.05	ME- MS61 Th ppm 0.01	ME- MS61 Ti % 0.005	ME- MS61 Tl ppm 0.02	ME- MS61 U ppm 0.1	ME- MS61 V ppm 1	ME- MS61 W ppm 0.1	ME- MS61 Y ppm 0.1	ME- MS61 Zn ppm 2	ME- MS61 Zr ppm 0.5
P86- 04 SAND		0.9	1	0.2	65.1	0.07	<0.05	1.34	0.026	0.06	0.5	6	28.6	2.7	6	17.4



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CERTIFICATE OF ANALYSIS VA17154368

Sample Description	Method Analyte Units LOR	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26
		Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	SiO2	SrO	TiO2	Total
		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
P86- 04 SAND		1.57	<0.01	26.3	<0.01	0.63	0.45	18.45	0.02	0.28	0.03	0.01	10.66	<0.01	0.04	99.20

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CERTIFICATE OF ANALYSIS VA17154368

Sample Description	Method Analyte Units LOR	OA- GRA05x LOI 1000 % 0.01
P86- 04 SAND		40.72

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 Account: TGM

Project: ENG.YARC03107- 01

CERTIFICATE OF ANALYSIS VA17154368

CERTIFICATE COMMENTS																	
	ANALYTICAL COMMENTS																
Applies to Method:	REE's may not be totally soluble in this method. ME- MS61																
	LABORATORY ADDRESSES																
Applies to Method:	<p>Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.</p> <table border="0"> <tr> <td>C- GAS05</td> <td>LOG- 22</td> <td>ME- MS61</td> <td>ME- XRF26</td> </tr> <tr> <td>OA- ELE07</td> <td>OA- GRA05x</td> <td>OA- VOL08</td> <td>PUL- 31</td> </tr> <tr> <td>S- GRA06a</td> <td>S- IR07</td> <td>S- IR08</td> <td>SND- 01</td> </tr> <tr> <td>SPL- 21X</td> <td>WEI- 21</td> <td></td> <td></td> </tr> </table>	C- GAS05	LOG- 22	ME- MS61	ME- XRF26	OA- ELE07	OA- GRA05x	OA- VOL08	PUL- 31	S- GRA06a	S- IR07	S- IR08	SND- 01	SPL- 21X	WEI- 21		
C- GAS05	LOG- 22	ME- MS61	ME- XRF26														
OA- ELE07	OA- GRA05x	OA- VOL08	PUL- 31														
S- GRA06a	S- IR07	S- IR08	SND- 01														
SPL- 21X	WEI- 21																



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 Finalized Date: 19- SEP- 2017
 Account: EBAENG

CERTIFICATE YW17178944

Project: ENG.YARC03107- 01

This report is for 23 Rock samples submitted to our lab in Yellowknife, NT, Canada on 24- AUG- 2017.

The following have access to data associated with this certificate:

SCOTT KINGSTON

SAMPLE PREPARATION

ALS CODE	DESCRIPTION
WEI- 21	Received Sample Weight
LOG- 22	Sample login - Rcd w/o BarCode
CRU- 31	Fine crushing - 70% < 2mm
SND- 01	Send samples to external laboratory
CRU- QC	Crushing QC Test
PUL- QC	Pulverizing QC Test
SPL- 21	Split sample - riffle splitter
PUL- 31	Pulverize split to 85% < 75 um

ANALYTICAL PROCEDURES

ALS CODE	DESCRIPTION	INSTRUMENT
S- IR07	Sulphide Sulphur (Leco)	LECO
C- GAS05	Inorganic Carbon (CO2)	
ME- MS61	48 element four acid ICP- MS	
ME- XRF26	Whole Rock By Fusion/XRF	XRF
OA- GRA05x	LOI for XRF	WST- SEQ
OA- VOL08	Basic Acid Base Accounting	
S- IR08	Total Sulphur (Leco)	LECO
OA- ELE07	Paste pH	
S- GRA06a	Sulfate Sulfur (HCl leachable)	WST- SEQ

To: TETRA TECH CANADA INC.
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***** See Appendix Page for comments regarding this certificate *****

Signature:


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 Account: EBAENG

Project: ENG.YARC03107- 01

CERTIFICATE OF ANALYSIS YW17178944

Sample Description	Method Analyte Units LOR	WEI- 21	OA- VOL08	OA- VOL08	OA- VOL08	OA- VOL08	OA- VOL08	OA- ELE07	S- IR08	S- IR07	C- GAS05	C- GAS05	S- GRA06a	ME- MS61	ME- MS61	ME- MS61
		Recvd Wt. kg	FIZZ RAT Unity	MPA tCaCO3/1Kt	NNP tCaCO3/1Kt	NP tCaCO3/1Kt	Ratio (N) Unity	pH Unity	S %	Sulphide %	C %	CO2 %	S %	Ag ppm	Al %	As ppm
P1- 02_2.0- 2.4		1.24	3	0.3	349	349	1117.0	8.8	0.01	0.01	4.02	14.7	<0.01	0.02	2.78	1.1
P1- 10.2_0.9- 1.0		0.50	3	0.3	89	89	284.8	8.9	0.01	<0.01	0.99	3.6	<0.01	0.02	2.23	0.8
P1- 18_3.0- 3.5		0.58	3	0.3	114	114	364.8	8.9	0.01	<0.01	1.32	4.9	<0.01	0.02	2.28	0.6
P13B- 01.2_4.8- 5.0		1.33	3	0.3	157	157	502.4	8.4	0.01	0.02	1.70	6.3	0.01	0.05	5.35	3.5
P13B- 03_3.5- 4.0		0.43	2	<0.3	59	59	377.6	8.9	<0.01	<0.01	0.67	2.5	<0.01	0.02	2.27	0.7
P13B- 07.2_2.5- 2.6		4.88	4	0.6	969	970	1552.0	9.3	0.02	0.02	11.45	41.9	<0.01	0.01	0.31	0.8
P13B- 09.2_3.7- 3.9		1.07	3	0.3	167	167	534.4	8.3	0.01	0.01	1.91	7.0	<0.01	0.06	5.61	3.7
P13C- 01_2.5- 3.5		0.91	3	0.3	86	86	275.2	8.8	0.01	0.01	1.04	3.8	<0.01	0.03	2.65	1.3
P13C- 09_3.0- 3.5		0.33	2	<0.3	69	69	441.6	8.7	<0.01	<0.01	0.82	3.0	<0.01	0.03	2.66	1.2
P116- 01_2.8- 3.3		0.87	3	0.9	268	269	286.9	8.6	0.03	0.02	3.17	11.6	<0.01	0.13	5.67	3.0
P116- 02_3.6- 4.0		0.86	3	0.9	175	176	187.75	8.4	0.03	0.03	2.00	7.3	<0.01	0.05	6.56	2.4
P116- 11.1_2.0- 3.5		0.89	3	0.6	225	226	361.6	8.5	0.02	0.01	2.58	9.5	<0.01	0.04	6.60	1.5
P116- 13_1.8- 1.9		0.60	3	<0.3	155	155	992.0	8.4	<0.01	<0.01	1.92	7.0	<0.01	0.04	6.59	1.6
P116- 17- 0.6- 0.8		0.96	4	0.3	423	423	1353.5	8.5	0.01	<0.01	4.93	18.1	<0.01	0.04	4.04	1.9
P116- 18_3.6- 3.8		0.83	3	0.6	150	151	241.6	8.4	0.02	0.02	1.66	6.1	<0.01	0.04	7.41	2.0
P98- 01.1_0.0- 2.2		1.57	4	0.3	619	619	1981.0	8.1	0.01	<0.01	6.83	25.0	<0.01	0.05	2.58	2.4
P98- 07_0.3- 0.6		2.50	4	<0.3	891	891	5702	8.4	<0.01	<0.01	10.45	38.2	0.01	0.02	1.08	1.8
P98- 12- 0.1- 0.3		1.18	4	<0.3	899	899	5754	8.3	<0.01	<0.01	10.55	38.6	<0.01	0.03	1.04	2.4
P76- 04_0.1- 0.4		0.20	2	<0.3	26	26	166.40	7.7	<0.01	<0.01	0.27	1.0	<0.01	0.02	4.51	1.5
P76- 05_20- 2.5		0.47	4	0.3	579	579	1853.0	8.6	0.01	0.01	6.80	24.9	0.01	0.03	3.67	1.7
P76- 09_0.1- 0.4		0.72	3	0.3	377	377	1206.5	8.4	0.01	<0.01	4.40	16.1	<0.01	0.03	4.42	3.1
P69- 05- 0.0- 7.2		1.43	4	<0.3	944	944	6042	8.4	<0.01	<0.01	10.95	40.2	<0.01	0.01	0.75	0.9
P69- 03- 0.1- 0.2		0.74	4	0.3	942	942	3014	8.5	0.01	<0.01	11.00	40.3	<0.01	0.01	0.84	0.6



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CERTIFICATE OF ANALYSIS YW17178944

Sample Description	Method Analyte Units LOR	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	ME- MS61	
		Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge	Hf	In
		ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm
P1- 02_2.0- 2.4		270	0.54	0.06	10.90	0.03	25.7	2.4	16	0.51	4.3	0.85	5.64	<0.05	1.3	0.058
P1- 10.2_0.9- 1.0		180	0.43	0.06	2.64	0.03	32.4	1.7	9	0.35	3.1	0.73	4.54	<0.05	1.2	0.033
P1- 18_3.0- 3.5		200	0.49	0.07	3.39	0.02	33.3	1.6	11	0.38	4.2	0.70	4.84	0.08	1.4	0.011
P13B- 01.2_4.8- 5.0		650	1.03	0.18	4.83	0.05	68.7	7.9	35	2.05	19.8	2.04	12.00	0.14	5.5	0.030
P13B- 03_3.5- 4.0		200	0.48	0.08	2.00	0.02	32.8	1.8	12	0.40	5.1	0.76	4.64	0.10	2.6	0.014
P13B- 07.2_2.5- 2.6		30	0.06	0.05	22.1	0.03	5.53	0.8	4	0.09	3.0	0.20	0.76	0.14	0.4	0.006
P13B- 09.2_3.7- 3.9		720	1.06	0.21	3.97	0.04	71.0	9.1	47	2.79	18.5	2.24	13.60	0.15	5.2	0.036
P13C- 01_2.5- 3.5		280	0.42	0.08	2.61	0.02	32.7	1.9	12	0.51	7.0	0.87	5.33	0.12	2.0	0.013
P13C- 09_3.0- 3.5		240	0.47	0.07	2.51	0.03	32.3	1.8	12	0.50	4.6	0.89	5.43	0.11	2.0	0.013
P116- 01_2.8- 3.3		620	1.23	0.31	5.82	0.04	64.0	6.8	32	2.80	15.1	2.46	12.25	0.16	4.0	0.070
P116- 02_3.6- 4.0		570	1.59	0.24	3.88	0.03	89.0	9.7	40	3.73	22.5	2.64	16.00	0.20	4.8	0.042
P116- 11.1_2.0- 3.5		620	1.33	0.20	4.79	0.03	77.1	8.4	37	3.51	14.9	2.52	15.45	0.19	3.9	0.044
P116- 13_1.8- 1.9		790	1.39	0.21	3.63	0.02	79.0	10.5	38	3.52	19.7	2.41	15.65	0.21	6.7	0.036
P116- 17- 0.6- 0.8		520	0.65	0.34	8.86	0.02	48.1	4.9	22	1.36	14.1	2.07	7.77	0.16	3.4	0.051
P116- 18_3.6- 3.8		580	1.74	0.42	3.34	0.03	92.1	10.8	47	4.25	23.7	2.86	17.90	0.20	3.7	0.044
P98- 01.1_0.0- 2.2		260	0.58	0.09	12.45	0.03	35.0	3.7	23	1.14	7.2	1.21	5.60	0.15	3.1	0.020
P98- 07_0.3- 0.6		100	0.25	0.05	17.30	0.02	16.60	2.1	11	0.54	4.9	0.69	2.35	0.16	1.1	0.012
P98- 12- 0.1- 0.3		90	0.26	0.05	18.10	<0.02	13.75	2.1	12	0.52	3.9	0.66	2.26	0.18	0.9	0.009
P76- 04_0.1- 0.4		590	0.69	0.09	1.08	0.02	46.1	3.5	21	1.06	3.5	1.36	9.37	0.21	6.2	0.017
P76- 05_20- 2.5		360	0.72	0.13	12.55	0.03	53.6	5.4	24	1.86	10.9	1.38	8.37	0.22	3.2	0.021
P76- 09_0.1- 0.4		500	0.88	0.14	8.97	<0.02	57.0	5.8	27	1.92	9.7	1.71	9.76	0.23	4.8	0.029
P69- 05- 0.0- 7.2		80	0.21	0.04	19.45	0.02	11.65	1.7	8	0.37	2.6	0.41	1.80	0.19	0.8	0.008
P69- 03- 0.1- 0.2		90	0.14	0.04	19.50	0.02	11.80	2.0	6	0.30	3.3	0.39	1.95	0.22	0.7	0.006



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		K %	La ppm	Li ppm	Mg %	Mn ppm	Mo ppm	Na %	Nb ppm	Ni ppm	P ppm	Pb ppm	Rb ppm	Re ppm	S %	Sb ppm
		0.01	0.5	0.2	0.01	5	0.05	0.01	0.1	0.2	10	0.5	0.1	0.002	0.01	0.05
P1- 02_2.0- 2.4		1.28	12.1	9.9	1.78	157	0.68	0.85	1.7	5.2	240	7.5	37.1	<0.002	0.01	0.14
P1- 10.2_0.9- 1.0		1.01	14.4	6.8	0.80	111	0.18	0.72	1.1	3.7	230	6.4	29.8	<0.002	0.01	0.09
P1- 18_3.0- 3.5		1.09	13.8	6.0	0.87	106	0.45	0.73	1.3	4.0	200	7.2	36.1	<0.002	0.01	0.09
P13B- 01_2.4.8- 5.0		2.75	31.6	17.9	1.66	279	0.43	1.02	7.2	19.8	580	14.5	87.3	<0.002	0.03	0.17
P13B- 03_3.5- 4.0		1.02	13.1	5.0	0.54	119	0.32	0.71	1.4	4.4	290	6.4	31.9	<0.002	0.01	0.11
P13B- 07.2_2.5- 2.6		0.15	2.6	2.7	9.39	57	0.21	0.08	0.3	2.1	40	1.0	4.7	<0.002	0.04	0.10
P13B- 09.2_3.7- 3.9		3.35	32.8	20.1	2.14	279	0.83	0.67	7.9	23.2	540	15.0	102.5	<0.002	0.02	0.17
P13C- 01_2.5- 3.5		1.34	13.1	5.4	0.77	126	0.44	0.77	1.6	5.3	270	7.4	40.2	<0.002	0.01	0.11
P13C- 09_3.0- 3.5		1.25	13.2	5.0	0.53	132	0.39	0.81	1.5	6.0	270	7.4	40.3	<0.002	0.01	0.11
P116- 01_2.8- 3.3		4.54	32.0	18.7	3.74	573	0.46	0.34	7.6	17.2	860	20.3	115.0	<0.002	0.03	0.21
P116- 02_3.6- 4.0		4.67	44.9	21.7	2.78	394	0.50	0.40	9.4	19.7	740	17.4	133.0	0.002	0.04	0.15
P116- 11.1_2.0- 3.5		5.22	39.0	23.2	3.48	320	0.40	0.24	9.6	19.7	740	15.8	128.5	<0.002	0.02	0.12
P116- 13_1.8- 1.9		5.18	40.6	17.1	2.55	385	0.35	0.32	9.9	18.0	640	19.7	147.0	<0.002	0.01	0.12
P116- 17_0.6- 0.8		3.56	22.2	14.9	5.38	876	0.34	0.31	5.0	11.9	850	13.5	75.9	<0.002	0.02	0.12
P116- 18_3.6- 3.8		5.31	46.7	21.4	2.63	380	0.50	0.38	10.7	22.7	630	19.3	133.5	<0.002	0.02	0.13
P98- 01.1_0.0- 2.2		1.28	17.2	13.7	7.99	409	0.53	0.34	3.9	7.0	140	11.0	44.3	<0.002	<0.01	0.13
P98- 07_0.3- 0.6		0.59	8.1	7.9	11.15	247	0.33	0.14	1.8	3.5	120	5.8	19.3	<0.002	<0.01	0.08
P98- 12_0.1- 0.3		0.57	6.7	9.6	11.50	303	0.34	0.14	1.6	3.7	100	7.9	19.2	<0.002	<0.01	0.07
P76- 04_0.1- 0.4		2.39	22.0	10.5	0.52	149	0.49	1.02	5.2	7.2	140	14.9	74.1	<0.002	0.01	0.16
P76- 05_20- 2.5		2.12	26.0	11.4	6.95	276	0.42	0.51	5.6	11.3	380	10.8	66.5	<0.002	<0.01	0.11
P76- 09_0.1- 0.4		2.46	28.5	13.6	5.22	362	0.44	0.73	5.6	14.0	410	13.7	80.7	<0.002	0.01	0.15
P69- 05_0.0- 7.2		0.33	5.6	5.4	12.15	228	0.23	0.13	1.1	2.4	80	2.8	13.3	<0.002	<0.01	0.06
P69- 03_0.1- 0.2		0.43	5.9	6.1	11.95	177	0.32	0.17	1.2	2.6	70	2.9	18.4	0.003	0.01	0.07



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		Sc ppm	Se ppm	Sn ppm	Sr ppm	Ta ppm	Te ppm	Th ppm	Ti %	Tl ppm	U ppm	V ppm	W ppm	Y ppm	Zn ppm	Zr ppm
P1- 02_2.0- 2.4		2.0	<1	0.4	157.0	0.13	<0.05	3.96	0.057	0.25	1.1	14	0.2	4.6	15	48.4
P1- 10.2_0.9- 1.0		1.4	<1	0.3	94.8	0.10	<0.05	4.18	0.045	0.22	0.7	10	0.1	4.1	8	43.9
P1- 18_3.0- 3.5		1.3	<1	0.3	93.2	0.10	<0.05	5.00	0.040	0.20	0.8	9	0.1	4.2	9	53.0
P13B- 01.2_4.8- 5.0		6.3	1	1.3	179.5	0.53	<0.05	12.95	0.233	0.53	2.5	43	0.7	15.4	36	202
P13B- 03_3.5- 4.0		1.7	1	0.3	97.3	0.11	<0.05	4.80	0.051	0.17	0.9	11	0.1	6.3	8	97.8
P13B- 07.2_2.5- 2.6		0.5	1	<0.2	160.5	<0.05	<0.05	0.92	0.012	0.04	0.7	5	<0.1	1.6	2	15.1
P13B- 09.2_3.7- 3.9		7.2	1	1.4	180.5	0.56	<0.05	13.50	0.228	0.56	2.6	47	0.7	16.6	37	194.0
P13C- 01_2.5- 3.5		1.7	<1	0.3	107.5	0.12	<0.05	4.56	0.053	0.25	0.9	12	0.2	5.5	9	76.3
P13C- 09_3.0- 3.5		1.7	1	0.3	108.0	0.15	<0.05	4.44	0.051	0.27	1.0	14	0.2	5.5	10	73.3
P116- 01_2.8- 3.3		7.1	1	1.1	156.0	0.63	<0.05	14.05	0.202	0.47	2.6	36	0.8	22.4	28	144.5
P116- 02_3.6- 4.0		8.0	1	1.5	189.0	0.70	<0.05	16.00	0.247	0.54	2.9	48	0.8	17.7	31	170.0
P116- 11.1_2.0- 3.5		8.0	1	1.3	178.5	0.70	<0.05	14.90	0.252	0.51	2.6	44	0.7	18.2	24	138.5
P116- 13_1.8- 1.9		8.2	1	1.3	197.0	0.74	<0.05	16.60	0.257	0.62	3.2	43	0.8	21.5	24	247
P116- 17- 0.6- 0.8		4.9	1	0.7	115.0	0.38	<0.05	10.30	0.138	0.34	2.3	26	0.5	18.3	17	123.5
P116- 18_3.6- 3.8		8.5	1	1.6	197.5	0.77	<0.05	15.60	0.274	0.56	2.6	52	0.9	16.6	32	131.0
P98- 01.1_0.0- 2.2		3.0	<1	0.6	93.3	0.30	<0.05	6.47	0.110	0.25	1.6	22	1.0	9.8	17	109.0
P98- 07_0.3- 0.6		1.6	<1	0.3	68.5	0.14	<0.05	2.72	0.046	0.10	0.9	10	0.3	5.0	6	40.4
P98- 12- 0.1- 0.3		1.6	1	0.3	65.9	0.12	<0.05	2.54	0.045	0.09	0.9	11	0.2	4.7	8	30.9
P76- 04_0.1- 0.4		3.2	<1	0.7	150.5	0.42	<0.05	9.93	0.153	0.41	2.2	24	0.5	12.0	15	224
P76- 05_20- 2.5		4.1	1	0.9	155.0	0.44	<0.05	10.25	0.153	0.33	2.4	28	0.5	10.8	22	117.5
P76- 09_0.1- 0.4		4.9	<1	0.9	162.5	0.44	<0.05	11.60	0.161	0.46	2.6	33	0.5	15.2	21	174.5
P69- 05- 0.0- 7.2		1.0	<1	0.2	71.3	0.08	<0.05	2.07	0.033	0.10	1.0	10	0.2	3.1	7	30.5
P69- 03- 0.1- 0.2		1.2	<1	0.2	89.4	0.11	<0.05	2.98	0.032	0.12	1.4	12	0.1	3.0	7	26.4



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CERTIFICATE OF ANALYSIS YW17178944

Sample Description	Method Analyte Units LOR	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26	ME- XRF26
		Al2O3 %	BaO %	CaO %	Cr2O3 %	Fe2O3 %	K2O %	MgO %	MnO %	Na2O %	P2O5 %	SO3 %	SiO2 %	SrO %	TiO2 %	Total %
P1- 02_2.0- 2.4		5.20	0.03	15.95	0.01	1.28	1.60	3.14	0.02	1.14	0.05	0.06	55.17	0.01	0.11	99.41
P1- 10.2_0.9- 1.0		4.18	0.03	3.59	0.01	1.07	1.26	1.41	0.02	0.97	0.05	0.03	83.17	0.01	0.08	99.81
P1- 18_3.0- 3.5		4.47	0.03	4.79	<0.01	1.04	1.40	1.54	0.02	1.02	0.04	0.04	80.28	0.01	0.08	99.81
P13B- 01_2.4.8- 5.0		9.99	0.08	6.63	0.01	2.94	3.37	2.87	0.04	1.36	0.12	0.08	63.67	0.02	0.42	99.21
P13B- 03_3.5- 4.0		4.43	0.03	2.76	<0.01	1.13	1.30	0.97	0.02	0.98	0.06	0.03	85.26	0.01	0.10	99.76
P13B- 07.2_2.5- 2.6		0.59	<0.01	32.9	<0.01	0.27	0.17	15.15	0.01	0.08	0.01	0.14	6.80	0.01	0.02	98.91
P13B- 09.2_3.7- 3.9		11.27	0.08	5.69	0.01	3.38	4.33	3.82	0.04	0.95	0.12	0.06	60.53	0.02	0.42	99.21
P13C- 01_2.5- 3.5		5.08	0.04	3.61	0.01	1.27	1.66	1.36	0.02	1.06	0.06	0.04	81.98	0.01	0.10	100.20
P13C- 09_3.0- 3.5		4.99	0.03	3.34	<0.01	1.27	1.56	0.89	0.02	1.09	0.06	0.04	82.98	0.01	0.09	99.63
P116- 01_2.8- 3.3		10.61	0.07	8.07	0.01	3.54	5.48	6.15	0.08	0.44	0.17	0.09	50.99	0.02	0.35	99.54
P116- 02_3.6- 4.0		12.30	0.07	5.38	0.01	3.85	5.64	4.76	0.05	0.54	0.15	0.11	56.37	0.02	0.42	99.43
P116- 11.1_2.0- 3.5		12.40	0.08	6.68	0.01	3.67	6.30	5.78	0.04	0.33	0.15	0.07	51.17	0.02	0.43	99.21
P116- 13_1.8- 1.9		12.52	0.10	5.10	0.01	3.56	6.37	4.44	0.06	0.43	0.13	0.03	57.04	0.02	0.46	99.51
P116- 17_0.6- 0.8		7.31	0.06	12.30	<0.01	2.94	4.16	8.55	0.12	0.39	0.17	0.06	43.32	0.01	0.25	99.26
P116- 18_3.6- 3.8		13.68	0.07	4.55	0.01	4.10	6.33	4.38	0.05	0.49	0.13	0.07	56.00	0.02	0.45	99.09
P98- 01.1_0.0- 2.2		4.81	0.03	18.00	0.01	1.78	1.56	12.85	0.06	0.43	0.03	0.04	28.82	0.01	0.20	99.19
P98- 07_0.3- 0.6		2.04	0.01	25.4	<0.01	1.05	0.72	17.95	0.04	0.17	0.02	0.05	11.92	<0.01	0.08	99.74
P98- 12_0.1- 0.3		1.89	0.01	25.6	<0.01	0.93	0.69	17.85	0.04	0.17	0.02	0.05	10.38	<0.01	0.07	98.95
P76- 04_0.1- 0.4		8.47	0.07	1.40	0.01	1.99	2.95	0.89	0.02	1.36	0.03	0.03	78.77	0.01	0.27	99.46
P76- 05_20- 2.5		6.61	0.04	18.15	0.01	2.00	2.55	11.05	0.04	0.63	0.08	0.05	31.05	0.01	0.26	99.25
P76- 09_0.1- 0.4		7.57	0.05	11.55	0.01	2.30	2.78	7.80	0.05	0.87	0.07	0.04	47.20	0.02	0.26	98.96
P69- 05- 0.0- 7.2		1.36	0.01	27.2	<0.01	0.58	0.38	18.80	0.03	0.15	0.02	0.05	8.02	<0.01	0.05	99.47
P69- 03- 0.1- 0.2		1.52	0.01	27.4	<0.01	0.56	0.50	18.55	0.03	0.20	0.01	0.07	7.91	<0.01	0.05	99.37



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Page: 2 - F
 Total # Pages: 2 (A - F)
 Plus Appendix Pages
 Finalized Date: 19- SEP- 2017
 Account: EBAENG

Project: ENG.YARC03107- 01

CERTIFICATE OF ANALYSIS YW17178944

Sample Description	Method Analyte Units LOR	OA- GRA05x LOI 1000 %
		0.01
P1- 02_2.0- 2.4 P1- 10.2_0.9- 1.0 P1- 18_3.0- 3.5 P13B- 01_2.4.8- 5.0 P13B- 03_3.5- 4.0		15.63 3.92 5.04 7.55 2.65
P13B- 07.2_2.5- 2.6 P13B- 09.2_3.7- 3.9 P13C- 01_2.5- 3.5 P13C- 09_3.0- 3.5 P116- 01_2.8- 3.3		42.74 8.44 3.89 3.24 13.42
P116- 02_3.6- 4.0 P116- 11.1_2.0- 3.5 P116- 13_1.8- 1.9 P116- 17- 0.6- 0.8 P116- 18_3.6- 3.8		9.71 12.02 9.18 19.58 8.73
P98- 01.1_0.0- 2.2 P98- 07_0.3- 0.6 P98- 12- 0.1- 0.3 P76- 04_0.1- 0.4 P76- 05_20- 2.5		30.51 40.25 41.21 3.14 26.68
P76- 09_0.1- 0.4 P69- 05- 0.0- 7.2 P69- 03- 0.1- 0.2		18.35 42.78 42.52



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 Account: EBAENG

Project: ENG.YARC03107- 01

CERTIFICATE OF ANALYSIS YW17178944

CERTIFICATE COMMENTS

ANALYTICAL COMMENTS

Applies to Method: REE's may not be totally soluble in this method.
 ME- MS61

LABORATORY ADDRESSES

Applies to Method: Processed at ALS Yellowknife located at 3 Coronation Drive, PO Box 1919, Yellowknife, NT, Canada.
 CRU- 31 CRU- QC LOG- 22 PUL- 31
 PUL- QC SND- 01 SPL- 21 WEI- 21

Applies to Method: Processed at ALS Vancouver located at 2103 Dollarton Hwy, North Vancouver, BC, Canada.
 C- GAS05 ME- MS61 ME- XRF26 OA- ELE07
 OA- GRA05x OA- VOL08 S- GRA06a S- IR07
 S- IR08



Tetra Tech Canada Inc.
ATTN: Scott Kingston
1000 - 885 Dunsmuir Street, 10th floor
Vancouver BC V6E 1N5

Date Received: 03-AUG-17
Report Date: 22-AUG-17 13:35 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L1969431
Project P.O. #: NOT SUBMITTED
Job Reference: ENG. YARCO03107-01
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1969431-1 Sediment P29-01_5.10-5.33	L1969431-2 Sediment P29-03_6.50-6.69	L1969431-3 Sediment P29-04_8.79-8.93	L1969431-4 Sediment P29-05_2.43-2.69	L1969431-5 Sediment P29-05_4.34-4.57
Grouping	Analyte					
SOIL						
Physical Tests	Hardness (as CaCO3) (mg/L)	35.7	26.7	34.5	31.9	42.6
	Moisture (%)	<0.25	<0.25	<0.25	<0.25	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	17.0	16.2	17.6	16.6	23.4
	Ammonia, Total Leachable (as N) (mg/L)	0.0633	0.0485	0.0653	0.0387	0.0755
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	5.49	5.15	2.08	5.27	3.00
	Conductivity (uS/cm)	104	77.5	92.8	91.3	118
	Fluoride (F) (mg/L)	0.213	0.440	0.401	0.157	0.598
	Nitrate (as N) (mg/L)	0.0144	0.0076	<0.0050	0.0125	0.0192
	Nitrite (as N) (mg/L)	0.0010	0.0012	0.0016	0.0015	0.0017
	pH (pH)	8.91	9.08	9.02	9.08	8.87
	Sulfate (SO4) (mg/L)	18.2	7.36	16.5	13.6	19.9
	Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.105	0.137	0.134	0.110
Antimony (Sb)-Leachable (mg/L)		0.00026	0.00021	0.00076	0.00014	0.00023
Arsenic (As)-Leachable (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Barium (Ba)-Leachable (mg/L)		0.0865	0.311	0.157	0.0362	0.0492
Beryllium (Be)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Bismuth (Bi)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Boron (B)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010
Cadmium (Cd)-Leachable (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Calcium (Ca)-Leachable (mg/L)		11.3	8.72	11.7	10.6	13.4
Chromium (Cr)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Cobalt (Co)-Leachable (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
Copper (Cu)-Leachable (mg/L)		<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
Iron (Fe)-Leachable (mg/L)		<0.030	<0.030	<0.030	<0.030	<0.030
Lead (Pb)-Leachable (mg/L)		<0.00010	<0.00010	<0.00010	0.00015	<0.00010
Lithium (Li)-Leachable (mg/L)		<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
Magnesium (Mg)-Leachable (mg/L)		1.79	1.19	1.29	1.30	2.20
Manganese (Mn)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Mercury (Hg)-Leachable (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
Molybdenum (Mo)-Leachable (mg/L)		0.00232	0.00223	0.00610	0.00293	0.00191
Nickel (Ni)-Leachable (mg/L)		0.00056	<0.00050	0.00162	<0.00050	<0.00050
Phosphorus (P)-Leachable (mg/L)		<0.30	<0.30	<0.30	<0.30	<0.30
Potassium (K)-Leachable (mg/L)		0.760	0.324	0.731	0.472	0.740
Selenium (Se)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Leachable (mg/L)		0.340	0.216	0.384	0.273	0.439

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1969431-6 Sediment P29-07_1.84-2.00	L1969431-7 Sediment P29-07_0.86-1.00	L1969431-8 Sediment P29-07_4.00-4.27	L1969431-9 Sediment P29-08_3.00-3.30	L1969431-10 Sediment P13D-02_5.00-5.16
Grouping	Analyte					
SOIL						
Physical Tests	Hardness (as CaCO3) (mg/L)	42.5	22.1	23.2	42.2	25.6
	Moisture (%)	<0.25	<0.25	<0.25	<0.25	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	18.5	18.7	21.1	21.9	16.6
	Ammonia, Total Leachable (as N) (mg/L)	0.0911	0.0337	0.0656	0.0954	0.0255
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	5.38	6.28	3.47	4.82	5.16
	Conductivity (uS/cm)	125	70.0	67.7	120	76.1
	Fluoride (F) (mg/L)	0.378	0.193	0.248	0.297	1.05
	Nitrate (as N) (mg/L)	0.0156	0.0094	0.0075	<0.0050	0.0238
	Nitrite (as N) (mg/L)	0.0016	0.0024	0.0035	0.0014	0.0014
	pH (pH)	8.88	9.22	9.23	8.94	9.25
	Sulfate (SO4) (mg/L)	24.1	3.09	4.99	20.9	6.06
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0987	0.109	0.136	0.167	0.0813
	Antimony (Sb)-Leachable (mg/L)	0.00023	<0.00010	<0.00010	0.00026	0.00014
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)	0.125	0.0821	0.271	0.0092	0.0243
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	0.022	0.010	<0.010	0.017	<0.010
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	14.6	7.26	7.50	13.8	8.02
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Leachable (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Lithium (Li)-Leachable (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	1.48	0.967	1.09	1.87	1.36
	Manganese (Mn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00226	0.00695	0.00227	0.00353	0.00323
	Nickel (Ni)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	0.731	0.478	0.672	1.10	0.288
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	0.00058	<0.00050
Silicon (Si)-Leachable (mg/L)	0.370	0.352	0.449	0.522	0.140	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1969431-11 Sediment P13D-03_0.84-1.02	L1969431-12 Sediment P13D-03_3.30-3.50	L1969431-13 Sediment P13D-04_2.63-2.83	L1969431-14 Sediment P13D-04_6.50-6.70	L1969431-15 Sediment P13D-05_4.41-4.63
Grouping	Analyte					
SOIL						
Physical Tests	Hardness (as CaCO3) (mg/L)	28.4	35.9	50.4	38.0	31.3
	Moisture (%)	<0.25	<0.25	<0.25	<0.25	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	21.3	21.8	24.6	23.2	24.5
	Ammonia, Total Leachable (as N) (mg/L)	0.0629	0.0712	0.108	0.0948	0.0347
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	2.70	2.20	4.84	4.04	1.47
	Conductivity (uS/cm)	77.7	96.8	145	107	77.9
	Fluoride (F) (mg/L)	0.281	0.298	0.248	0.285	0.390
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	0.0054	<0.0050	0.0112
	Nitrite (as N) (mg/L)	0.0047	0.0036	0.0027	0.0018	0.0030
	pH (pH)	9.11	9.04	8.81	8.98	9.32
	Sulfate (SO4) (mg/L)	8.42	14.7	26.7	15.1	8.60
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.171	0.215	0.228	0.223	0.126
	Antimony (Sb)-Leachable (mg/L)	0.00027	0.00048	0.00033	0.00077	0.00027
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)	0.0167	0.0121	0.0894	0.184	0.0614
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	0.027	0.010	0.017	0.013	<0.010
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	10.1	12.1	17.4	12.8	7.24
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Leachable (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Lithium (Li)-Leachable (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	0.793	1.37	1.72	1.50	3.21
	Manganese (Mn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00207	0.00391	0.00426	0.00393	0.0102
	Nickel (Ni)-Leachable (mg/L)	0.00088	<0.00050	<0.00050	0.00073	<0.00050
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	0.928	1.25	2.81	1.57	0.346
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Leachable (mg/L)	0.703	0.802	1.37	0.829	0.342	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1969431-16 Sediment P13D-05_8.23-8.40	L1969431-17 Sediment P33A-01_3.24-3.40	L1969431-18 Sediment P33A-01_7.50-7.69	L1969431-19 Sediment P33A-02_4.20-4.38	L1969431-20 Sediment P33A-02_5.08-5.25
Grouping	Analyte					
SOIL						
Physical Tests	Hardness (as CaCO3) (mg/L)	37.5	42.1	47.7	46.7	48.4
	Moisture (%)	<0.25	<0.25	<0.25	<0.25	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	14.8	40.4	33.8	43.0	23.0
	Ammonia, Total Leachable (as N) (mg/L)	0.0481	0.0746	0.0339	0.0884	0.0723
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	3.50	1.81	1.21	2.04	1.59
	Conductivity (uS/cm)	101	97.1	113	105	126
	Fluoride (F) (mg/L)	1.16	1.39	0.950	1.09	0.959
	Nitrate (as N) (mg/L)	<0.0050	0.0199	0.0052	0.0288	0.0059
	Nitrite (as N) (mg/L)	<0.0010	0.0103	0.0012	0.0091	0.0014
	pH (pH)	9.19	9.56	9.49	9.62	9.16
	Sulfate (SO4) (mg/L)	18.3	3.14	13.4	5.59	26.5
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0930	0.0335	0.0242	0.0097	0.144
	Antimony (Sb)-Leachable (mg/L)	0.00036	0.00012	0.00068	0.00010	0.00033
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)	0.0234	0.0268	0.107	0.0389	0.130
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	12.0	6.35	5.43	6.39	11.0
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Leachable (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Lithium (Li)-Leachable (mg/L)	<0.0050	0.0051	<0.0050	0.0057	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	1.85	6.37	8.30	7.46	5.06
	Manganese (Mn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00389	0.00284	0.0219	0.0104	0.00765
	Nickel (Ni)-Leachable (mg/L)	<0.00050	0.00064	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	0.361	0.932	0.497	1.07	0.783
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Leachable (mg/L)	0.169	0.733	0.409	0.843	0.438	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1969431-21 Sediment P33A-03_6.06-6.31	L1969431-22 Sediment P33A-03_9.15-9.39	L1969431-24 Sediment P33A-04_9.12-9.30	L1969431-25 Sediment P33A-06_0.50-0.80	L1969431-26 Sediment P33A-07_2.50-2.71
Grouping	Analyte					
SOIL						
Physical Tests	Hardness (as CaCO3) (mg/L)	58.3	73.6	52.9	44.7	40.1
	Moisture (%)	<0.25	<0.25	<0.25	<0.25	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	33.7	31.4	32.7	36.6	36.1
	Ammonia, Total Leachable (as N) (mg/L)	0.0553	0.0669	0.0641	0.0239	0.0356
	Bromide (Br) (mg/L)	<0.050	0.064	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	1.59	10.5	1.84	2.42	1.37
	Conductivity (uS/cm)	133	179	119	97.1	85.1
	Fluoride (F) (mg/L)	1.63	1.20	0.939	2.21	1.24
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	0.0072	0.0063
	Nitrite (as N) (mg/L)	0.0018	0.0012	0.0028	0.0091	0.0067
	pH (pH)	9.24	9.34	9.32	9.42	9.53
	Sulfate (SO4) (mg/L)	23.5	35.0	17.6	3.01	2.06
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0423	0.0402	0.0756	0.100	0.0447
	Antimony (Sb)-Leachable (mg/L)	0.00035	0.00027	0.00055	0.00014	0.00010
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	0.0015	<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)	0.0084	0.0028	0.135	0.0061	0.0395
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	<0.010	0.016	<0.010	<0.010	<0.010
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	7.45	10.8	6.80	7.69	5.07
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Leachable (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Leachable (mg/L)	<0.00010	0.00015	0.00015	<0.00010	<0.00010
	Lithium (Li)-Leachable (mg/L)	<0.0050	0.0138	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	9.63	11.3	8.72	6.20	6.67
	Manganese (Mn)-Leachable (mg/L)	<0.00050	<0.00050	0.00068	<0.00050	<0.00050
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00813	0.0122	0.0177	0.00377	0.00240
	Nickel (Ni)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	0.938	1.19	1.12	0.817	0.637
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Leachable (mg/L)	0.666	0.560	0.697	0.880	0.667	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1969431-27 Sediment P33A-07_6.25-6.41	L1969431-28 Sediment P33A-08_3.50-4.30	L1969431-29 Sediment P33A-08_8.80-9.01	L1969431-30 Sediment P33A-10_1.00-1.23	L1969431-31 Sediment P33A-10_8.83-9.00
Grouping	Analyte					
SOIL						
Physical Tests	Hardness (as CaCO3) (mg/L)	34.3	36.8	39.0	26.3	41.0
	Moisture (%)	<0.25	<0.25	<0.25	<0.25	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	1.0
	Alkalinity, Total (as CaCO3) (mg/L)	28.1	26.9	26.4	22.2	20.4
	Ammonia, Total Leachable (as N) (mg/L)	0.0119	0.0385	0.0260	0.0256	0.0419
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	3.43	2.56	1.28	3.29	1.70
	Conductivity (uS/cm)	76.6	85.4	85.5	64.2	97.2
	Fluoride (F) (mg/L)	1.57	1.44	1.38	0.362	1.64
	Nitrate (as N) (mg/L)	0.0517	0.0080	0.0164	0.0057	0.0087
	Nitrite (as N) (mg/L)	0.0022	0.0038	0.0063	0.0045	0.0042
	pH (pH)	9.61	9.33	9.43	9.22	8.96
	Sulfate (SO4) (mg/L)	3.06	7.51	11.1	4.13	17.2
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0384	0.151	0.0642	0.183	0.0470
	Antimony (Sb)-Leachable (mg/L)	<0.00010	0.00015	<0.00010	<0.00010	0.00018
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)	0.0820	0.0670	0.0483	0.104	0.231
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	5.12	6.65	7.20	8.12	13.0
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Leachable (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Lithium (Li)-Leachable (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	5.24	4.90	5.10	1.46	2.05
	Manganese (Mn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.0147	0.00221	0.00341	0.00229	0.00755
	Nickel (Ni)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	0.395	1.33	0.515	0.751	0.865
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Leachable (mg/L)	0.289	0.955	0.337	0.689	0.392	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1969431-32 Sediment P86-01A_0.31-0.50	L1969431-33 Sediment P86-02_3.95-4.16	L1969431-34 Sediment P86-02_8.09-8.30	L1969431-35 Sediment P86-04_6.17-6.36	L1969431-36 Sediment P86-04_8.36-8.55
Grouping	Analyte					
SOIL						
Physical Tests	Hardness (as CaCO3) (mg/L)	58.0	60.3	57.4	137	205
	Moisture (%)	<0.25	<0.25	<0.25	<0.25	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	34.7	40.6	44.1	39.5	40.1
	Ammonia, Total Leachable (as N) (mg/L)	0.0449	0.0406	0.0546	0.0674	0.0633
	Bromide (Br) (mg/L)	0.287	0.263	0.138	0.242	0.205
	Chloride (Cl) (mg/L)	24.0	21.8	10.7	20.2	16.5
	Conductivity (uS/cm)	149	147	138	312	437
	Fluoride (F) (mg/L)	0.138	0.108	0.312	0.145	0.126
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	0.0084
	Nitrite (as N) (mg/L)	0.0024	0.0034	0.0034	0.0015	<0.0010
	pH (pH)	9.52	9.53	9.26	9.07	8.79
	Sulfate (SO4) (mg/L)	1.55	1.62	8.74	82.6	148
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0276	0.0358	0.136	0.115	0.114
	Antimony (Sb)-Leachable (mg/L)	0.00010	0.00011	0.00019	<0.00010	0.00015
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)	0.0951	0.0132	0.0739	0.0561	0.0153
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	0.041	0.026	0.034	0.027	0.030
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	8.51	7.18	10.9	22.8	36.4
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Leachable (mg/L)	<0.030	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Lithium (Li)-Leachable (mg/L)	0.0079	0.0078	0.0067	0.0101	0.0099
	Magnesium (Mg)-Leachable (mg/L)	8.93	10.3	7.32	19.5	27.7
	Manganese (Mn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	0.00058	0.00144
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00375	0.00113	0.0539	0.00306	0.00757
	Nickel (Ni)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00058
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	1.55	1.63	3.73	4.06	4.35
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00119
Silicon (Si)-Leachable (mg/L)	0.532	0.825	1.84	1.13	0.927	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1969431-37 Sediment P86-06_3.50-3.80	L1969431-38 Sediment P86-06_5.60-5.82	L1969431-39 Sediment P86-06_6.76-6.93	L1969431-40 Sediment P13D-02_1.25-144
Grouping	Analyte				
SOIL					
Physical Tests	Hardness (as CaCO3) (mg/L)	67.9	63.2	61.2	24.3
	Moisture (%)	<0.25	<0.25	<0.25	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0	<1.0	<1.0	<1.0
	Alkalinity, Total (as CaCO3) (mg/L)	42.3	42.7	44.5	20.4
	Ammonia, Total Leachable (as N) (mg/L)	0.0611	0.0599	0.0591	0.0448
	Bromide (Br) (mg/L)	0.311	0.195	0.135	<0.050
	Chloride (Cl) (mg/L)	25.2	17.0	11.7	6.76
	Conductivity (uS/cm)	165	154	147	68.4
	Fluoride (F) (mg/L)	0.085	0.278	0.354	0.077
	Nitrate (as N) (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050
	Nitrite (as N) (mg/L)	0.0043	0.0023	0.0024	0.0030
	pH (pH)	9.53	9.49	9.38	9.33
	Sulfate (SO4) (mg/L)	2.48	5.49	7.69	3.35
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0567	0.127	0.129	0.121
	Antimony (Sb)-Leachable (mg/L)	0.00012	0.00015	0.00027	<0.00010
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)	0.0109	0.0056	0.0065	0.0069
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	0.036	0.027	0.027	<0.010
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	9.18	9.89	10.2	6.75
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Copper (Cu)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010
	Iron (Fe)-Leachable (mg/L)	<0.030	<0.030	<0.030	<0.030
	Lead (Pb)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010
	Lithium (Li)-Leachable (mg/L)	0.0076	0.0072	0.0067	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	10.9	9.36	8.69	1.80
	Manganese (Mn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00109	0.0145	0.0209	0.00109
	Nickel (Ni)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	2.33	3.41	3.50	0.602
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050
Silicon (Si)-Leachable (mg/L)	1.18	1.60	1.59	0.315	

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ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1969431-1	L1969431-2	L1969431-3	L1969431-4	L1969431-5
		Description	Sediment	Sediment	Sediment	Sediment	Sediment
		Sampled Date					
		Sampled Time					
		Client ID	P29-01_5.10-5.33	P29-03_6.50-6.69	P29-04_8.79-8.93	P29-05_2.43-2.69	P29-05_4.34-4.57
Grouping	Analyte						
SOIL							
Leachable Metals	Silver (Ag)-Leachable (mg/L)	<0.000050	0.000097	<0.000050	<0.000050	0.000201	
	Sodium (Na)-Leachable (mg/L)	2.22	2.02	1.10	2.17	1.31	
	Strontium (Sr)-Leachable (mg/L)	0.0936	0.133	0.146	0.0925	0.0988	
	Thallium (Tl)-Leachable (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	
	Tin (Sn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	
	Titanium (Ti)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	
	Uranium (U)-Leachable (mg/L)	0.000099	0.000069	0.000087	0.000055	0.000061	
	Vanadium (V)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	
	Zinc (Zn)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1969431-6 Sediment P29-07_1.84-2.00	L1969431-7 Sediment P29-07_0.86-1.00	L1969431-8 Sediment P29-07_4.00-4.27	L1969431-9 Sediment P29-08_3.00-3.30	L1969431-10 Sediment P13D-02_5.00-5.16
Grouping	Analyte						
SOIL							
Leachable Metals	Silver (Ag)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)	2.21	2.71	1.42	2.18	2.20	
	Strontium (Sr)-Leachable (mg/L)	0.132	0.0770	0.0768	0.153	0.0827	
	Thallium (Tl)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)	0.000070	0.000141	0.000055	0.000099	0.000124	
	Vanadium (V)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description Sampled Date Sampled Time Client ID	L1969431-11 Sediment P13D-03_0.84-1.02	L1969431-12 Sediment P13D-03_3.30-3.50	L1969431-13 Sediment P13D-04_2.63-2.83	L1969431-14 Sediment P13D-04_6.50-6.70	L1969431-15 Sediment P13D-05_4.41-4.63
Grouping	Analyte						
SOIL							
Leachable Metals	Silver (Ag)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)	1.31	1.04	2.08	1.79	0.676	0.676
	Strontium (Sr)-Leachable (mg/L)	0.0532	0.0817	0.136	0.122	0.0669	0.0669
	Thallium (Tl)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)	0.000080	0.000229	0.000314	0.000293		
	Vanadium (V)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1969431-16	L1969431-17	L1969431-18	L1969431-19	L1969431-20
		Description	Sediment	Sediment	Sediment	Sediment	Sediment
		Sampled Date					
		Sampled Time					
		Client ID	P13D-05_8.23-8.40	P33A-01_3.24-3.40	P33A-01_7.50-7.69	P33A-02_4.20-4.38	P33A-02_5.08-5.25
Grouping	Analyte						
SOIL							
Leachable Metals	Silver (Ag)-Leachable (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)		1.52	0.781	0.642	0.987	0.793
	Strontium (Sr)-Leachable (mg/L)		0.157	0.0288	0.0329	0.0538	0.128
	Thallium (Tl)-Leachable (mg/L)		<0.00010	<0.00010	0.00026	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)		0.000083	0.000053	0.000151	0.000017	0.000146
	Vanadium (V)-Leachable (mg/L)		<0.0010	<0.0010	0.0010	<0.0010	<0.0010
	Zinc (Zn)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1969431-21 Sediment P33A-03_6.06-6.31	L1969431-22 Sediment P33A-03_9.15-9.39	L1969431-24 Sediment P33A-04_9.12-9.30	L1969431-25 Sediment P33A-06_0.50-0.80	L1969431-26 Sediment P33A-07_2.50-2.71
Grouping	Analyte					
SOIL						
Leachable Metals	Silver (Ag)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)	0.710	4.58	0.913	1.13	0.664
	Strontium (Sr)-Leachable (mg/L)	0.0263	0.0350	0.0279	0.0140	0.0124
	Thallium (Tl)-Leachable (mg/L)	<0.00010	0.00025	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)	0.000025	0.000101	0.000170	0.000572	0.000321
	Vanadium (V)-Leachable (mg/L)	<0.0010	<0.0010	0.0013	0.0013	<0.0010
	Zinc (Zn)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1969431-27	L1969431-28	L1969431-29	L1969431-30	L1969431-31
		Description	Sediment	Sediment	Sediment	Sediment	Sediment
		Sampled Date					
		Sampled Time					
		Client ID	P33A-07_6.25-6.41	P33A-08_3.50-4.30	P33A-08_8.80-9.01	P33A-10_1.00-1.23	P33A-10_8.83-9.00
Grouping	Analyte						
SOIL							
Leachable Metals	Silver (Ag)-Leachable (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)		1.46	1.20	0.617	1.36	0.858
	Strontium (Sr)-Leachable (mg/L)		0.0240	0.0409	0.0189	0.0567	0.0635
	Thallium (Tl)-Leachable (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	0.00068
	Tin (Sn)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)		0.000337	0.000118	0.000379	0.000125	0.000103
	Vanadium (V)-Leachable (mg/L)		<0.0010	0.0011	<0.0010	<0.0010	<0.0010
	Zinc (Zn)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1969431-32	L1969431-33	L1969431-34	L1969431-35	L1969431-36
		Description	Sediment	Sediment	Sediment	Sediment	Sediment
		Sampled Date					
		Sampled Time					
		Client ID	P86-01A_0.31-0.50	P86-02_3.95-4.16	P86-02_8.09-8.30	P86-04_6.17-6.36	P86-04_8.36-8.55
Grouping	Analyte						
SOIL							
Leachable Metals	Silver (Ag)-Leachable (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)		3.49	2.61	1.24	2.88	2.33
	Strontium (Sr)-Leachable (mg/L)		0.0921	0.0592	0.0322	0.0751	0.0712
	Thallium (Tl)-Leachable (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)		0.000023	0.000025	0.000050	0.000091	0.00127
	Vanadium (V)-Leachable (mg/L)		<0.0010	<0.0010	0.0030	<0.0010	<0.0010
	Zinc (Zn)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1969431-37	L1969431-38	L1969431-39	L1969431-40
		Description	Sediment	Sediment	Sediment	Sediment
		Sampled Date				
		Sampled Time				
		Client ID	P86-06_3.50-3.80	P86-06_5.60-5.82	P86-06_6.76-6.93	P13D-02_1.25-144
Grouping	Analyte					
SOIL						
Leachable Metals	Silver (Ag)-Leachable (mg/L)		<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)		3.22	2.56	1.86	2.37
	Strontium (Sr)-Leachable (mg/L)		0.0751	0.0583	0.0479	0.0536
	Thallium (Tl)-Leachable (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)		0.000014	<0.000010	0.000014	0.000102
	Vanadium (V)-Leachable (mg/L)		<0.0010	0.0017	0.0017	<0.0010
	Zinc (Zn)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Acidity (as CaCO3)	B	L1969431-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Method Blank	Acidity (as CaCO3)	B	L1969431-21, -22, -24, -25, -26, -27, -28, -29, -30, -31, -32, -33, -34, -35, -36, -37, -38, -39, -40
Method Blank	Conductivity	B	L1969431-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L1969431-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L1969431-22, -24, -25, -26, -27, -28, -29, -30, -31, -32, -33, -34, -35, -36, -37, -38, -39, -40
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L1969431-21
Matrix Spike	Magnesium (Mg)-Leachable	MS-B	L1969431-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Magnesium (Mg)-Leachable	MS-B	L1969431-22, -24, -25, -26, -27, -28, -29, -30, -31, -32, -33, -34, -35, -36, -37, -38, -39, -40
Matrix Spike	Magnesium (Mg)-Leachable	MS-B	L1969431-21
Matrix Spike	Silicon (Si)-Leachable	MS-B	L1969431-1, -10, -11, -12, -13, -14, -15, -16, -17, -18, -19, -2, -20, -3, -4, -5, -6, -7, -8, -9
Matrix Spike	Silicon (Si)-Leachable	MS-B	L1969431-22, -24, -25, -26, -27, -28, -29, -30, -31, -32, -33, -34, -35, -36, -37, -38, -39, -40
Matrix Spike	Silicon (Si)-Leachable	MS-B	L1969431-21

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-SHKFLSK-PCT-VA	Soil	Acidity by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2310 "Acidity".</p> <p>Lab deionized water is used in the creation of the samples for acidity testing. Although of very low ionic strength, the water does have pH <8.3, and hence inherent acidity, and may contribute measurable acidity levels near the limit of reporting."</p>			
ALK-SHKFLSK-PCT-VA	Soil	Alkalinity by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2320 "Alkalinity".</p>			
BR-SHKFLSK-IC-VA	Soil	Bromide by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
CL-SHKFLSK-IC-VA	Soil	Chloride by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
EC-SHKFLSK-PCT-VA	Soil	EC by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2510 "Conductivity".</p>			
F-SHKFLSK-IC-VA	Soil	Fluoride by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.

Reference Information

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

HARDNESS-CALC-VA Soil Hardness APHA 2340B

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-SHKFLSK-CVAFS-VA Soil Mercury by CVAFS (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

The Shakeflask extraction is an empirical procedure with pre-defined characteristics. Recovery of some elements (Ag, Bi, Hg, and Sn) by this method can be variable due to the neutral pH of the extraction fluid. LCS QC sample DQOs for these elements have been established at 50-130% for this reason

MET-SHKFLSK-MS-VA Soil Metals by ICPMS (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using inductively coupled plasma - mass spectrophotometry (EPA Method 6020A).

The Shakeflask extraction is an empirical procedure with pre-defined characteristics. Recovery of some elements (Ag, Bi, Hg, and Sn) by this method can be variable due to the neutral pH of the extraction fluid. LCS QC sample DQOs for these elements have been established at 50-130% for this reason.

MOISTURE-VA Soil Moisture content CWS for PHC in Soil - Tier 1

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

NH3-SHKFLSK-F-VA Soil Ammonia by Fluorescence (SHAKE FLASK) BC MIN. OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.

NO2-SHKFLSK-IC-VA Soil Nitrite by IC (SHAKEFLASK) BC MIN. OF ENERGY AND MINES/APHA 4110 B.

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

NO3-SHKFLSK-IC-VA Soil Nitrate by IC (SHAKEFLASK) BC MIN. OF ENERGY AND MINES/APHA 4110 B.

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

PH-SHKFLSK-MAN-VA Soil pH by Manual Meter (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently analysed using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

SO4-SHKFLSK-IC-VA Soil Sulfate by IC (SHAKEFLASK) BC MIN. OF ENERGY AND MINES/APHA 4110 B.

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
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VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA
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Reference Information

Chain of Custody Numbers:

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



L1969431-COFC

Analysis Request Form

Date:	8/2/2017
Workorder Number:	VA17154303 TGM
Analyzing Laboratory:	ALSE
Client Contact Name:	Scott Kingston
Client Company Name:	Tetra Tech Canada Inc.
Project Name:	ENG.YARCO03107-01
Number of Samples & Country of Origin:	39 , Canada
Sample IDs:	See Attached
Sample Type:	<input type="checkbox"/> Drill Core <input type="checkbox"/> Percussion <input type="checkbox"/> Rock <input type="checkbox"/> Soil <input type="checkbox"/> Pulp <input checked="" type="checkbox"/> Other
Analysis Required:	Shake Flask (OA-SFE01)
Special Instructions:	ALS contact (Deidre Heffernan)
Sample Disposition:	<input type="checkbox"/> Return <input type="checkbox"/> Dispose after analysis
Results to:	Attention: Scott Kingston Tetra Tech Canada Inc. 885 Dunsmuir St. Vancouver BC Canada , V6C 1N5 Email:scott.kingston@tetrattech.com
Invoice to:	Attention: Scott Kingston Address: Same as above Phone: Enter Client Phone Number Here Email: scott.kingston@tetrattech.com

Paul Avg 3 @ 9:35
22.5, 22.9°C

ADDRESS 2103 Dollarton Hwy, North Vancouver BC V7H 0A7 Canada | PHONE +1 604 984 0221 | FAX +1 604 984 0218
ALS CANADA LTD Part of the ALS Group A Campbell Brothers Limited Company



RIGHT SOLUTIONS RIGHT PARTNER

VA17154303

Method	WEI-21
Analyte	Recvd Wt.
	kg
	0.02
1 P29-01_5.10-5.33	0.72
2 P29-03_6.50-6.69	0.66
3 P29-04_8.79-8.93	0.48
4 P29-05_2.43-2.69	0.88
5 P29-05_4.34-4.57	0.76
6 P29-06_1.84-2.00	0.52
7 P29-07_0.86-1.00	0.8
8 P29-07_4.00-4.27	0.88
9 P29-08_3.00-3.30	0.98
10 P13D-02_5.00-5.16	0.66
11 P13D-03-0.84-1.02	0.58
12 P13D-03_3.30-3.50	0.64
13 P13D-04_2.63-2.83	0.72
14 P13D-04_6.50-6.70	0.64
15 P13D-05_4.41-4.63	0.7
16 P13D-05_8.23-8.40	0.58
17 P33A-01_3.24-3.40	0.48
18 P33A-01_7.50-7.69	0.64
19 P33A-02_4.20-4.38	0.54
20 P33A-02_5.08-5.25	0.56
21 P33A-03_6.06-6.31	0.86
22 P33A-03_9.15-9.39	0.84
23 P33A-04_5.46-5.71	Not Recvd
24 P33A-04_9.12-9.30	0.58
25 P33A-06_0.50-0.80	0.6
26 P33A-07_2.50-2.71	0.64
27 P33A-07_6.25-6.41	0.56
28 P33A-08_3.50-4.30	0.66
29 P33A-08_8.80-9.01	0.62
30 P33A-10_1.00-1.23	0.7
31 P33A-10_8.83-9.00	0.58
32 P86-01A_0.31-050	0.6
33 P86-02_3.95-4.16	0.74
34 P86-02_8.09-8.30	0.72
35 P86-04_6.17-6.36	0.68
36 P86-04_8.36-8.55	0.62
37 P86-06_3.50-3.80	0.7
38 P86-06_5.60-5.82	0.8
39 P86-06_6.76-6.93	0.62
40 P13D-02_1.25-144	0.56



L1969431-COFC

Paul Aug 3 @ 9:35
22.5, 22.9°C



Tetra Tech Canada Inc.
ATTN: Scott Kingston
1000 - 885 Dunsmuir Street, 10th floor
Vancouver BC V6E 1N5

Date Received: 04-AUG-17
Report Date: 15-AUG-17 14:31 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L1970139
Project P.O. #: NOT SUBMITTED
Job Reference: ENG.YARC03107-01
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID				
	L1970139-1 Other P86-04 SAND				
Grouping	Analyte				
SOIL					
Physical Tests	Hardness (as CaCO3) (mg/L)	30.6			
	Moisture (%)	<0.25			
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<1.0			
	Alkalinity, Total (as CaCO3) (mg/L)	31.7			
	Ammonia, Total Leachable (as N) (mg/L)	<0.0050			
	Bromide (Br) (mg/L)	<0.050			
	Chloride (Cl) (mg/L)	0.73			
	Conductivity (uS/cm)	62.0			
	Fluoride (F) (mg/L)	0.036			
	Nitrate (as N) (mg/L)	0.0534			
	Nitrite (as N) (mg/L)	0.0741			
	pH (pH)	8.63			
	Sulfate (SO4) (mg/L)	0.56			
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.238			
	Antimony (Sb)-Leachable (mg/L)	<0.00010			
	Arsenic (As)-Leachable (mg/L)	<0.0010			
	Barium (Ba)-Leachable (mg/L)	0.0038			
	Beryllium (Be)-Leachable (mg/L)	<0.00050			
	Bismuth (Bi)-Leachable (mg/L)	<0.00050			
	Boron (B)-Leachable (mg/L)	<0.010			
	Cadmium (Cd)-Leachable (mg/L)	0.000171			
	Calcium (Ca)-Leachable (mg/L)	5.97			
	Chromium (Cr)-Leachable (mg/L)	<0.00050			
	Cobalt (Co)-Leachable (mg/L)	<0.00010			
	Copper (Cu)-Leachable (mg/L)	0.0081			
	Iron (Fe)-Leachable (mg/L)	0.137			
	Lead (Pb)-Leachable (mg/L)	<0.00010			
	Lithium (Li)-Leachable (mg/L)	<0.0050			
	Magnesium (Mg)-Leachable (mg/L)	3.82			
	Manganese (Mn)-Leachable (mg/L)	0.00443			
	Mercury (Hg)-Leachable (mg/L)	<0.000050			
	Molybdenum (Mo)-Leachable (mg/L)	0.220			
	Nickel (Ni)-Leachable (mg/L)	0.00113			
	Phosphorus (P)-Leachable (mg/L)	<0.30			
	Potassium (K)-Leachable (mg/L)	0.414			
	Selenium (Se)-Leachable (mg/L)	<0.00050			
	Silicon (Si)-Leachable (mg/L)	0.506			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1970139-1 Other P86-04 SAND				
Grouping	Analyte					
SOIL						
Leachable Metals	Silver (Ag)-Leachable (mg/L)	<0.000050				
	Sodium (Na)-Leachable (mg/L)	0.323				
	Strontium (Sr)-Leachable (mg/L)	0.00535				
	Thallium (Tl)-Leachable (mg/L)	<0.00010				
	Tin (Sn)-Leachable (mg/L)	<0.00050				
	Titanium (Ti)-Leachable (mg/L)	<0.010				
	Uranium (U)-Leachable (mg/L)	0.000045				
	Vanadium (V)-Leachable (mg/L)	<0.0010				
	Zinc (Zn)-Leachable (mg/L)	<0.010				

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Method Blank	Alkalinity, Total (as CaCO3)	B	L1970139-1
Duplicate	Conductivity	DUP-H	L1970139-1
Duplicate	Magnesium (Mg)-Leachable	DUP-H	L1970139-1
Duplicate	Molybdenum (Mo)-Leachable	DUP-H	L1970139-1
Duplicate	Sodium (Na)-Leachable	DUP-H	L1970139-1
Duplicate	Uranium (U)-Leachable	DUP-H	L1970139-1
Duplicate	Sulfate (SO4)	DUP-H	L1970139-1
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L1970139-1
Matrix Spike	Magnesium (Mg)-Leachable	MS-B	L1970139-1
Matrix Spike	Molybdenum (Mo)-Leachable	MS-B	L1970139-1
Matrix Spike	Silicon (Si)-Leachable	MS-B	L1970139-1

Qualifiers for Individual Parameters Listed:

Qualifier	Description
B	Method Blank exceeds ALS DQO. Associated sample results which are < Limit of Reporting or > 5 times blank level are considered reliable.
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-SHKFLSK-PCT-VA	Soil	Acidity by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2310 "Acidity".</p> <p>Lab deionized water is used in the creation of the samples for acidity testing. Although of very low ionic strength, the water does have pH <8.3, and hence inherent acidity, and may contribute measurable acidity levels near the limit of reporting."</p>			
ALK-SHKFLSK-COL-VA	Soil	Alkalinity by Colour (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from EPA Method 310.2 "Alkalinity".</p>			
BR-SHKFLSK-IC-VA	Soil	Bromide by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
CL-SHKFLSK-IC-VA	Soil	Chloride by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
EC-SHKFLSK-PCT-VA	Soil	EC by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2510 "Conductivity".</p>			
F-SHKFLSK-IC-VA	Soil	Fluoride by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
HARDNESS-CALC-VA	Soil	Hardness	APHA 2340B

Reference Information

Hardness is calculated from Calcium and Magnesium concentrations, and is expressed as calcium carbonate equivalents.

HG-SHKFLSK-CVAFS-VA	Soil	Mercury by CVAFS (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7). The Shakeflask extraction is an empirical procedure with pre-defined characteristics. Recovery of some elements (Ag, Bi, Hg, and Sn) by this method can be variable due to the neutral pH of the extraction fluid. LCS QC sample DQOs for these elements have been established at 50-130% for this reason</p>			
MET-SHKFLSK-MS-VA	Soil	Metals by ICPMS (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using inductively coupled plasma - mass spectrophotometry (EPA Method 6020A). The Shakeflask extraction is an empirical procedure with pre-defined characteristics. Recovery of some elements (Ag, Bi, Hg, and Sn) by this method can be variable due to the neutral pH of the extraction fluid. LCS QC sample DQOs for these elements have been established at 50-130% for this reason.</p>			
MOISTURE-VA	Soil	Moisture content	CWS for PHC in Soil - Tier 1
<p>This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.</p>			
NH3-SHKFLSK-F-VA	Soil	Ammonia by Fluorescence (SHAKE FLASK)	BC MIN. OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures modified from J. Environ. Monit., 2005, 7, 37 - 42, The Royal Society of Chemistry, "Flow-injection analysis with fluorescence detection for the determination of trace levels of ammonium in seawater", Roslyn J. Waston et al.</p>			
NO2-SHKFLSK-IC-VA	Soil	Nitrite by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
NO3-SHKFLSK-IC-VA	Soil	Nitrate by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
PH-SHKFLSK-MAN-VA	Soil	pH by Manual Meter (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently analysed using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.</p>			
SO4-SHKFLSK-IC-VA	Soil	Sulfate by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".</p>			

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



L1970139-COFC

Analysis Request Form

Date:	8/3/2017
Workorder Number:	VA17154368TGM
Analyzing Laboratory:	ALSE
Client Contact Name:	Scott Kingston
Client Company Name:	Tetra Tech Canada Inc.
Project Name:	ENG.YARC03107-01
Number of Samples & Country of Origin:	1 , Canada
Sample IDs:	P86-04 SAND
Sample Type:	<input type="checkbox"/> Drill Core <input type="checkbox"/> Percussion <input type="checkbox"/> Rock <input type="checkbox"/> Soil <input type="checkbox"/> Pulp <input checked="" type="checkbox"/> Other
Analysis Required:	Shake Flask (OA-SFE01)
Special Instructions:	ALS contact (Deidre Heffernan)
Sample Disposition:	<input type="checkbox"/> Return <input type="checkbox"/> Dispose after analysis
Results to:	Attention: Scott Kingston Tetra Tech Canada Inc. 885 Dunsmuir St. Vancouver BC Canada , V6C 1N5 Email:scott.kingston@tetratech.com
Invoice to:	Attention: Scott Kingston Address: Same as above Phone: Enter Client Phone Number Here Email: scott.kingston@tetratech.com

Shayan Aug 4 1015 25.8°C



Tetra Tech Canada Inc.
ATTN: Scott Kingston
1000 - 885 Dunsmuir Street, 10th floor
Vancouver BC V6E 1N5

Date Received: 31-AUG-17
Report Date: 15-SEP-17 16:33 (MT)
Version: FINAL

Client Phone: 604-685-0275

Certificate of Analysis

Lab Work Order #: L1984719
Project P.O. #: NOT SUBMITTED
Job Reference: YW17178944
C of C Numbers:
Legal Site Desc:

Brent Mack, B.Sc.
Account Manager

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ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1984719-1 Other P1-02_2.0-2.4	L1984719-2 Other P1-10.2_0.9-1.0	L1984719-3 Other P1-18_3.0-3.5	L1984719-4 Other P13B-01.2_4.8-5.0	L1984719-5 Other P13B-03_3.5-4.0
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	<0.25	0.29	<0.25	0.94	<0.25
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<4.0	<4.0	<4.0	<4.0	<4.0
	Alkalinity, Total (as CaCO3) (mg/L)	31.2	20.9	26.5	42.6	22.2
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	<0.050
	Chloride (Cl) (mg/L)	3.67	<0.50	1.21	0.69	1.10
	Conductivity (uS/cm)	81.2	39.1	53.8	84.5	47.5
	Fluoride (F) (mg/L)	0.271	0.051	0.110	0.245	0.064
	Nitrate (as N) (mg/L)	0.0082	<0.0050	<0.0050	<0.0050	0.0067
	Nitrite (as N) (mg/L)	0.0158	0.0145	0.0128	0.0403	0.0165
	pH (pH)	9.03	9.09	9.21	8.78	9.28
	Sulfate (SO4) (mg/L)	3.66	<0.50	1.12	0.70	0.61
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.415	0.500	0.597	0.360	0.624
	Antimony (Sb)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	0.00015	0.00030
	Arsenic (As)-Leachable (mg/L)	0.0011	<0.0010	<0.0010	0.0029	0.0026
	Barium (Ba)-Leachable (mg/L)	0.0145	0.0038	0.0053	0.0717	0.0094
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	<0.010	<0.010	<0.010	0.014	<0.010
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	8.36	6.26	7.78	12.6	6.81
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	0.00056
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	0.00010	<0.00010
	Copper (Cu)-Leachable (mg/L)	0.0012	0.0014	0.0017	0.0035	0.0028
	Iron (Fe)-Leachable (mg/L)	<0.030	0.153	0.116	0.210	0.192
	Lead (Pb)-Leachable (mg/L)	<0.00010	0.00010	<0.00010	0.00023	0.00018
	Lithium (Li)-Leachable (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	2.37	0.875	1.65	2.26	1.13
	Manganese (Mn)-Leachable (mg/L)	<0.00050	0.00192	0.00162	0.00183	0.00187
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00144	0.00014	0.00099	0.00062	0.00063
	Nickel (Ni)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	2.18	0.445	0.997	1.93	0.953
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Silicon (Si)-Leachable (mg/L)	2.84	1.24	2.37	4.99	2.23
	Silver (Ag)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)	2.15	0.285	0.802	0.970	0.638

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1984719-6 Other P13B-07.2_2.5-2.6	L1984719-7 Other P13B-09.2_3.7-3.9	L1984719-8 Other P13C-01_2.5-3.5	L1984719-9 Other P13C-09_3.0-3.5	L1984719-10 Other P116-01_2.8-3.3
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	<0.25	1.56	0.34	<0.25	0.78
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<4.0	<4.0	<4.0	<4.0	<4.0
	Alkalinity, Total (as CaCO3) (mg/L)	42.5	52.1	30.3	22.6	33.4
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	<0.050	0.060
	Chloride (Cl) (mg/L)	1.93	1.30	0.50	<0.50	4.28
	Conductivity (uS/cm)	93.8	109	62.1	48.6	83.5
	Fluoride (F) (mg/L)	0.508	0.355	0.106	0.064	0.167
	Nitrate (as N) (mg/L)	0.0140	0.0060	<0.0050	<0.0050	0.0067
	Nitrite (as N) (mg/L)	0.0312	0.0460	0.0188	0.0192	0.0265
	pH (pH)	9.41	8.75	9.37	8.74	9.11
	Sulfate (SO4) (mg/L)	2.32	1.28	0.81	<0.50	0.94
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0999	0.175	0.209	0.440	0.532
	Antimony (Sb)-Leachable (mg/L)	<0.00010	0.00013	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Leachable (mg/L)	<0.0010	0.0012	0.0018	0.0012	0.0013
	Barium (Ba)-Leachable (mg/L)	0.0061	0.0595	0.0453	0.0033	0.0301
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	<0.010	0.033	<0.010	<0.010	0.026
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	5.73	14.8	8.07	6.59	7.98
	Chromium (Cr)-Leachable (mg/L)	<0.00050	0.00067	<0.00050	<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	0.00010
	Copper (Cu)-Leachable (mg/L)	<0.0010	0.0013	<0.0010	0.0017	0.0025
	Iron (Fe)-Leachable (mg/L)	<0.030	0.086	<0.030	0.155	0.202
	Lead (Pb)-Leachable (mg/L)	<0.00010	0.00011	<0.00010	<0.00010	0.00027
	Lithium (Li)-Leachable (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	8.01	3.15	2.35	0.943	3.95
	Manganese (Mn)-Leachable (mg/L)	<0.00050	0.00102	<0.00050	0.00231	0.00126
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00043	0.0201	0.00082	0.00034	0.00063
	Nickel (Ni)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	0.985	2.79	0.848	0.440	3.64
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Silicon (Si)-Leachable (mg/L)	1.18	5.24	1.91	1.09	3.88
	Silver (Ag)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)	0.990	1.45	0.488	0.255	0.701

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1984719-11 Other P116-02_3.6-4.0	L1984719-12 Other P116-11.1_2.0-3.5	L1984719-13 Other P116-13_1.8-1.9	L1984719-14 Other P116-17-0.6-0.8	L1984719-15 Other P116-18_3.6-3.8
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	1.34	1.16	0.98	0.43	1.05
Leachable Anions & Nutrients	Acidity (as CaCO ₃) (mg/L)	<4.0	<4.0	<4.0	<4.0	<4.0
	Alkalinity, Total (as CaCO ₃) (mg/L)	26.7	37.1	29.2	35.3	23.4
	Bromide (Br) (mg/L)	<0.050	<0.050	<0.050	0.139	<0.050
	Chloride (Cl) (mg/L)	0.67	1.88	0.80	10.1	0.63
	Conductivity (uS/cm)	84.1	82.1	66.0	106	54.5
	Fluoride (F) (mg/L)	0.361	0.312	0.338	0.172	0.220
	Nitrate (as N) (mg/L)	0.0303	0.0090	<0.0050	0.0063	0.0590
	Nitrite (as N) (mg/L)	0.0364	0.0478	0.0302	0.0412	0.0427
	pH (pH)	8.80	8.84	8.75	9.03	8.64
	Sulfate (SO ₄) (mg/L)	12.6	1.46	1.63	1.17	1.11
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0833	1.11	5.56	0.266	1.17
	Antimony (Sb)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	0.0015	<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)	0.118	0.0263	0.0634	0.0260	0.0264
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	0.048	0.034	0.048	0.015	0.026
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	7.37	8.16	7.40	10.1	4.97
	Chromium (Cr)-Leachable (mg/L)	0.00061	0.00103	0.00542	<0.00050	0.00119
	Cobalt (Co)-Leachable (mg/L)	<0.00010	0.00026	0.00350	<0.00010	0.00041
	Copper (Cu)-Leachable (mg/L)	<0.0010	0.0040	0.0238	0.0041	0.0048
	Iron (Fe)-Leachable (mg/L)	<0.030	0.551	3.43	0.163	0.522
	Lead (Pb)-Leachable (mg/L)	<0.00010	0.00032	0.00195	0.00019	0.00038
	Lithium (Li)-Leachable (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	3.94	4.81	4.76	5.44	2.67
	Manganese (Mn)-Leachable (mg/L)	<0.00050	0.00286	0.0142	0.00159	0.00271
	Mercury (Hg)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00326	0.00075	0.00114	0.00049	0.00067
	Nickel (Ni)-Leachable (mg/L)	<0.00050	0.00085	0.00626	0.00059	0.00103
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	3.73	2.83	4.60	2.31	2.24
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Silicon (Si)-Leachable (mg/L)	1.89	4.77	11.7	2.55	3.91
	Silver (Ag)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)	0.645	0.509	0.505	1.24	0.315

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID		L1984719-16 Other P98-01.1_0.0-2.2	L1984719-17 Other P98-07_0.3-0.6	L1984719-18 Other P98-12-0.1-0.3	L1984719-20 Other P76-05_20-2.5	L1984719-21 Other P76-09_0.1-0.4
Grouping	Analyte					
SOIL						
Physical Tests	Moisture (%)	0.83	0.38	0.32	0.61	0.87
Leachable Anions & Nutrients	Acidity (as CaCO3) (mg/L)	<4.0	<4.0	<4.0	<4.0	<4.0
	Alkalinity, Total (as CaCO3) (mg/L)	123	67.3	140	53.8	91.0
	Bromide (Br) (mg/L)	0.132	0.113	0.209	<0.050	0.069
	Chloride (Cl) (mg/L)	12.9	10.9	18.1	1.54	8.47
	Conductivity (uS/cm)	274	162	317	108	197
	Fluoride (F) (mg/L)	0.167	0.124	0.131	0.385	0.404
	Nitrate (as N) (mg/L)	0.156	<0.0050	0.0105	<0.0050	0.0315
	Nitrite (as N) (mg/L)	0.0235	0.0040	0.0148	0.0232	0.0734
	pH (pH)	7.91	8.26	8.01	8.73	8.39
	Sulfate (SO4) (mg/L)	<0.50	<0.50	0.54	0.51	0.69
Leachable Metals	Aluminum (Al)-Leachable (mg/L)	0.0821	0.215	0.0981	0.0877	0.125
	Antimony (Sb)-Leachable (mg/L)	0.00014	<0.00010	<0.00010	0.00014	<0.00010
	Arsenic (As)-Leachable (mg/L)	<0.0010	<0.0010	0.0011	<0.0010	0.0011
	Barium (Ba)-Leachable (mg/L)	0.0125	0.0068	0.0159	0.0108	0.0114
	Beryllium (Be)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)	0.019	0.013	0.022	0.030	0.035
	Cadmium (Cd)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)	27.4	16.0	27.4	11.5	21.5
	Chromium (Cr)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	0.00090	<0.00050
	Cobalt (Co)-Leachable (mg/L)	0.00057	0.00021	0.00022	<0.00010	0.00016
	Copper (Cu)-Leachable (mg/L)	0.0040	0.0021	0.0021	0.0019	0.0053
	Iron (Fe)-Leachable (mg/L)	0.073	0.249	<0.030	0.054	0.248
	Lead (Pb)-Leachable (mg/L)	<0.00010	0.00015	<0.00010	<0.00010	0.00013
	Lithium (Li)-Leachable (mg/L)	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)	15.4	9.62	18.2	4.28	8.69
	Manganese (Mn)-Leachable (mg/L)	0.0523	0.0212	0.0286	0.00101	0.00829
	Mercury (Hg)-Leachable (mg/L)	0.000162	<0.000050	<0.000050	<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)	0.00292	0.00239	0.00073	0.00617	0.00175
	Nickel (Ni)-Leachable (mg/L)	0.00103	0.00064	0.00053	<0.00050	0.00202
	Phosphorus (P)-Leachable (mg/L)	<0.30	<0.30	<0.30	<0.30	<0.30
	Potassium (K)-Leachable (mg/L)	1.97	0.624	3.84	2.22	2.03
	Selenium (Se)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Silicon (Si)-Leachable (mg/L)	3.48	1.91	2.88	4.78	4.70
	Silver (Ag)-Leachable (mg/L)	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)	1.84	1.46	2.42	1.08	2.59

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID Description	L1984719-22 Other	L1984719-23 Other
		Sampled Date		
		Sampled Time		
		Client ID	P69-05-0.0-7.2	P69-03-0.1-0.2
Grouping	Analyte			
SOIL				
Physical Tests	Moisture (%)		0.30	0.26
Leachable Anions & Nutrients	Acidity (as CaCO ₃) (mg/L)		<4.0	<4.0
	Alkalinity, Total (as CaCO ₃) (mg/L)		112	109
	Bromide (Br) (mg/L)		0.090	0.161
	Chloride (Cl) (mg/L)		11.3	24.5
	Conductivity (uS/cm)		237	280
	Fluoride (F) (mg/L)		0.128	0.209
	Nitrate (as N) (mg/L)		0.0286	0.0069
	Nitrite (as N) (mg/L)		0.0212	<0.0010
	pH (pH)		7.91	8.35
	Sulfate (SO ₄) (mg/L)		<0.50	0.80
Leachable Metals	Aluminum (Al)-Leachable (mg/L)		0.187	0.149
	Antimony (Sb)-Leachable (mg/L)		<0.00010	<0.00010
	Arsenic (As)-Leachable (mg/L)		<0.0010	<0.0010
	Barium (Ba)-Leachable (mg/L)		0.0204	0.0261
	Beryllium (Be)-Leachable (mg/L)		<0.00050	<0.00050
	Bismuth (Bi)-Leachable (mg/L)		<0.00050	<0.00050
	Boron (B)-Leachable (mg/L)		0.011	0.011
	Cadmium (Cd)-Leachable (mg/L)		<0.000050	<0.000050
	Calcium (Ca)-Leachable (mg/L)		24.3	20.8
	Chromium (Cr)-Leachable (mg/L)		<0.00050	<0.00050
	Cobalt (Co)-Leachable (mg/L)		0.00024	0.00024
	Copper (Cu)-Leachable (mg/L)		0.0015	<0.0010
	Iron (Fe)-Leachable (mg/L)		0.114	0.036
	Lead (Pb)-Leachable (mg/L)		<0.00010	<0.00010
	Lithium (Li)-Leachable (mg/L)		<0.0050	<0.0050
	Magnesium (Mg)-Leachable (mg/L)		13.1	15.3
	Manganese (Mn)-Leachable (mg/L)		0.0174	0.00942
	Mercury (Hg)-Leachable (mg/L)		<0.000050	<0.000050
	Molybdenum (Mo)-Leachable (mg/L)		0.00067	0.00147
	Nickel (Ni)-Leachable (mg/L)		0.00062	<0.00050
	Phosphorus (P)-Leachable (mg/L)		<0.30	<0.30
	Potassium (K)-Leachable (mg/L)		1.69	2.15
	Selenium (Se)-Leachable (mg/L)		<0.00050	<0.00050
	Silicon (Si)-Leachable (mg/L)		1.31	1.96
	Silver (Ag)-Leachable (mg/L)		<0.000050	<0.000050
	Sodium (Na)-Leachable (mg/L)		2.76	7.40

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1984719-1 Other P1-02_2.0-2.4	L1984719-2 Other P1-10.2_0.9-1.0	L1984719-3 Other P1-18_3.0-3.5	L1984719-4 Other P13B-01.2_4.8-5.0	L1984719-5 Other P13B-03_3.5-4.0
Grouping	Analyte					
SOIL						
Leachable Metals	Strontium (Sr)-Leachable (mg/L)	0.0263	0.00529	0.00978	0.0112	0.00943
	Thallium (Tl)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)	<0.010	<0.010	<0.010	0.016	<0.010
	Uranium (U)-Leachable (mg/L)	0.000151	0.000057	0.000102	0.000193	0.000092
	Vanadium (V)-Leachable (mg/L)	0.0045	0.0028	0.0026	0.0036	0.0031
	Zinc (Zn)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

Sample ID Description Sampled Date Sampled Time Client ID	L1984719-6 Other P13B-07.2_2.5-2.6	L1984719-7 Other P13B-09.2_3.7-3.9	L1984719-8 Other P13C-01_2.5-3.5	L1984719-9 Other P13C-09_3.0-3.5	L1984719-10 Other P116-01_2.8-3.3	
Grouping	Analyte					
SOIL						
Leachable Metals	Strontium (Sr)-Leachable (mg/L)	0.0246	0.0119	0.00938	0.00694	0.00937
	Thallium (Tl)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)	0.000107	0.000440	0.000068	0.000092	0.000149
	Vanadium (V)-Leachable (mg/L)	0.0035	0.0020	0.0031	0.0039	0.0017
	Zinc (Zn)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1984719-11	L1984719-12	L1984719-13	L1984719-14	L1984719-15
		Description	Other	Other	Other	Other	Other
		Sampled Date					
		Sampled Time					
		Client ID	P116-02_3.6-4.0	P116-11.1_2.0-3.5	P116-13_1.8-1.9	P116-17-0.6-0.8	P116-18_3.6-3.8
Grouping	Analyte						
SOIL							
Leachable Metals	Strontium (Sr)-Leachable (mg/L)		0.0272	0.00908	0.00874	0.0118	0.00465
	Thallium (Tl)-Leachable (mg/L)		<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)		<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)		<0.010	0.011	0.039	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)		0.000069	0.000158	0.000136	0.000143	0.000036
	Vanadium (V)-Leachable (mg/L)		<0.0010	0.0017	0.0059	<0.0010	0.0012
	Zinc (Zn)-Leachable (mg/L)		<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

	Sample ID Description Sampled Date Sampled Time Client ID	L1984719-16 Other P98-01.1_0.0-2.2	L1984719-17 Other P98-07_0.3-0.6	L1984719-18 Other P98-12-0.1-0.3	L1984719-20 Other P76-05_20-2.5	L1984719-21 Other P76-09_0.1-0.4
Grouping	Analyte					
SOIL						
Leachable Metals	Strontium (Sr)-Leachable (mg/L)	0.0174	0.0124	0.0296	0.00779	0.0124
	Thallium (Tl)-Leachable (mg/L)	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010
	Tin (Sn)-Leachable (mg/L)	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050
	Titanium (Ti)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010
	Uranium (U)-Leachable (mg/L)	0.000193	0.000149	0.000160	0.000418	0.000633
	Vanadium (V)-Leachable (mg/L)	<0.0010	<0.0010	<0.0010	0.0014	0.0016
	Zinc (Zn)-Leachable (mg/L)	<0.010	<0.010	<0.010	<0.010	<0.010

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

ALS ENVIRONMENTAL ANALYTICAL REPORT

		Sample ID	L1984719-22	L1984719-23			
		Description	Other	Other			
		Sampled Date					
		Sampled Time					
		Client ID	P69-05-0.0-7.2	P69-03-0.1-0.2			
Grouping	Analyte						
SOIL							
Leachable Metals	Strontium (Sr)-Leachable (mg/L)		0.0205	0.0338			
	Thallium (Tl)-Leachable (mg/L)		<0.00010	<0.00010			
	Tin (Sn)-Leachable (mg/L)		<0.00050	<0.00050			
	Titanium (Ti)-Leachable (mg/L)		<0.010	<0.010			
	Uranium (U)-Leachable (mg/L)		0.000259	0.000363			
	Vanadium (V)-Leachable (mg/L)		<0.0010	0.0011			
	Zinc (Zn)-Leachable (mg/L)		<0.010	<0.010			

* Please refer to the Reference Information section for an explanation of any qualifiers detected.

Reference Information

QC Samples with Qualifiers & Comments:

QC Type Description	Parameter	Qualifier	Applies to Sample Number(s)
Duplicate	Aluminum (Al)-Leachable	DUP-H	L1984719-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8
Duplicate	Iron (Fe)-Leachable	DUP-H	L1984719-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8
Duplicate	Manganese (Mn)-Leachable	DUP-H	L1984719-15, -16, -17, -18, -20, -21, -22, -23, -9
Duplicate	Uranium (U)-Leachable	DUP-H	L1984719-15, -16, -17, -18, -20, -21, -22, -23, -9
Duplicate	Nitrite (as N)	DUP-H	L1984719-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8
Duplicate	Nitrite (as N)	DUP-H	L1984719-15, -16, -17, -18, -20, -21, -22, -23, -9
Duplicate	Lead (Pb)-Leachable	DUP-H,J	L1984719-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8
Duplicate	Manganese (Mn)-Leachable	DUP-H,J	L1984719-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L1984719-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Calcium (Ca)-Leachable	MS-B	L1984719-15, -16, -17, -18, -20, -21, -22, -23, -9
Matrix Spike	Magnesium (Mg)-Leachable	MS-B	L1984719-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Magnesium (Mg)-Leachable	MS-B	L1984719-15, -16, -17, -18, -20, -21, -22, -23, -9
Matrix Spike	Silicon (Si)-Leachable	MS-B	L1984719-1, -10, -11, -12, -13, -14, -2, -3, -4, -5, -6, -7, -8
Matrix Spike	Silicon (Si)-Leachable	MS-B	L1984719-15, -16, -17, -18, -20, -21, -22, -23, -9

Qualifiers for Individual Parameters Listed:

Qualifier	Description
DUP-H	Duplicate results outside ALS DQO, due to sample heterogeneity.
DUP-H,J	Duplicate results outside ALS DQO, due to sample heterogeneity. Duplicate results and limits are expressed in terms of absolute difference.
MS-B	Matrix Spike recovery could not be accurately calculated due to high analyte background in sample.

Test Method References:

ALS Test Code	Matrix	Test Description	Method Reference**
ACY-SHKFLSK-PCT-VA	Soil	Acidity by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2310 "Acidity".</p> <p>Lab deionized water is used in the creation of the samples for acidity testing. Although of very low ionic strength, the water does have pH <8.3, and hence inherent acidity, and may contribute measurable acidity levels near the limit of reporting."</p>			
ALK-SHKFLSK-PCT-VA	Soil	Alkalinity by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2320 "Alkalinity".</p>			
BR-SHKFLSK-IC-VA	Soil	Bromide by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
CL-SHKFLSK-IC-VA	Soil	Chloride by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.</p>			
EC-SHKFLSK-PCT-VA	Soil	EC by PCT (SHAKEFLASK)	BC MINISTRY OF ENERGY AND MINES
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using procedures adapted from APHA Method 2510 "Conductivity".</p>			
F-SHKFLSK-IC-VA	Soil	Fluoride by IC (SHAKEFLASK)	BC MIN. OF ENERGY AND MINES/APHA 4110 B.
<p>This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted</p>			

Reference Information

from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

HG-SHKFLSK-CVAFS-VA Soil Mercury by CVAFS (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using cold vapour atomic fluorescence spectrophotometry or atomic absorption spectrophotometry (EPA Method 245.7).

The Shakeflask extraction is an empirical procedure with pre-defined characteristics. Recovery of some elements (Ag, Bi, Hg, and Sn) by this method can be variable due to the neutral pH of the extraction fluid. LCS QC sample DQOs for these elements have been established at 50-130% for this reason.

MET-SHKFLSK-MS-VA Soil Metals by ICPMS (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter and analysed using inductively coupled plasma - mass spectrophotometry (EPA Method 6020A).

The Shakeflask extraction is an empirical procedure with pre-defined characteristics. Recovery of some elements (Ag, Bi, Hg, and Sn) by this method can be variable due to the neutral pH of the extraction fluid. LCS QC sample DQOs for these elements have been established at 50-130% for this reason.

MOISTURE-VA Soil Moisture content CWS for PHC in Soil - Tier 1

This analysis is carried out gravimetrically by drying the sample at 105 C for a minimum of six hours.

NO2-SHKFLSK-IC-VA Soil Nitrite by IC (SHAKEFLASK) BC MIN. OF ENERGY AND MINES/APHA 4110 B.

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

NO3-SHKFLSK-IC-VA Soil Nitrate by IC (SHAKEFLASK) BC MIN. OF ENERGY AND MINES/APHA 4110 B.

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography". Anions routinely determined by this method include: bromide, chloride, fluoride, nitrate, nitrite and sulphate.

PH-SHKFLSK-MAN-VA Soil pH by Manual Meter (SHAKEFLASK) BC MINISTRY OF ENERGY AND MINES

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently analysed using procedures adapted from APHA Method 4500-H "pH Value". The pH is determined in the laboratory using a pH electrode.

SO4-SHKFLSK-IC-VA Soil Sulfate by IC (SHAKEFLASK) BC MIN. OF ENERGY AND MINES/APHA 4110 B.

This analysis is based upon the extraction procedure outlined in "Prediction Manual for Drainage Chemistry from Sulphidic Geologic Materials (MEND Report 1.20.1)" (William A. Price, 2009). In summary, a sample is extracted with deionized water at a 3:1 liquid to solids ratio for 24 hours. The extract is then allowed to settle and subsequently filtered through a 0.45 micron membrane filter. The analysis is carried out using procedures adapted from APHA Method 4110 B. "Ion Chromatography with Chemical Suppression of Eluent Conductivity" and EPA Method 300.0 "Determination of Inorganic Anions by Ion Chromatography".

** ALS test methods may incorporate modifications from specified reference methods to improve performance.

The last two letters of the above test code(s) indicate the laboratory that performed analytical analysis for that test. Refer to the list below:

Laboratory Definition Code	Laboratory Location
VA	ALS ENVIRONMENTAL - VANCOUVER, BRITISH COLUMBIA, CANADA

Chain of Custody Numbers:

Reference Information

GLOSSARY OF REPORT TERMS

Surrogate - A compound that is similar in behaviour to target analyte(s), but that does not occur naturally in environmental samples. For applicable tests, surrogates are added to samples prior to analysis as a check on recovery.

mg/kg - milligrams per kilogram based on dry weight of sample.

mg/kg wwt - milligrams per kilogram based on wet weight of sample.

mg/kg lwt - milligrams per kilogram based on lipid-adjusted weight of sample.

mg/L - milligrams per litre.

< - Less than.

D.L. - The reported Detection Limit, also known as the Limit of Reporting (LOR).

N/A - Result not available. Refer to qualifier code and definition for explanation.

Test results reported relate only to the samples as received by the laboratory.

UNLESS OTHERWISE STATED, ALL SAMPLES WERE RECEIVED IN ACCEPTABLE CONDITION.

Analytical results in unsigned test reports with the DRAFT watermark are subject to change, pending final QC review.



L1984719-COFC

Analysis Request Form – Shake Flask Analysis – OA-SFE01

Date:	8/31/2017				
Workorder Number:	YW17178944				
Analyzing Laboratory:	ALSE – ALS Environmental				
Client Contact Name:	Scott Kingston				
Client Company Name:	Tetra Tech Canada Inc.				
Project Name:	YW17178944				
Number of Samples & Country of Origin:	23				
Sample IDs:	P1-02_2.0-2.4	P13B-09.2_3.7-3.9	P116-13_1.8-1.9	P76-04_0.1-0.4	
	P1-10.2_0.9-1.0	P13C-01_2.5-3.5	P116-17-0.6-0.8	P76-05_20-2.5	
	P1-18_3.0-3.5	P13C-09_3.0-3.5	P116-18_3.6-3.8	P76-09_0.1-0.4	
	P13B-01.2_4.8-5.0	P116-01_2.8-3.3	P98-01.1_0.0-2.2	P69-05-0.0-7.2	
	P13B-03_3.5-4.0	P116-02_3.6-4.0	P98-07_0.3-0.6	P69-03-0.1-0.2	
	P13B-07.2_2.5-2.6	P116-11.1_2.0-3.5	P98-12-0.1-0.3		
Sample Type:	<input type="checkbox"/> Drill Core <input type="checkbox"/> Percussion <input type="checkbox"/> Rock <input type="checkbox"/> Soil <input type="checkbox"/> Pulp <input checked="" type="checkbox"/> Other 250g of crushed reject material				
Analysis Required:	Shake Flask Analysis- ACY-SHKFLSK-PCT-VA ALK-SHKFLSK-PCT-VA ANIONS-ALL-SHKFL-VA EC-SHKFLSK-PCT-VA MET-SHKFLSK-VA SO4-SHKFLSK-IC-VA				
Special Instructions:	Attn: Brent Mack				
Sample Disposition:	<input type="checkbox"/> Return <input checked="" type="checkbox"/> Dispose after analysis				
Results to:	Scott Kingston - scott.kingston@tetrattech.com				

Recd: MS Aug 31/17 16:20
TEMP: 23.7°C

ADDRESS 2103 Dollarton Hwy, North Vancouver BC V7H 0A7 Canada | PHONE +1 604 984 0221 | FAX +1 604 984 0218

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APPENDIX D2

GEOCHEMICAL CHARACTERIZATION - LAB DATA SUMMARY TABLES

Table 1: Acid-Base Accounting (ABA) Analysis Results

Prospect ID	Sample ID	Lab Reported Values										Calculated Values		
		Fizz Rating	Maximum Potential Acidity (MPA)	Net-Neutralization Potential (NNP)	Sobek Neutralization Potential (NP)	Neutralization Potential Ratio, NPR (NP:MPA)	pH	Total Sulphur	Sulphide Sulphur	Sulphate Sulphur (HCl Leachable)	Inorganic Carbon		Carbonate Neutralization Potential (CNP)	Carbonate Neutralization Potential Ratio (CNPR)
		Unity	tCaCO3/1Kt	tCaCO3/1Kt	tCaCO3/1Kt	Unity	Unity	S%	S%	%	C%	CO2%	tCaCO3/1Kt	Unity
P29	P29-01_5.10-5.33	4	1.6	971	973	622.7	8.3	0.05	0.04	<0.01	11.3	41.4	941.5	588.5
	P29-03_6.50-6.69	4	1.3	987	988	790.4	8.3	0.04	0.02	<0.01	10.05	36.9	839.2	645.5
	P29-04_8.79-8.93	4	2.2	968	970	443.4	8.4	0.07	0.04	<0.01	10.4	38	864.2	392.8
	P29-05_2.43-2.69	4	0.9	984	985	1050.5	8.3	0.03	0.02	<0.01	11.15	40.9	930.2	1033.5
	P29-05_4.34-4.57	4	29.1	926	955	32.86	8.4	0.93	0.84	<0.01	10.85	39.8	905.2	31.1
	P29-06_1.84-2.00	4	1.6	972	974	623.4	8.3	0.05	0.03	<0.01	11.25	41.2	937.0	585.6
	P29-07_0.86-1.00	4	0.6	974	975	1560	8.4	0.02	0.02	<0.01	11.15	40.8	927.9	1546.5
	P29-07_4.00-4.27	4	0.6	973	974	1558.5	8.4	0.02	0.01	<0.01	10.25	37.6	855.1	1425.2
	P29-08_3.00-3.30	4	11.3	959	970	86.22	8.4	0.36	0.31	<0.01	10.95	40.2	914.3	80.9
	Minimum	4	0.6	926	955	33	8.3	0.02	0.01	<0.01	10.05	36.9	839.2	31.1
Maximum	4	29.1	987	988	1560	8.4	0.93	0.84	<0.01	11.3	41.4	941.5	1546.5	
10th Percentile	4	0.6	926	955	33	8.3	0.02	0.01	<0.01	10.05	36.9	839.2	31.1	
90th Percentile	4	0.6	926	955	33	8.3	0.02	0.01	<0.01	10.05	36.9	839.2	31.1	
Median	4	1.6	972	974	623	8.4	0.05	0.03	<0.01	10.95	40.2	914.3	588.5	
Mean	4	5.5	968	974	752	8.4	0.17	0.15	<0.01	10.82	39.6	901.6	703.3	
P13D	P13D-02_1.25-1.44	4	0.3	991	991	3171	8.5	0.01	<0.01	<0.01	11.65	42.6	968.8	3229.4
	P13D-02_5.00-5.16	4	0.9	992	993	1059	8.4	0.03	0.02	<0.01	11.2	41.1	934.7	1038.6
	P13D-03-0.84-1.02	4	3.8	953	957	255.2	8.4	0.12	0.09	<0.01	10.8	39.6	900.6	237.0
	P13D-03_3.30-3.50	4	5	942	947	189.4	8.4	0.16	0.1	<0.01	9.4	34.4	782.3	156.5
	P13D-04_2.63-2.83	4	6.3	927	933	149.3	8.2	0.2	0.11	<0.01	9.99	36.6	832.4	132.1
	P13D-04_6.50-6.70	4	8.8	935	944	107.9	8.3	0.28	0.19	<0.01	10.5	38.5	875.6	99.5
	P13D-05_4.41-4.63	4	0.9	1000	1000	1069	8.5	0.03	0.03	<0.01	11.1	40.6	923.3	1025.9
	P13D-05_8.23-8.40	4	1.3	978	979	783.2	8.3	0.04	0.03	<0.01	10.65	39	887.0	682.3
	Minimum	4	0.3	927	933	108	8.2	0.01	0.02	<0.01	9.4	34.4	782.3	99.5
	Maximum	4	8.8	1000	1000	3171	8.5	0.28	0.19	<0.01	11.65	42.6	968.8	3229.4
10th Percentile	4	0.72	933	941	137	8.27	0.024	0.026	<0.01	9.813	35.94	817.4	122.3	
90th Percentile	4	7.05	994	995	1700	8.5	0.224	0.142	<0.01	11.335	41.55	945.0	1695.8	
Median	4	2.6	966	968	519	8.4	0.08	0.09	<0.01	10.73	39.3	893.8	459.6	
Mean	4	3.4	965	968	848	8.4	0.11	0.08	<0.01	10.66	39.05	888.1	825.2	
P33A	P33A-01_3.24-3.40	4	0.6	1030	1030	1649.5	9.1	0.02	0.02	0.01	11.6	42.5	966.6	1610.9
	P33A-01_7.50-7.69	4	2.2	1040	1045	476.8	9.2	0.07	0.06	<0.01	11.55	42.3	962.0	437.3
	P33A-02_4.20-4.38	4	0.6	1040	1045	1669	9.1	0.02	0.02	<0.01	11.95	43.9	998.4	1664.0
	P33A-02_5.08-5.25	4	3.1	977	980	313.6	8.4	0.1	0.07	<0.01	10.5	38.5	875.6	282.4
	P33A-03_6.06-6.31	4	1.6	1020	1020	654.1	9.1	0.05	0.03	<0.01	11.25	41.3	939.3	587.0
	P33A-03_9.15-9.39	4	1.3	1055	1055	843.2	9	0.04	0.02	<0.01	12.05	44.2	1005.2	773.2
	P33A-04_9.12-9.30	4	3.4	1010	1010	294.1	9.1	0.11	0.08	<0.01	10.85	39.7	902.9	265.6
	P33A-06_0.50-0.80	4	0.9	972	973	1038	9.1	0.03	0.02	<0.01	10.5	38.4	873.3	970.3
	P33A-07_2.50-2.71	4	0.3	1030	1030	3302	9.2	0.01	0.01	<0.01	11.8	43.2	982.5	3274.9
	P33A-07_6.25-6.41	4	1.3	1030	1035	826.4	9.1	0.04	0.03	<0.01	11.65	42.6	968.8	745.3
Minimum	4	0.3	936	937	236	8.4	0.01	0.01	0.01	10.50	38.4	873.3	223.5	
Maximum	4	4.1	1055	1055	3302	9.2	0.13	0.08	0.07	12.05	44.2	1005.2	3274.9	
10th Percentile	4	0.5	946	948	265	8.4	0.02	0.02	<0.01	10.50	38.5	874.5	244.5	
90th Percentile	4	0.5	946	948	265	8.4	0.02	0.02	<0.01	10.50	38.5	874.5	244.5	
Median	4	1.5	1020	1020	702	9.1	0.05	0.03	0.04	11.38	41.7	948.4	634.7	
Mean	4	1.8	1005	1007	934	8.9	0.06	0.04	0.04	11.25	41.2	937.6	889.8	
P86	P86-04 SAND	4	<0.3	920	920	5888	8.8	<0.01	0.01	<0.01	10.30	37.8	859.7	5731.1
	P86-01A_0.31-0.50	4	<0.3	1065	1065	6810	8.7	<0.01	<0.01	<0.01	12.3	45.1	1025.7	6837.9
	P86-02_3.95-4.16	4	<0.3	1060	1060	6784	8.8	<0.01	<0.01	<0.01	12.3	45.1	1025.7	6837.9
	P86-02_8.09-8.30	4	6.3	956	962	153.9	8.9	0.2	0.17	<0.01	10.6	38.9	884.7	140.4
	P86-04_6.17-6.36	4	3.1	1025	1030	329	8.7	0.1	0.04	<0.01	10.15	37.1	843.7	272.2
	P86-04_8.36-8.55	4	8.1	1010	1015	125.05	8.7	0.26	0.12	<0.01	10.2	37.3	848.3	104.7
	P86-06_3.50-3.80	4	<0.3	1060	1060	6784	8.9	<0.01	<0.01	<0.01	10.7	39.1	889.2	5928.2
	P86-06_5.60-5.82	4	1.3	1025	1025	820	8.9	0.04	0.02	<0.01	11.45	42	955.2	734.8
	P86-06_6.76-6.93	4	2.8	1010	1015	360.5	8.9	0.09	0.04	0.02	10.95	40	909.7	324.9
	Minimum	4	1.3	956	962	125	8.7	0.04	0.02	0.02	10.2	37.1	843.7	104.7
Maximum	4	8.1	1065	1065	6810	8.9	0.26	0.17	0.02	12.3	45.1	1025.7	6837.9	
10th Percentile	4	1.9	994	999	145	8.7	0.06	0.03	0.02	10.2	37.2	846.9	129.7	
90th Percentile	4	7.4	1062	1062	6792	8.9	0.24	0.15	0.02	12.3	45.1	1025.7	6837.9	
Median	4	3.1	1025	1028	590	8.9	0.10	0.04	0.02	10.8	39.6	899.5	529.8	
Mean	4	4.3	1026	1029	2771	8.8	0.14	0.08	0.02	11.1	40.6	922.8	2647.6	

Table 2: Trace Element Analysis by ICP-MS Results

Prospect	Sample ID	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge	Hf	In	K	La	Li	Mg	Mn	Mo	Na
		ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%	ppm	ppm
P29	P29-01_5.10-5.33	0.01	0.19	0.3	50	0.37	0.03	35.5	<0.02	1.35	0.5	6	0.22	2.9	0.09	0.54	0.05	0.1	<0.005	0.08	0.6	13.5	1.35	47	0.3	0.02
	P29-03_6.50-6.69	<0.01	0.05	<0.2	120	0.22	0.02	37.4	<0.02	1.03	0.4	2	0.11	1.4	0.03	0.17	0.06	<0.1	<0.005	0.02	0.5	7.9	0.64	32	0.22	0.02
	P29-04_8.79-8.93	<0.01	0.18	<0.2	110	0.07	0.02	37.5	<0.02	1.58	0.6	3	0.1	1.5	0.06	0.51	0.06	0.1	<0.005	0.08	0.7	3	0.37	35	0.25	0.01
	P29-05_2.43-2.69	0.01	0.11	<0.2	20	0.05	0.02	37.3	<0.02	1.25	0.4	2	0.06	1.2	0.07	0.27	0.05	<0.1	<0.005	0.05	0.7	1.4	0.95	69	0.29	0.01
	P29-05_4.34-4.57	<0.01	0.17	1.4	30	0.06	0.02	35	<0.02	1.52	0.5	3	0.1	1.5	0.81	0.43	<0.05	0.1	<0.005	0.08	0.7	2.3	1.3	47	0.2	0.01
	P29-06_1.84-2.00	0.01	0.15	0.2	210	0.06	0.02	35.7	<0.02	1.51	1.8	2	0.1	6	0.07	0.49	<0.05	0.1	<0.005	0.07	0.8	2.1	0.39	39	0.26	0.01
	P29-07_0.86-1.00	<0.01	0.1	0.3	40	0.05	0.02	35.8	<0.02	1.66	1.6	2	0.06	5.7	0.07	0.34	<0.05	<0.1	<0.005	0.04	1.1	1.3	0.82	83	0.71	0.01
	P29-07_4.00-4.27	0.01	0.16	0.2	130	0.07	0.02	37.1	0.02	1.4	1.7	3	0.11	6.7	0.07	0.55	<0.05	0.1	<0.005	0.07	0.7	2.3	0.99	42	0.16	0.01
	P29-08_3.00-3.30	0.01	0.19	1.3	10	0.1	0.02	34.4	0.02	3.02	2.6	4	0.11	6.5	0.39	0.58	<0.05	0.1	<0.005	0.09	2	2.1	0.74	180	1	0.02
P13D	P13D-02_1.25-1.44	<0.01	0.08	0.2	10	0.06	0.02	36.9	<0.02	1.09	0.4	1	<0.05	0.9	0.06	0.24	0.19	<0.1	<0.005	0.03	0.6	2.3	0.47	76	0.17	0.01
	P13D-02_5.00-5.16	0.01	0.04	<0.2	10	<0.05	0.05	38.1	0.04	0.94	1.6	2	<0.05	9.7	0.05	0.24	<0.05	<0.1	<0.005	0.01	0.6	1.1	1.55	46	0.43	0.01
	P13D-03-0.84-1.02	0.01	0.38	<0.2	20	0.15	0.02	36.2	<0.02	5.57	2.3	6	0.23	5.8	0.2	1.03	<0.05	0.1	<0.005	0.17	4.6	2.7	0.31	173	0.19	0.02
	P13D-03_3.30-3.50	<0.01	0.45	<0.2	30	0.22	0.02	35.7	0.13	5.4	2.5	7	0.26	5.9	0.21	1.22	<0.05	0.2	<0.005	0.21	3.8	4.1	0.5	167	0.19	0.02
	P13D-04_2.63-2.83	<0.01	0.64	<0.2	40	0.21	0.03	35.6	<0.02	7.87	2.7	11	0.39	6.2	0.25	1.67	<0.05	0.3	<0.005	0.29	5.5	5.4	0.39	158	0.29	0.02
	P13D-04_6.50-6.70	0.01	0.46	<0.2	210	0.16	0.02	34.2	<0.02	4.96	2.5	9	0.28	5.8	0.29	1.32	<0.05	0.2	<0.005	0.21	3.3	3.5	0.58	181	0.23	0.02
	P13D-05_4.41-4.63	<0.01	0.06	<0.2	30	0.06	0.01	34.2	<0.02	1.6	1.6	2	<0.05	4.8	0.08	0.33	<0.05	<0.1	<0.005	0.02	0.8	2.2	3.12	45	1.22	0.01
	P13D-05_8.23-8.40	<0.01	0.05	<0.2	10	<0.05	0.01	35.8	<0.02	1.5	1.6	2	<0.05	4.4	0.04	0.32	<0.05	<0.1	<0.005	0.02	0.8	1.4	0.66	25	0.38	0.01
P33A	P33A-01_3.24-3.40	0.01	0.16	0.6	20	0.13	0.02	21.7	<0.02	2.54	1.2	3	0.09	4.6	0.09	0.85	0.21	0.1	<0.005	0.06	1.1	9.4	11.9	42	0.25	0.02
	P33A-01_7.50-7.69	<0.01	0.09	0.7	70	0.1	0.01	23.1	<0.02	2.36	1.3	2	0.05	4.6	0.07	0.73	0.24	<0.1	<0.005	0.03	1.1	6.1	12.55	45	2.44	0.02
	P33A-02_4.20-4.38	<0.01	0.17	<0.2	20	0.08	0.01	21.9	<0.02	2.05	1.2	3	0.09	4.1	0.09	0.86	0.25	0.1	<0.005	0.07	1	10.3	12	40	0.44	0.02
	P33A-02_5.08-5.25	<0.01	0.15	<0.2	260	0.07	0.01	35.3	<0.02	2.96	1.7	3	0.09	4.5	0.07	0.73	0.09	0.1	<0.005	0.06	1.4	5.8	2.3	22	0.71	0.01
	P33A-03_6.06-6.31	<0.01	0.17	<0.2	10	0.07	0.01	21.5	<0.02	2.48	1.2	3	0.1	4	0.09	0.86	0.2	0.1	<0.005	0.07	1.2	10.2	11.65	45	0.49	0.01
	P33A-03_9.15-9.39	0.01	0.12	1	<10	0.06	0.01	21.4	<0.02	1.91	1.2	1	0.08	3.6	0.07	0.84	0.24	<0.1	<0.005	0.05	1	3.9	13.15	37	0.8	0.02
	P33A-04_9.12-9.30	0.01	0.22	<0.2	160	0.08	0.01	22.7	<0.02	2.77	1.2	4	0.12	3.8	0.18	0.98	0.2	0.2	<0.005	0.09	1.3	11	10.35	42	0.67	0.02
	P33A-06_0.50-0.80	0.01	0.42	0.5	70	0.13	0.04	21.5	0.02	9.41	0.6	2	0.09	4.1	0.17	1.11	0.14	0.5	0.006	0.25	4.6	4.7	10.15	43	1.17	0.1
	P33A-07_2.50-2.71	0.01	0.14	0.5	20	0.05	0.03	23.3	<0.02	2.02	0.4	2	0.07	4.4	0.09	0.37	0.18	0.1	<0.005	0.05	0.9	5.3	10.45	42	1.48	0.02
	P33A-07_6.25-6.41	<0.01	0.06	0.3	70	<0.05	0.03	25.5	<0.02	1.01	0.3	1	0.05	1.8	0.03	0.22	0.21	<0.1	<0.005	0.02	0.5	1.2	9.93	44	0.63	0.01
	P33A-08_3.50-4.30	0.03	0.53	0.7	90	0.12	0.04	28.5	0.02	5.27	1.7	9	0.24	4.6	0.29	1.42	0.2	0.2	<0.005	0.17	2.7	4.8	5.38	49	0.53	0.09
P33A-08_8.80-9.01	<0.01	0.09	0.9	20	0.07	0.03	22.6	<0.02	3.69	0.5	2	0.06	2.2	0.17	0.33	0.23	<0.1	<0.005	0.04	1.5	3.2	11.1	42	2.21	0.02	
P33A-10_1.00-1.23	0.01	0.26	<0.2	50	0.1	0.03	35.1	0.03	2.84	0.8	4	0.16	2.5	0.12	0.74	0.18	0.1	<0.005	0.12	1.7	3.5	0.36	91	0.46	0.01	
P33A-10_8.83-9.00	0.01	0.15	0.4	3680	0.05	0.03	34.4	<0.02	2.11	0.5	2	0.16	1.9	0.15	0.49	0.14	0.1	<0.005	0.06	1	3.4	1.07	54	0.88	<0.01	
P86	P86-04 SAND	7.16	0.84	1	70	0.24	0.04	18.65	0.02	8.8	1.3	9	0.26	14.9	0.46	1.85	0.14	0.5	0.005	0.39	4.6	5.4	11.8	193	8.59	0.24
	P86-01A_0.31-0.50	0.01	0.09	0.3	10	0.07	0.03	21	<0.02	1.54	0.3	2	0.07	1.5	0.19	0.27	0.23	<0.1	<0.005	0.05	1	2.8	13.15	193	0.48	0.02
	P86-02_3.95-4.16	0.01	0.11	<0.2	10	0.06	0.03	21.5	<0.02	2.09	0.4	2	0.09	1	0.16	0.36	0.28	<0.1	<0.005	0.06	1.2	2.9	12.95	199	0.16	0.01
	P86-02_8.09-8.30	0.01	0.74	1.3	60	0.27	0.03	19.2	<0.02	7.9	0.6	7	0.64	0.7	0.5	1.78	0.2	0.4	0.006	0.49	4	12.4	12.05	201	0.85	0.02
	P86-04_6.17-6.36	0.01	0.48	1	50	0.19	0.03	20.3	<0.02	5.62	0.5	7	0.42	0.8	0.33	1.19	0.25	0.2	0.005	0.28	3	7.7	12.9	206	0.31	0.02
	P86-04_8.36-8.55	0.01	0.59	1.4	20	0.21	0.03	20	<0.02	7.99	0.7	6	0.49	1.7	0.49	1.43	0.23	0.3	0.007	0.32	4.1	9.5	12.5	231	0.64	0.02
	P86-06_3.50-3.80	0.01	0.14	<0.2	10	0.08	0.03	20.8	<0.02	1.95	0.5	2	0.11	1.3	0.16	0.44	0.23	0.1	<0.005	0.08	1.1	3.6	13.05	178	0.18	0.01
	P86-06_5.60-5.82	0.01	0.36	<0.2	20	0.19	0.02	20.5	<0.02	4.84	0.5	4	0.3	1.3	0.26	0.88	0.25	0.2	0.005	0.22	2.6	6.4	12.9	185	0.22	0.02
P86-06_6.76-6.93	<0.01	0.44	0.4	20	0.17	0.02	20.8	<0.02	4.82	0.5	5	0.37	0.7	0.34	1.08	0.25	0.2	<0.005	0.27	2.6	7.1	13.05	200	0.32	0.02	
Crustal Abundance		0.0X	0.42	1	10	0.X	D	30.23	0.035	11.5	0.1	11	0.X	4	0.38	4	0.2	0.3	0.0X	0.27	X	5	4.7	1100	0.4	0.04
10x Crustal Abundance		0.0X	4.2	10	100	0.X	D	302.3	0.35	115	1	110	0.X	40	3.8	40	2	3	0.0X	2.7	X	50	47	11000	4	0.4

Table 2: Trace Element Analys

Prospect	Sample ID	Nb	Ni	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr
		ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm
P29	P29-01_5.10-5.33	0.5	2.2	20	1.4	4.6	0.002	0.06	0.1	0.3	1	0.2	240	0.12	<0.05	0.2	0.009	0.05	1	4	0.1	0.5	<2	2.4
	P29-03_6.50-6.69	0.2	0.7	10	0.6	1.8	0.002	0.04	0.06	0.1	1	<0.2	260	0.08	<0.05	0.07	<0.005	0.03	0.7	3	<0.1	0.4	<2	0.5
	P29-04_8.79-8.93	0.3	1.7	40	0.7	3.1	<0.002	0.07	0.09	0.4	1	<0.2	326	<0.05	<0.05	0.23	0.009	0.02	0.8	3	0.1	0.6	<2	2.6
	P29-05_2.43-2.69	0.2	1.1	10	0.6	1.7	<0.002	0.04	0.07	0.2	1	<0.2	257	<0.05	<0.05	0.15	0.006	0.02	0.7	3	<0.1	0.5	<2	1.7
	P29-05_4.34-4.57	0.3	1.1	30	0.8	2.8	<0.002	0.96	0.08	0.3	1	<0.2	271	<0.05	<0.05	0.22	0.009	0.02	0.7	3	<0.1	0.6	2	2.5
	P29-06_1.84-2.00	0.3	2.7	20	1.5	3	<0.002	0.07	0.05	0.4	1	<0.2	283	<0.05	<0.05	0.22	0.008	0.03	0.8	3	<0.1	0.6	<2	2.2
	P29-07_0.86-1.00	0.1	2.3	<10	1	1.8	<0.002	0.03	<0.05	0.3	1	<0.2	290	<0.05	<0.05	0.11	<0.005	0.03	1.2	3	<0.1	0.8	<2	1.3
	P29-07_4.00-4.27	0.3	2.4	20	1.4	3	<0.002	0.03	<0.05	0.4	1	<0.2	312	<0.05	<0.05	0.21	0.009	0.02	0.8	3	<0.1	0.6	2	2.5
P29-08_3.00-3.30	0.3	7.9	170	1.9	3.5	0.005	0.4	0.14	0.6	1	<0.2	308	<0.05	<0.05	0.24	0.01	0.09	1.3	3	<0.1	3.6	3	2.5	
P13D	P13D-02_1.25-1.44	0.1	0.5	10	<0.5	1.2	<0.002	0.02	0.05	0.2	1	<0.2	232	<0.05	<0.05	0.12	<0.005	<0.02	0.8	2	<0.1	0.4	<2	1.2
	P13D-02_5.00-5.16	0.1	2.9	10	1.4	0.7	0.003	0.04	<0.05	0.2	1	<0.2	228	<0.05	<0.05	0.08	<0.005	0.02	0.9	3	<0.1	0.3	6	0.7
	P13D-03-0.84-1.02	0.6	5	220	2.3	7.1	<0.002	0.14	0.08	1.1	1	<0.2	268	<0.05	<0.05	0.5	0.018	0.04	0.9	5	0.1	8.1	2	5
	P13D-03_3.30-3.50	0.7	5.2	140	2.2	8.1	0.002	0.19	0.08	1.1	1	0.2	356	0.05	<0.05	0.62	0.023	0.04	1	5	0.1	5.6	30	5.9
	P13D-04_2.63-2.83	1.1	5.7	170	2.7	11.3	<0.002	0.22	0.07	1.7	1	0.2	267	0.07	<0.05	0.99	0.037	0.06	1.2	8	0.1	7.6	2	9.9
	P13D-04_6.50-6.70	0.9	7	260	2.3	8.3	<0.002	0.3	0.09	1.2	1	0.2	397	0.06	<0.05	0.69	0.028	0.05	1.2	5	0.1	4.6	8	7.6
	P13D-05_4.41-4.63	0.1	3.5	20	0.9	1	0.005	0.05	0.09	0.2	1	<0.2	278	<0.05	<0.05	0.09	<0.005	0.05	2.5	8	<0.1	0.5	<2	0.9
P13D-05_8.23-8.40	0.1	1.9	10	0.6	0.8	0.003	0.04	0.05	0.2	1	<0.2	247	<0.05	<0.05	0.08	<0.005	0.04	0.9	2	<0.1	0.4	<2	0.7	
P33A	P33A-01_3.24-3.40	0.2	2	30	0.9	2.7	<0.002	0.02	0.07	0.4	1	<0.2	143.5	<0.05	<0.05	0.22	0.007	0.03	0.8	3	<0.1	1	<2	2.1
	P33A-01_7.50-7.69	0.1	2.2	<10	0.8	1.5	0.006	0.09	0.08	0.3	1	<0.2	121	<0.05	<0.05	0.13	<0.005	0.13	1.5	6	<0.1	0.8	<2	1.2
	P33A-02_4.20-4.38	0.3	1.9	40	0.6	2.8	0.002	0.02	<0.05	0.4	1	<0.2	152	<0.05	<0.05	0.23	0.008	0.03	1	4	<0.1	0.7	<2	2.3
	P33A-02_5.08-5.25	0.2	3.9	20	0.6	2.7	0.002	0.11	0.06	0.4	1	<0.2	270	<0.05	<0.05	0.21	0.008	0.06	1.8	6	0.1	0.8	<2	2.3
	P33A-03_6.06-6.31	0.3	1.9	20	0.8	3.1	<0.002	0.05	<0.05	0.4	1	<0.2	103.5	<0.05	<0.05	0.24	0.009	0.03	1.1	4	0.1	0.9	<2	2.6
	P33A-03_9.15-9.39	0.2	2.2	10	0.8	2.7	0.002	0.04	<0.05	0.3	1	<0.2	95.9	<0.05	<0.05	0.18	0.006	0.06	0.9	4	<0.1	0.7	2	1.7
	P33A-04_9.12-9.30	0.3	1.8	20	0.6	4.2	<0.002	0.13	0.06	0.5	1	<0.2	102.5	<0.05	<0.05	0.31	0.01	0.05	2.7	6	0.1	1	<2	3.3
	P33A-06_0.50-0.80	1.2	4.3	30	3.3	7.5	0.004	0.02	0.09	0.7	1	0.2	123.5	0.08	<0.05	1.13	0.015	0.04	1.8	6	0.1	2.5	4	17.7
	P33A-07_2.50-2.71	0.2	4.8	20	3.1	2.3	0.002	0.01	0.09	0.3	1	<0.2	109.5	<0.05	<0.05	0.2	0.006	0.04	1.5	3	<0.1	0.7	4	2.3
	P33A-07_6.25-6.41	0.1	1.5	10	1	1.2	0.002	0.03	0.06	0.1	1	<0.2	94.8	<0.05	<0.05	0.1	<0.005	0.03	1.2	2	<0.1	0.4	<2	0.9
P33A-08_3.50-4.30	0.5	5.3	20	2.3	6.1	0.002	0.04	0.07	1.1	1	<0.2	193	<0.05	<0.05	0.69	0.023	0.04	1.4	10	0.1	1.1	7	8.3	
P33A-08_8.80-9.01	0.1	2.1	20	1.4	1.8	0.011	0.08	0.13	0.6	1	<0.2	121.5	<0.05	<0.05	0.15	<0.005	0.04	1.5	3	0.1	1.3	5	1.4	
P33A-10_1.00-1.23	0.4	2.7	120	1.4	4.9	<0.002	0.05	0.09	0.7	1	<0.2	310	<0.05	<0.05	0.35	0.014	0.17	1	4	0.1	2.1	5	4.1	
P33A-10_8.83-9.00	0.2	1.9	20	0.8	2.9	<0.002	0.14	0.29	0.3	1	<0.2	197	<0.05	<0.05	0.19	0.007	0.32	0.8	3	<0.1	0.9	<2	2.6	
P86	P86-04 SAND	0.8	4	120	2.9	13.2	<0.002	<0.01	0.06	0.9	1	0.2	65.1	0.07	<0.05	1.34	0.026	0.06	0.5	6	28.6	2.7	6	17.4
	P86-01A_0.31-0.50	0.2	0.5	50	1.4	1.6	<0.002	<0.01	<0.05	0.2	1	<0.2	55	<0.05	<0.05	0.15	0.006	0.02	0.3	2	0.1	1	2	1.4
	P86-02_3.95-4.16	0.2	0.9	150	1.4	2	<0.002	<0.01	<0.05	0.3	1	<0.2	48.5	<0.05	<0.05	0.18	0.006	<0.02	0.4	2	<0.1	1.2	2	1.8
	P86-02_8.09-8.30	1.4	1.9	60	0.9	14.9	<0.002	0.24	0.11	1.5	1	0.2	50.2	0.09	<0.05	1.22	0.04	0.05	0.8	11	0.2	2.9	2	14.4
	P86-04_6.17-6.36	0.8	2	60	0.6	9.5	<0.002	0.12	0.07	1	1	0.2	63	0.05	<0.05	0.77	0.023	0.06	0.6	6	0.2	2.5	2	7.8
	P86-04_8.36-8.55	1.1	2.8	90	2.6	11.4	0.012	0.32	0.09	1.3	1	0.2	62.1	0.08	<0.05	1.01	0.03	0.19	0.9	8	0.2	3.2	5	11.8
	P86-06_3.50-3.80	0.3	1.1	50	1.5	2.5	<0.002	<0.01	<0.05	0.3	1	<0.2	46.6	<0.05	<0.05	0.23	0.008	<0.02	0.4	3	0.1	1	<2	2.3
	P86-06_5.60-5.82	0.6	2.2	70	1.8	6.7	<0.002	0.06	0.06	0.7	1	<0.2	59	<0.05	<0.05	0.57	0.018	0.02	0.4	4	0.1	2.2	2	5.9
P86-06_6.76-6.93	0.7	1.6	50	0.7	8.2	<0.002	0.13	0.07	0.9	<1	<0.2	56.2	0.05	<0.05	0.71	0.021	0.03	0.6	5	0.1	2.2	2	7.1	
Crustal Abundance		0.3	20	400	9	3	D	0.12	0.2	1	0.08	0.X	610	0.0X	D	1.7	0.04	0.0X	2.2	20	0.6	30	20	19
10x Crustal Abundance		3	200	4000	90	30	D	1.2	2	10	0.8	0.X	6100	0.0X	D	17	0.4	0.0X	22	200	6	300	200	190

Table 3: Whole Rock XRF Analysis Results

Prospect	Sample ID	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	SiO2	SrO	TiO2	LOI 1000	Total
		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
P29	P29-01_5.10-5.33	0.38	<0.01	51.7	<0.01	0.12	0.1	2.14	0.01	<0.01	<0.01	0.18	2.21	0.02	0.02	42.78	99.68
	P29-03_6.50-6.69	0.12	<0.01	53.9	<0.01	0.04	0.02	0.91	<0.01	<0.01	<0.01	0.13	0.69	0.02	<0.01	43.25	99.1
	P29-04_8.79-8.93	0.34	<0.01	53.6	<0.01	0.08	0.1	0.47	0.01	<0.01	0.01	0.22	1.95	0.03	0.02	42.48	99.33
	P29-05_2.43-2.69	0.22	<0.01	52.8	<0.01	0.1	0.06	1.42	0.01	<0.01	<0.01	0.12	1.3	0.03	0.01	43.11	99.2
	P29-05_4.34-4.57	0.32	<0.01	50.7	<0.01	1.23	0.1	2.08	0.01	<0.01	<0.01	2.35	2.58	0.03	0.02	41.14	100.6
	P29-06_1.84-2.00	0.3	0.01	53.8	<0.01	0.1	0.09	0.51	0.01	<0.01	<0.01	0.2	1.74	0.03	0.02	42.81	99.65
	P29-07_0.86-1.00	0.22	<0.01	52.3	<0.01	0.11	0.06	1.26	0.01	<0.01	<0.01	0.09	2.25	0.03	0.01	43.21	99.59
	P29-07_4.00-4.27	0.31	0.01	52.8	<0.01	0.1	0.09	1.48	0.01	<0.01	<0.01	0.09	1.9	0.03	0.02	43.04	99.91
	P29-08_3.00-3.30	0.39	<0.01	52.8	<0.01	0.59	0.11	1.14	0.03	<0.01	0.04	0.98	1.79	0.03	0.02	42.14	100.1
P13D	P13D-02_1.25-1.44	0.14	<0.01	54.3	<0.01	0.08	0.03	0.65	0.01	<0.01	0.01	0.04	0.61	0.02	0.01	43.45	99.38
	P13D-02_5.00-5.16	0.08	<0.01	52.7	<0.01	0.08	0.02	2.28	0.01	<0.01	<0.01	0.12	0.7	0.02	0.01	44.07	100.1
	P13D-03-0.84-1.02	0.72	<0.01	52.6	<0.01	0.3	0.21	0.37	0.02	<0.01	0.04	0.35	2.65	0.03	0.03	41.94	99.29
	P13D-03_3.30-3.50	0.84	<0.01	51.6	<0.01	0.3	0.25	0.69	0.02	<0.01	0.03	0.48	3.32	0.03	0.04	41.57	99.2
	P13D-04_2.63-2.83	1.19	<0.01	51.2	<0.01	0.36	0.35	0.49	0.02	<0.01	0.03	0.53	3.86	0.02	0.07	41.03	99.17
	P13D-04_6.50-6.70	0.88	0.01	51.2	<0.01	0.42	0.25	0.84	0.02	<0.01	0.06	0.75	3.21	0.03	0.05	41.29	99.04
	P13D-05_4.41-4.63	0.17	<0.01	49.5	<0.01	0.12	0.03	4.79	0.01	<0.01	<0.01	0.13	0.71	0.02	0.01	44.22	99.73
	P13D-05_8.23-8.40	0.1	<0.01	53.3	<0.01	0.06	0.03	0.99	<0.01	<0.01	<0.01	0.15	1.29	0.02	0.01	43.39	99.36
P33A	P33A-01_3.24-3.40	0.3	<0.01	31.6	<0.01	0.14	0.08	18.9	0.01	<0.01	0.01	0.09	1.63	0.01	0.01	46.12	98.92
	P33A-01_7.50-7.69	0.16	<0.01	31.5	<0.01	0.1	0.04	18.85	0.01	<0.01	<0.01	0.27	2.01	0.01	0.01	45.91	98.9
	P33A-02_4.20-4.38	0.33	<0.01	31.5	<0.01	0.12	0.09	19.1	<0.01	<0.01	0.01	0.11	1.77	0.01	0.01	46.04	99.11
	P33A-02_5.08-5.25	0.27	0.01	49.7	<0.01	0.09	0.08	3.46	<0.01	<0.01	<0.01	0.33	2.02	0.02	0.01	43.24	99.25
	P33A-03_6.06-6.31	0.33	<0.01	31.2	<0.01	0.13	0.09	18.55	0.01	<0.01	0.01	0.18	3.3	0.01	0.02	45.33	99.17
	P33A-03_9.15-9.39	0.23	<0.01	30	<0.01	0.09	0.07	20.5	<0.01	<0.01	<0.01	0.16	1.25	0.01	0.01	46.54	98.89
	P33A-04_9.12-9.30	0.42	0.01	33.2	<0.01	0.28	0.12	16.4	0.01	0.01	0.01	0.38	3.84	0.01	0.02	44.38	99.12
	P33A-06_0.50-0.80	0.81	<0.01	32	<0.01	0.24	0.32	16.45	0.01	0.11	0.01	0.1	5.93	0.01	0.02	43.24	99.27
	P33A-07_2.50-2.71	0.26	<0.01	34.2	<0.01	0.13	0.07	16.75	0.01	<0.01	0.01	0.09	2.22	0.01	0.01	45.43	99.21
	P33A-07_6.25-6.41	0.12	<0.01	36.5	<0.01	0.04	0.03	15.35	0.01	<0.01	<0.01	0.16	0.79	0.01	0.01	46.21	99.25
	P33A-08_3.50-4.30	1	<0.01	40.6	<0.01	0.42	0.21	8.33	0.01	0.09	0.01	0.15	6.9	0.02	0.04	41.48	99.28
	P33A-08_8.80-9.01	0.18	<0.01	32.5	<0.01	0.25	0.05	17.55	0.01	<0.01	0.01	0.24	3.16	0.01	0.01	45.22	99.21
	P33A-10_1.00-1.23	0.5	<0.01	52.5	<0.01	0.18	0.14	0.42	0.01	<0.01	0.02	0.14	2.59	0.03	0.03	42.47	99.06
P33A-10_8.83-9.00	0.29	0.37	51.4	<0.01	0.21	0.08	1.65	0.01	<0.01	<0.01	0.37	2.51	0.02	0.02	41.99	98.94	
P86	P86-04 SAND	1.57	<0.01	26.3	<0.01	0.63	0.45	18.45	0.02	0.28	0.03	0.01	10.66	<0.01	0.04	40.72	99.2
	P86-01A_0.31-050	0.17	<0.01	30.1	<0.01	0.26	0.07	20.8	0.02	<0.01	0.01	0.03	0.57	<0.01	0.01	46.82	98.91
	P86-02_3.95-4.16	0.2	<0.01	30.6	<0.01	0.23	0.08	20.4	0.03	<0.01	0.03	0.05	0.82	<0.01	0.01	46.53	99.05
	P86-02_8.09-8.30	1.39	0.01	27.3	<0.01	0.73	0.6	19.05	0.03	<0.01	0.01	0.61	6.67	<0.01	0.07	42.54	99.05
	P86-04_6.17-6.36	0.91	<0.01	29.1	<0.01	0.47	0.34	20.2	0.03	<0.01	0.02	0.33	2.26	<0.01	0.04	45.47	99.21
	P86-04_8.36-8.55	1.12	<0.01	28.8	<0.01	0.72	0.39	19.95	0.03	0.01	0.02	0.81	2.63	0.01	0.06	44.7	99.31
	P86-06_3.50-3.80	0.28	<0.01	30.1	<0.01	0.23	0.1	21	0.02	<0.01	0.01	0.05	0.74	<0.01	0.01	46.57	99.17
	P86-06_5.60-5.82	0.66	<0.01	29	0.01	0.39	0.25	20.4	0.02	<0.01	0.02	0.16	3.24	<0.01	0.03	45.19	99.4
P86-06_6.76-6.93	0.79	<0.01	28.8	0.01	0.48	0.32	20.3	0.02	<0.01	0.02	0.29	3.48	<0.01	0.03	44.78	99.36	

Table 4: Whole Rock XRF Analysis Normalized Results

Sample ID	Normalized Proportion in Class (%)		
	Impurities	Calcite	Dolomite
P29-01_5.10-5.33	5.47	90.68	3.85
P29-03_6.50-6.69	1.85	96.51	1.65
P29-04_8.79-8.93	4.88	94.29	0.83
P29-05_2.43-2.69	3.35	94.08	2.57
P29-05_4.34-4.57	7.34	88.92	3.74
P29-06_1.84-2.00	3.26	95.83	0.91
P29-07_0.86-1.00	8.82	89.00	2.18
P29-07_4.00-4.27	12.41	85.17	2.43
P29-08_3.00-3.30	5.01	92.95	2.03
P13D-02_1.25-1.44	2.10	96.73	1.17
P13D-02_5.00-5.16	14.17	82.18	3.65
P13D-03-0.84-1.02	6.92	92.43	0.65
P13D-03_3.30-3.50	6.56	92.20	1.24
P13D-04_2.63-2.83	7.02	92.09	0.89
P13D-04_6.50-6.70	2.16	96.24	1.59
P13D-05_4.41-4.63	2.74	88.19	9.07
P13D-05_8.23-8.40	15.86	82.59	1.55
P33A-01_3.24-3.40	10.13	46.36	43.51
P33A-01_7.50-7.69	12.97	44.88	42.15
P33A-02_4.20-4.38	3.56	49.23	47.21
P33A-02_5.08-5.25	9.63	84.25	6.12
P33A-03_6.06-6.31	9.58	46.85	43.57
P33A-03_9.15-9.39	4.56	44.04	51.40
P33A-04_9.12-9.30	11.42	51.95	36.64
P33A-06_0.50-0.80	16.42	47.84	35.74
P33A-07_2.50-2.71	6.94	54.85	38.22
P33A-07_6.25-6.41	2.34	62.42	35.24
P33A-08_3.50-4.30	5.92	76.22	17.86
P33A-08_8.80-9.01	4.48	52.98	42.54
P33A-10_1.00-1.23	7.19	92.07	0.74
P33A-10_8.83-9.00	3.38	93.56	3.06
P86-01A_0.31-0.50	11.78	40.29	47.93
P86-02_3.95-4.16	16.37	39.46	44.17
P86-02_8.09-8.30	7.47	41.87	50.66
P86-04_6.17-6.36	3.06	44.08	52.85
P86-04_8.36-8.55	19.45	36.70	43.85
P86-06_3.50-3.80	9.27	41.06	49.67
P86-06_5.60-5.82	8.95	40.89	50.16
P86-06_6.76-6.93	9.54	40.54	49.92
P86-04 SAND	3.29	43.54	53.17

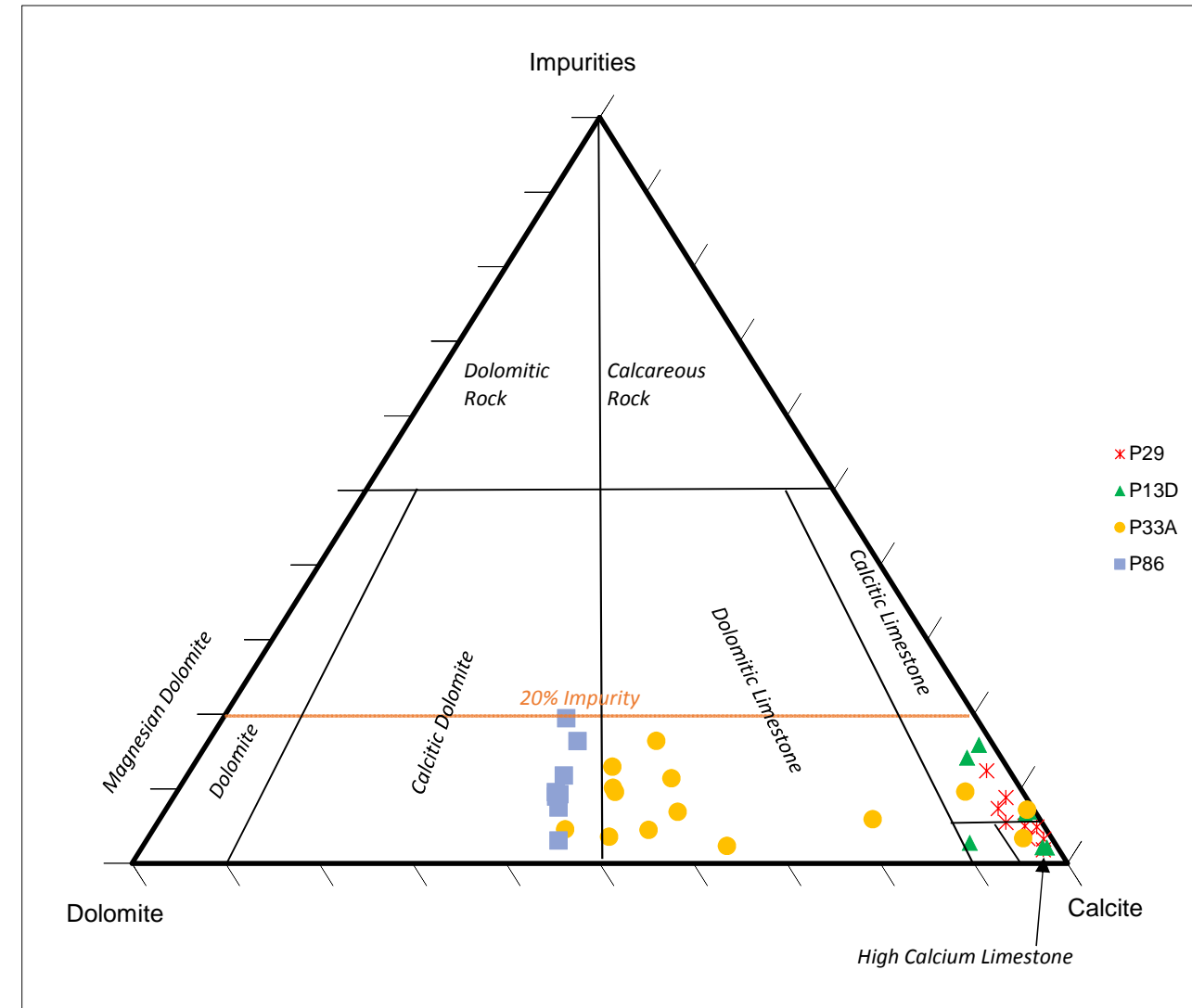


Table 5: Shake Flask Extraction (SFE) Analysis Results

Client Sample ID	Lowest Detection Limit	Units	P29-01_5.10-5.33	P29-03_6.50-6.69	P29-04_8.79-8.93	P29-05_2.43-2.69	P29-05_4.34-4.57	P29-07_1.84-2.00	P29-07_0.86-1.00	P29-07_4.00-4.27	P29-08_3.00-3.30	P13D-02_1.25-1.44	P13D-02_5.00-5.16	P13D-03_0.84-1.02	P13D-03_3.30-3.50	P13D-04_2.63-2.83	CCME - AL	BCAWQG - AL
ALS Sample ID			L1969431-1	L1969431-2	L1969431-3	L1969431-4	L1969431-5	L1969431-6	L1969431-7	L1969431-8	L1969431-9	L1969431-40	L1969431-10	L1969431-11	L1969431-12	L1969431-13	mg/L	mg/L
Physical Tests (Soil)																		
Hardness (as CaCO3)	0.50	mg/L	35.7	26.7	34.5	31.9	42.6	42.5	22.1	23.2	42.2	24.3	25.6	28.4	35.9	50.4	-	-
Moisture	0.25	%	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	-	-
Leachable Anions & Nutrients																		
Acidity (as CaCO3)	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Alkalinity, Total (as CaCO3)	1.0	mg/L	17.0	16.2	17.6	16.6	23.4	18.5	18.7	21.1	21.9	20.4	16.6	21.3	21.8	24.6	-	-
Ammonia, Total Leachable (as N)	0.0050	mg/L	0.0633	0.0485	0.0653	0.0387	0.0755	0.0911	0.0337	0.0656	0.0954	0.0448	0.0255	0.0629	0.0712	0.108	-	-
Bromide (Br)	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	-	-
Chloride (Cl)	0.50	mg/L	5.49	5.15	2.08	5.27	3.00	5.38	6.28	3.47	4.82	6.76	5.16	2.70	2.20	4.84	120	-
Conductivity	2.0	uS/cm	104	77.5	92.8	91.3	118	125	70.0	67.7	120	68	76.1	77.7	96.8	145	-	-
Fluoride (F)	0.020	mg/L	0.213	0.440	0.401	0.157	0.598	0.378	0.193	0.248	0.297	0.077	1.05	0.281	0.298	0.248	0.12	-
Nitrate (as N)	0.0050	mg/L	0.0144	0.0076	<0.0050	0.0125	0.0192	0.0156	0.0094	0.0075	<0.0050	<0.0050	0.0238	<0.0050	<0.0050	0.0054	13	-
Nitrite (as N)	0.0010	mg/L	0.0010	0.0012	0.0016	0.0015	0.0017	0.0016	0.0024	0.0035	0.0014	0.0030	0.0014	0.0047	0.0036	0.0027	0.06	-
pH	0.10	pH	8.91	9.08	9.02	9.08	8.87	8.88	9.22	9.23	8.94	9.33	9.25	9.11	9.04	8.81	6.5-9.0	6.5-9.0
Sulfate (SO4)	0.50	mg/L	18.2	7.36	16.5	13.6	19.9	24.1	3.09	4.99	20.9	3.4	6.06	8.42	14.7	26.7	-	-
Leachable Metals																		
Aluminum (Al)-Leachable	0.0050	mg/L	0.105	0.137	0.134	0.110	0.093	0.099	0.109	0.136	0.167	0.121	0.081	0.171	0.215	0.228	0.1	0.1
Antimony (Sb)-Leachable	0.00010	mg/L	0.00026	0.00021	0.00076	0.00014	0.00023	0.00023	<0.00010	<0.00010	0.00026	<0.00010	0.00014	0.00027	0.00048	0.00033	0.02	-
Arsenic (As)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.005	0.005
Barium (Ba)-Leachable	0.0010	mg/L	0.087	0.311	0.157	0.036	0.049	0.125	0.082	0.271	0.009	0.007	0.024	0.017	0.012	0.089	-	1
Beryllium (Be)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Bismuth (Bi)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	1	-
Boron (B)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.010	<0.010	0.017	<0.010	<0.010	0.017	0.017	0.017	1.5	1.2
Cadmium (Cd)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00009**	0.000015**
Calcium (Ca)-Leachable	0.10	mg/L	11.30	8.72	11.70	10.60	13.40	14.60	7.26	7.50	13.80	6.75	8.02	10.10	12.10	17.40	-	-
Chromium (Cr)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0089	0.001
Cobalt (Co)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	0.11
Copper (Cu)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.002	0.002**
Iron (Fe)-Leachable	0.030	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.3	0.35
Lead (Pb)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	0.00015	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0024**	0.020**
Lithium (Li)-Leachable	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	-
Magnesium (Mg)-Leachable	0.050	mg/L	1.790	1.190	1.300	1.290	1.300	1.480	1.090	2.200	1.870	1.800	1.360	0.793	1.370	1.720	-	-
Manganese (Mn)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Mercury (Hg)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000026	-
Molybdenum (Mo)-Leachable	0.00010	mg/L	0.00232	0.00223	0.00610	0.00293	0.00191	0.00226	0.00695	0.00227	0.00353	0.00109	0.00323	0.00207	0.00391	0.00426	0.073	-
Nickel (Ni)-Leachable	0.00050	mg/L	0.00056	<0.00050	0.002	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.001	<0.00050	<0.00050	0.025**	0.025**
Phosphorus (P)-Leachable	0.30	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.015	-
Potassium (K)-Leachable	0.050	mg/L	0.760	0.324	0.731	0.472	0.740	0.731	0.478	0.672	1.100	0.602	0.288	0.928	1.250	2.810	-	373
Selenium (Se)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.001	0.002
Silicon (Si)-Leachable	0.050	mg/L	0.340	0.216	0.384	0.273	0.439	0.370	0.352	0.449	0.522	0.315	0.140	0.449	0.703	1.370	-	-
Silver (Ag)-Leachable	0.000050	mg/L	<0.000050	0.000097	<0.000050	<0.000050	0.00020	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0001	**
Sodium (Na)-Leachable	0.050	mg/L	2.220	2.020	1.100	2.170	1.310	2.210	2.710	1.420	2.180	2.370	2.200	1.310	1.040	2.080	-	-
Strontium (Sr)-Leachable	0.00050	mg/L	0.094	0.133	0.146	0.093	0.099	0.132	0.077	0.077	0.153	0.054	0.083	0.053	0.082	0.136	-	-
Thallium (Tl)-Leachable	0.00010	mg/L	<0.00010	0.00011	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0008	0.0003
Tin (Sn)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Titanium (Ti)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	2
Uranium (U)-Leachable	0.000010	mg/L	0.00010	0.00007	0.00009	0.00006	0.00006	0.00007	0.00014	0.00006	0.00010	0.00010	0.00012	0.00008	0.00023	0.00031	0.015	0.3
Vanadium (V)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	-	0.006
Zinc (Zn)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.03	0.033**

- Not analyzed or no standard exists. Aluminum guideline is provided only for the dissolved fraction.
 < Concentration is less than the laboratory detection limit indicated.
 CCME - AL Canadian Council of Ministers of the Environment (CCME) (1999). Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater).
 BCWQ-AL British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture, Summary Report (January 2017).
Bold Bold indicates an exceedance of one or both of the guideline values
Shaded Shaded cell indicates an exceedance of one or both of the guideline values by an order of magnitude or more
****** Indicates that the guideline is derived from an equation or matrix, based on water hardness

Table 5: Shake Flask Extraction (SFE) Analysis Results

Client Sample ID	Lowest Detection Limit	Units	P13D-04_6.50-6.70	P13D-05_4.41-4.63	P13D-05_8.23-8.40	P33A-01_3.24-3.40	P33A-01_7.50-7.69	P33A-02_4.20-4.38	P33A-02_5.08-5.25	P33A-03_6.06-6.31	P33A-03_9.15-9.39	P33A-04_9.12-9.30	P33A-06_0.50-0.80	P33A-07_2.50-2.71	P33A-07_6.25-6.41	P33A-08_3.50-4.30	CCME - AL	BCAWQG - AL	
ALS Sample ID			L1969431-14	L1969431-15	L1969431-16	L1969431-17	L1969431-18	L1969431-19	L1969431-20	L1969431-21	L1969431-22	L1969431-24	L1969431-25	L1969431-26	L1969431-27	L1969431-28	mg/L	mg/L	
Physical Tests (Soil)																			
Hardness (as CaCO3)	0.50	mg/L	38	31.3	37.5	42.1	47.7	46.7	48.4	58.3	73.6	52.9	44.7	40.1	34.3	36.8			
Moisture	0.25	%	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25			
Leachable Anions & Nutrients																			
Acidity (as CaCO3)	1.0	mg/L	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-	
Alkalinity, Total (as CaCO3)	1.0	mg/L	23.2	24.5	14.8	40.4	33.8	43.0	23.0	33.7	31.4	32.7	36.6	36.1	28.1	26.9	-	-	
Ammonia, Total Leachable (as N)	0.0050	mg/L	0.0948	0.0347	0.0481	0.0746	0.0339	0.0884	0.0723	0.0553	0.0669	0.0641	0.0239	0.0356	0.0119	0.0385	-	-	
Bromide (Br)	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.064	<0.050	<0.050	<0.050	<0.050	<0.050	-	-	
Chloride (Cl)	0.50	mg/L	4.04	1.47	3.50	1.81	1.21	2.04	1.59	10.5	1.84	2.42	1.37	3.43	2.56	120	-	-	
Conductivity	2.0	uS/cm	107	77.9	101	126	113	105	126	133	179	126	119	85.1	76.6	85.4	-	-	
Fluoride (F)	0.020	mg/L	0.285	0.390	1.16	1.39	0.950	1.09	0.959	1.63	1.20	0.939	2.21	1.24	1.57	1.44	0.12	-	
Nitrate (as N)	0.0050	mg/L	<0.0050	0.0112	<0.0050	0.0199	0.0052	0.0288	0.0059	<0.0050	<0.0050	<0.0050	0.0072	0.0063	0.0517	0.0080	13	-	
Nitrite (as N)	0.0010	mg/L	0.0018	0.0030	<0.0010	0.0103	0.0012	0.0091	0.0028	0.0014	0.0018	0.0012	0.0028	0.0091	0.0067	0.0022	0.0038	0.06	-
pH	0.10	pH	8.98	9.32	9.19	9.56	9.49	9.62	9.16	9.24	9.34	9.32	9.42	9.53	9.61	9.33	6.5-9.0	6.5-9.0	
Sulfate (SO4)	0.50	mg/L	15.1	8.60	18.3	3.14	13.4	5.59	26.5	23.5	35.0	17.6	3.01	2.06	3.06	7.51	-	-	
Leachable Metals																			
Aluminum (Al)-Leachable	0.0050	mg/L	0.223	0.126	0.093	0.034	0.024	0.010	0.144	0.042	0.040	0.076	0.100	0.045	0.038	0.151	0.1	0.1	
Antimony (Sb)-Leachable	0.00010	mg/L	0.00077	0.00027	0.00036	0.00012	0.00068	0.00010	0.00033	0.00035	0.00027	0.00055	0.00014	0.00010	<0.00010	0.00015	0.02	-	
Arsenic (As)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.002	<0.0010	<0.0010	<0.0010	<0.0010	0.005	0.005	
Barium (Ba)-Leachable	0.0010	mg/L	0.184	0.061	0.023	0.107	0.027	0.130	0.008	0.039	0.135	0.006	0.040	0.082	0.067	0.067	-	1	
Beryllium (Be)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	
Bismuth (Bi)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	1	-	
Boron (B)-Leachable	0.010	mg/L	0.013	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	1.5	1.2	
Cadmium (Cd)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00009**	0.000015**	
Calcium (Ca)-Leachable	0.10	mg/L	12.80	7.24	12.00	6.35	5.43	6.39	11.00	7.45	10.80	6.80	7.69	5.07	5.12	6.65	-	-	
Chromium (Cr)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0089	0.001	
Cobalt (Co)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	0.11	
Copper (Cu)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.002	0.002**	
Iron (Fe)-Leachable	0.030	mg/L	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.3	0.35	
Lead (Pb)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.00015	0.00015	<0.00010	<0.00010	<0.00010	<0.00010	0.0024**	0.020**	
Lithium (Li)-Leachable	0.0050	mg/L	<0.0050	<0.0050	<0.0050	0.005	<0.0050	0.006	<0.0050	<0.0050	0.014	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	-	
Magnesium (Mg)-Leachable	0.050	mg/L	1.500	3.210	1.850	6.370	7.460	1.850	5.060	8.300	11.300	8.720	6.200	6.670	5.240	4.900	-	-	
Manganese (Mn)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.001	<0.00050	<0.00050	<0.00050	<0.00050	-	-	
Mercury (Hg)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000026	-	
Molybdenum (Mo)-Leachable	0.00010	mg/L	0.00393	0.01020	0.00389	0.00284	0.02190	0.01040	0.00765	0.00813	0.01220	0.01770	0.00377	0.00240	0.01470	0.00221	0.073	-	
Nickel (Ni)-Leachable	0.00050	mg/L	0.001	<0.00050	<0.00050	0.001	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.025**	0.025**	
Phosphorus (P)-Leachable	0.30	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.015	-	
Potassium (K)-Leachable	0.050	mg/L	1.570	0.346	0.361	0.932	0.497	0.783	0.938	1.190	1.120	0.817	0.637	0.395	1.330	1.330	-	373	
Selenium (Se)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.001	0.002	
Silicon (Si)-Leachable	0.050	mg/L	0.829	0.342	0.169	0.733	0.409	0.843	0.438	0.666	0.560	0.880	0.667	0.289	0.955	0.955	-	-	
Silver (Ag)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0001	**	
Sodium (Na)-Leachable	0.050	mg/L	1.790	0.676	1.520	0.781	0.642	0.987	0.793	0.710	4.580	0.913	1.130	0.664	1.460	1.200	-	-	
Strontium (Sr)-Leachable	0.00050	mg/L	0.122	0.067	0.157	0.029	0.033	0.054	0.028	0.026	0.035	0.028	0.014	0.012	0.024	0.041	-	-	
Thallium (Tl)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.000	<0.00010	<0.00010	<0.00010	0.00025	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0008	0.0003	
Tin (Sn)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-	
Titanium (Ti)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	2	
Uranium (U)-Leachable	0.000010	mg/L	0.00029		0.00008	0.00005	0.00015	0.00002	0.00015	0.00003	0.00010	0.00017	0.00057	0.00032	0.00034	0.00012	0.015	0.3	
Vanadium (V)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	<0.0010	<0.0010	<0.0010	0.001	0.001	<0.0010	<0.0010	0.001	-	0.006	
Zinc (Zn)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.03	0.033**	

- Not analyzed or no standard exists. Aluminum guideline is provided only for the dissolved fraction.
 < Concentration is less than the laboratory detection limit indicated.
 CCME - AL Canadian Council of Ministers of the Environment (CCME) (1999). Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater).
 BCWAWQG-AL British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture, Summary Report (January 2017).
Bold Bold indicates an exceedance of one or both of the guideline values
Shaded Shaded cell indicates an exceedance of one or both of the guideline values by an order of magnitude or more
****** Indicates that the guideline is derived from an equation or matrix, based on water hardness

Table 5: Shake Flask Extraction (SFE) Analysis Results

Client Sample ID	Lowest Detection Limit	Units	P33A-08_8.80-9.01	P33A-10_1.00-1.23	P33A-10_8.83-9.00	P86-04 SAND	P86-01A_0.31-0.50	P86-02_3.95-4.16	P86-02_8.09-8.30	P86-04_6.17-6.36	P86-04_8.36-8.55	P86-06_3.50-3.80	P86-06_5.60-5.82	P86-06_6.76-6.93	CCME - AL	BCAWQG - AL
ALS Sample ID			L1969431-29	L1969431-30	L1969431-31	L1970139-1	L1969431-32	L1969431-33	L1969431-34	L1969431-35	L1969431-36	L1969431-37	L1969431-38	L1969431-39	mg/L	mg/L
Physical Tests (Soil)																
Hardness (as CaCO3)	0.50	mg/L	39	26.3	41	30.6	58	60.3	57.4	137	205	67.9	63.2	61.2		
Moisture	0.25	%	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25	<0.25		
Leachable Anions & Nutrients																
Acidity (as CaCO3)	1.0	mg/L	<1.0	<1.0	1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	-	-
Alkalinity, Total (as CaCO3)	1.0	mg/L	26.4	22.2	20.4	31.7	34.7	40.6	44.1	39.5	40.1	42.3	42.7	44.5	-	-
Ammonia, Total Leachable (as N)	0.0050	mg/L	0.0260	0.0256	0.0419	<0.0050	0.0449	0.0406	0.0546	0.0674	0.0633	0.0611	0.0599	0.0591	-	-
Bromide (Br)	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	0.287	0.263	0.138	0.242	0.205	0.311	0.195	0.135	-	-
Chloride (Cl)	0.50	mg/L	1.28	3.29	1.70	0.73	24.0	21.8	10.7	20.2	16.5	25.2	17.0	11.7	120	-
Conductivity	2.0	uS/cm	85.5	64.2	97.2	62.0	149	147	138	312	437	165	154	147	-	-
Fluoride (F)	0.020	mg/L	1.38	0.362	1.64	0.036	0.138	0.108	0.312	0.145	0.126	0.085	0.278	0.354	0.12	-
Nitrate (as N)	0.0050	mg/L	0.0164	0.0057	0.0087	0.0534	<0.0050	<0.0050	<0.0050	<0.0050	0.0084	<0.0050	<0.0050	<0.0050	13	-
Nitrite (as N)	0.0010	mg/L	0.0063	0.0045	0.0042	0.0741	0.0024	0.0034	0.0034	0.0015	<0.0010	0.0043	0.0023	0.0024	0.06	-
pH	0.10	pH	9.43	9.22	8.96	8.63	9.52	9.53	9.26	9.07	8.79	9.53	9.49	9.38	6.5-9.0	6.5-9.0
Sulfate (SO4)	0.50	mg/L	11.1	4.13	17.2	0.56	1.55	1.62	8.74	82.6	148	2.48	5.49	7.69	-	-
Leachable Metals																
Aluminum (Al)-Leachable	0.0050	mg/L	0.064	0.183	0.047	0.238	0.028	0.036	0.136	0.115	0.114	0.057	0.127	0.129	0.1	0.1
Antimony (Sb)-Leachable	0.00010	mg/L	<0.00010	<0.00010	0.00018	<0.00010	0.00010	0.00011	0.00019	<0.00010	0.00015	0.00012	0.00015	0.00027	0.02	-
Arsenic (As)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.005	0.005
Barium (Ba)-Leachable	0.0010	mg/L	0.048	0.104	0.231	0.0038	0.095	0.013	0.074	0.056	0.015	0.011	0.006	0.007	-	1
Beryllium (Be)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Bismuth (Bi)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	1	-
Boron (B)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	0.041	0.026	0.034	0.027	0.030	0.036	0.027	0.027	1.5	1.2
Cadmium (Cd)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	0.000171	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00009**	0.000015**
Calcium (Ca)-Leachable	0.10	mg/L	7.20	8.12	13.00	5.97	8.51	7.18	10.90	22.80	36.400	9.180	9.890	10.200	-	-
Chromium (Cr)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0089	0.001
Cobalt (Co)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	-	0.11
Copper (Cu)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	0.0081	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.002	0.002**
Iron (Fe)-Leachable	0.030	mg/L	<0.030	<0.030	<0.030	0.137	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	<0.030	0.3	0.35
Lead (Pb)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0024**	0.020**
Lithium (Li)-Leachable	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	0.008	0.008	0.007	0.010	0.010	0.008	0.007	0.007	-	-
Magnesium (Mg)-Leachable	0.050	mg/L	5.100	1.460	2.050	3.82	8.930	10.300	7.320	19.500	27.700	10.900	9.360	8.690	-	-
Manganese (Mn)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	0.00443	<0.00050	<0.00050	<0.00050	0.001	0.001	<0.00050	<0.00050	<0.00050	-	-
Mercury (Hg)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000026	-
Molybdenum (Mo)-Leachable	0.00010	mg/L	0.00341	0.00229	0.00755	0.22	0.00375	0.00113	0.05390	0.00306	0.00757	0.00109	0.01450	0.02090	0.073	-
Nickel (Ni)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	0.00113	<0.00050	<0.00050	<0.00050	<0.00050	0.001	<0.00050	<0.00050	<0.00050	0.025**	0.025**
Phosphorus (P)-Leachable	0.30	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.015	-
Potassium (K)-Leachable	0.050	mg/L	0.515	0.751	0.865	0.414	1.550	1.630	3.730	4.060	4.350	2.330	3.410	3.500	-	373
Selenium (Se)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.0012	<0.00050	<0.00050	<0.00050	0.001	0.002
Silicon (Si)-Leachable	0.050	mg/L	0.337	0.689	0.392	0.506	0.532	0.825	1.840	1.130	0.927	1.180	1.600	1.590	-	-
Silver (Ag)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0001	**
Sodium (Na)-Leachable	0.050	mg/L	0.617	1.360	0.858	0.323	3.490	2.610	1.240	2.880	2.330	3.220	2.560	1.860	-	-
Strontium (Sr)-Leachable	0.00050	mg/L	0.019	0.057	0.064	0.00535	0.092	0.059	0.032	0.075	0.071	0.075	0.058	0.048	-	-
Thallium (Tl)-Leachable	0.00010	mg/L	<0.00010	<0.00010	0.001	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0008	0.0003
Tin (Sn)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Titanium (Ti)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	2
Uranium (U)-Leachable	0.000010	mg/L	0.00038	0.00013	0.00010	0.000045	0.00002	0.00003	0.00005	0.00009	0.00127	0.00001	<0.000010	0.00001	0.015	0.3
Vanadium (V)-Leachable	0.0010	mg/L	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	<0.0010	0.003	<0.0010	<0.0010	<0.0010	0.002	0.002	-	0.006
Zinc (Zn)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.03	0.033**

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Bold Bold indicates an exceedance of one or both of the guideline values
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****** Indicates that the guideline is derived from an equation or matrix, based on water hardness

Table 6: Acid-Base Accounting (ABA) Analysis Results

Prospect ID	Sample ID	Sample Type	Lab Reported Values											Calculated Values		
			Fizz Rating	Maximum Potential Acidity (MPA)	Net-Neutralization Potential (NNP)	Sobek Neutralization Potential (NP)	Neutralization Potential Ratio, NPR (NP:MPA)	pH	Total Sulphur	Sulphide Sulphur	Sulphate Sulphur (HCl Leachable)	Inorganic Carbon		Carbonate Neutralization Potential (CNP)	Carbonate Neutralization Potential Ratio (CNPR)	
			Unity	tCaCO3/1Kt	tCaCO3/1Kt	tCaCO3/1Kt	Unity	Unity	S%	S%	%	C%	CO2%	tCaCO3/1Kt	Unity	
P1	P1-02_2.0-2.4	Sand/Gravel	3	0.3	349	349	1117	8.8	0.01	0.01	<0.01	4.02	14.7	334.32	1114.39	
	P1-10.2_0.9-1.0	Sand	3	0.3	89	89	284.8	8.9	0.01	<0.01	<0.01	0.99	3.6	81.87	272.91	
	P1-18_3.0-3.5	Sand	3	0.3	114	114	364.8	8.9	0.01	<0.01	<0.01	1.32	4.9	111.44	371.46	
	Minimum		3	0.3	89	89	285	8.8	0.01	0.01	<0.01	0.99	3.6	81.87	272.91	
	Maximum		3	0.3	349	349	1117	8.9	0.01	0.01	<0.01	4.02	14.7	334.32	1114.39	
	10th Percentile		3	0.3	94	94	300.8	8.82	0.01	0.01	<0.01	1.056	3.86	87.79	292.62	
	90th Percentile		3	0.3	94	94	300.8	8.82	0.01	0.01	<0.01	1.056	3.86	87.79	292.62	
	Median		3	0.3	114	114	365	8.9	0.01	0.01	<0.01	1.32	4.9	111.44	371.46	
	Mean		3	0.3	184	184	589	8.9	0.01	0.01	<0.01	2.11	7.7	175.88	586.25	
P13B/C	P13B-01.2_4.8-5.0	Clay	3	0.3	157	157	502.4	8.4	0.01	0.02	0.01	1.7	6.3	143.28	477.59	
	P13B-03_3.5-4.0	Sand	2	<0.3	59	59	377.6	8.9	<0.01	<0.01	<0.01	0.67	2.5	56.86	379.04	
	P13B-07.2_2.5-2.6	Rock Fragments	4	0.6	969	970	1552	9.3	0.02	0.02	<0.01	11.45	41.9	952.91	1588.19	
	P13B-09.2_3.7-3.9	Clay	3	0.3	167	167	534.4	8.3	0.01	0.01	<0.01	1.91	7	159.20	530.66	
	P13C-01_2.5-3.5	Sand	3	0.3	86	86	275.2	8.8	0.01	0.01	<0.01	1.04	3.8	86.42	288.07	
	P13C-09_3.0-3.5	Sand	2	<0.3	69	69	441.6	8.7	<0.01	<0.01	<0.01	0.82	3	68.23	454.85	
	Minimum		2	<0.3	59	59	275	8.3	0.01	0.01	<0.01	0.67	2.5	56.86	288.07	
Maximum		4	0.6	969	970	1552	9.3	0.02	0.02	<0.01	11.45	41.9	952.91	1588.19		
	10th Percentile		2	0.3	64	64	326.4	8.35	0.01	0.01	<0.01	0.745	2.75	62.54	333.56	
	90th Percentile		3.5	0.51	568	569	1043.2	9.1	0.017	0.02	<0.01	6.68	24.45	556.06	1059.42	
	Median		3	0.3	122	122	472	8.75	0.01	0.015	<0.01	1.37	5.05	114.85	466.22	
	Mean		2.8	0.4	251	251	614	8.7	0.01	0.02	<0.01	2.93	10.75	244.48	619.73	
P116	P116-01_2.8-3.3	Sand/Gravel	3	0.9	268	269	286.9	8.6	0.03	0.02	<0.01	3.17	11.6	263.81	293.13	
	P116-02_3.6-4.0	Sand	3	0.9	175	176	187.75	8.4	0.03	0.03	<0.01	2	7.3	166.02	184.47	
	P116-11.1_2.0-3.5	Sand/Gravel	3	0.6	225	226	361.6	8.5	0.02	0.01	<0.01	2.58	9.5	216.05	360.09	
	P116-13_1.8-1.9	Sand	3	<0.3	155	155	992	8.4	<0.01	<0.01	<0.01	1.92	7	159.20	1061.32	
	P116-17-0.6-0.8	Sand/Gravel	4	0.3	423	423	1353.5	8.5	0.01	<0.01	<0.01	4.93	18.1	411.64	1372.13	
	P116-18_3.6-3.8	Sand	3	0.6	150	151	241.6	8.4	0.02	0.02	<0.01	1.66	6.1	138.73	231.22	
	Minimum		3	<0.3	150	151	188	8.4	0.01	0.01	<0.01	1.66	6.1	138.73	184.47	
Maximum		4	0.9	423	423	1354	8.6	0.03	0.03	<0.01	4.93	18.1	411.64	1372.13		
	10th Percentile		3	0.42	152.5	153	214.675	8.4	0.014	0.013	<0.01	1.79	6.55	148.96	207.84	
	90th Percentile		3	0.42	152.5	153	214.675	8.4	0.014	0.013	<0.01	1.79	6.55	148.96	207.84	
	Median		3	0.6	200	201	324	8.45	0.02	0.02	<0.01	2.29	8.4	191.04	326.61	
	Mean		3.2	0.7	233	233	571	8.5	0.02	0.02	<0.01	2.71	9.9	225.91	583.73	
P98	P98-01.1_0.0-2.2	Sand/Gravel	4	0.3	619	619	1981	8.1	0.01	<0.01	<0.01	6.83	25	568.56	1895.21	
	P98-07_0.3-0.6	Gravel	4	<0.3	891	891	5702	8.4	<0.01	<0.01	0.01	10.45	38.2	868.77	5791.77	
	P98-12-0.1-0.3	Silt/Gravel	4	<0.3	899	899	5754	8.3	<0.01	<0.01	<0.01	10.55	38.6	877.86	5852.42	
	Minimum		4	<0.3	619	619	1981	8.1	0.01	<0.01	0.01	6.8	25.0	568.56	1895.21	
	Maximum		4	0.3	899	899	5754	8.4	0.01	<0.01	0.01	10.6	38.6	877.86	5852.42	
		10th Percentile		4	0.3	673	673	2725	8.14	0.01	<0.01	0.01	7.6	27.6	628.60	2674.52
		90th Percentile		4	0.3	897	897	5744	8.38	0.01	<0.01	0.01	10.5	38.5	876.04	5840.29
	Median		4	0.3	891	891	5702	8.3	0.01	<0.01	0.01	10.5	38.2	868.77	5791.77	
	Mean		4	0.3	803	803	4479	8.3	0.01	<0.01	0.01	9.3	33.9	771.73	4513.13	
P76	P76-04_0.1-0.4	Sand	2	<0.3	26	26	166.4	7.7	<0.01	<0.01	<0.01	0.27	1	22.74	151.62	
	P76-05_20-2.5	Silt	4	0.3	579	579	1853	8.6	0.01	0.01	0.01	6.8	24.9	566.29	1887.63	
	P76-09_0.1-0.4	Silt	3	0.3	377	377	1206.5	8.4	0.01	<0.01	<0.01	4.40	16.10	366.16	1220.52	
	Minimum		2	<0.3	26	26	166.4	7.7	0.01	0.01	0.01	0.27	1.00	22.74	151.62	
	Maximum		4	0.3	579	579	1853	8.6	0.01	0.01	0.01	6.80	24.90	566.29	1887.63	
		10th Percentile		2.2	0.3	96	96.2	374.42	7.84	0.01	0.01	0.01	1.10	4.02	91.43	365.40
		90th Percentile		3.8	0.3	539	538.6	1723.7	8.56	0.01	0.01	0.01	6.32	23.14	526.26	1754.21
	Median		3	0.3	377	377	1206.5	8.4	0.01	0.01	0.01	4.40	16.10	366.16	1220.52	
	Mean		3	0.3	327	327.3	1075.3	8.2	0.01	0.01	0.01	3.82	14.00	318.40	1086.59	
P69	P69-05-0.0-7.2	Gravel	4	<0.3	944	944	6042	8.4	<0.01	<0.01	<0.01	10.95	40.2	914.25	6095.01	
	P69-03-0.1-0.2	Gravel	4	0.3	942	942	3014	8.5	0.01	<0.01	<0.01	11	40.3	916.53	3055.08	
	Minimum		4	<0.3	942	942	3014	8.4	0.01	<0.01	<0.01	10.95	40.2	914.25	3055.08	
	Maximum		4	0.3	944	944	6042	8.5	0.01	<0.01	<0.01	11	40.3	916.53	6095.01	
		10th Percentile		4	0.3	942	942.2	3316.8	8.41	0.01	<0.01	<0.01	10.96	40.21	914.48	3359.08
		90th Percentile		4	0.3	944	943.8	5739.2	8.49	0.01	<0.01	<0.01	11.00	40.29	916.30	5791.01
		Median		4	0.3	943	943	4528	8.45	0.01	<0.01	<0.01	10.98	40.25	915.39	4575.04
	Mean		4	0.3	943	943	4528	8.45	0.01	<0.01	<0.01	10.98	40.25	915.39	4575.04	

Table 7: Trace Element by ICP-MS Analysis Results

Prospect	Sample ID	Sample Type	Ag	Al	As	Ba	Be	Bi	Ca	Cd	Ce	Co	Cr	Cs	Cu	Fe	Ga	Ge	Hf	In	K	La	Li	Mg	Mn	Mo
			ppm	%	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	%	ppm	ppm	%
P1	P1-02_2.0-2.4	Sand/Gravel	0.02	2.78	1.1	270	0.54	0.06	10.9	0.03	25.7	2.4	16	0.51	4.3	0.85	5.64	<0.05	1.3	0.058	1.28	12.1	9.9	1.78	157	0.68
	P1-10.2_0.9-1.0	Sand	0.02	2.23	0.8	180	0.43	0.06	2.64	0.03	32.4	1.7	9	0.35	3.1	0.73	4.54	<0.05	1.2	0.033	1.01	14.4	6.8	0.8	111	0.18
	P1-18_3.0-3.5	Sand	0.02	2.28	0.6	200	0.49	0.07	3.39	0.02	33.3	1.6	11	0.38	4.2	0.7	4.84	0.08	1.4	0.011	1.09	13.8	6	0.87	106	0.45
P13B/C	P13B-01.2_4.8-5.0	Clay	0.05	5.35	3.5	650	1.03	0.18	4.83	0.05	68.7	7.9	35	2.05	19.8	2.04	12	0.14	5.5	0.03	2.75	31.6	17.9	1.66	279	0.43
	P13B-03_3.5-4.0	Sand	0.02	2.27	0.7	200	0.48	0.08	2	0.02	32.8	1.8	12	0.4	5.1	0.76	4.64	0.1	2.6	0.014	1.02	13.1	5	0.54	119	0.32
	P13B-07.2_2.5-2.6	Rock Fragments	0.01	0.31	0.8	30	0.06	0.05	22.1	0.03	5.53	0.8	4	0.09	3	0.2	0.76	0.14	0.4	0.006	0.15	2.6	2.7	9.39	57	0.21
	P13B-09.2_3.7-3.9	Clay	0.06	5.61	3.7	720	1.06	0.21	3.97	0.04	71	9.1	47	2.79	18.5	2.24	13.6	0.15	5.2	0.036	3.35	32.8	20.1	2.14	279	0.83
	P13C-01_2.5-3.5	Sand	0.03	2.65	1.3	280	0.42	0.08	2.61	0.02	32.7	1.9	12	0.51	7	0.87	5.33	0.12	2	0.013	1.34	13.1	5.4	0.77	126	0.44
	P13C-09_3.0-3.5	Sand	0.03	2.66	1.2	240	0.47	0.07	2.51	0.03	32.3	1.8	12	0.5	4.6	0.89	5.43	0.11	2	0.013	1.25	13.2	5	0.53	132	0.39
P116	P116-01_2.8-3.3	Sand/Gravel	0.13	5.67	3	620	1.23	0.31	5.82	0.04	64	6.8	32	2.8	15.1	2.46	12.25	0.16	4	0.07	4.54	32	18.7	3.74	573	0.46
	P116-02_3.6-4.0	Sand	0.05	6.56	2.4	570	1.59	0.24	3.88	0.03	89	9.7	40	3.73	22.5	2.64	16	0.2	4.8	0.042	4.67	44.9	21.7	2.78	394	0.5
	P116-11.1_2.0-3.5	Sand/Gravel	0.04	6.6	1.5	620	1.33	0.2	4.79	0.03	77.1	8.4	37	3.51	14.9	2.52	15.45	0.19	3.9	0.044	5.22	39	23.2	3.48	320	0.4
	P116-13_1.8-1.9	Sand	0.04	6.59	1.6	790	1.39	0.21	3.63	0.02	79	10.5	38	3.52	19.7	2.41	15.65	0.21	6.7	0.036	5.18	40.6	17.1	2.55	385	0.35
	P116-17-0.6-0.8	Sand/Gravel	0.04	4.04	1.9	520	0.65	0.34	8.86	0.02	48.1	4.9	22	1.36	14.1	2.07	7.77	0.16	3.4	0.051	3.56	22.2	14.9	5.38	876	0.34
P116-18_3.6-3.8	Sand	0.04	7.41	2	580	1.74	0.42	3.34	0.03	92.1	10.8	47	4.25	23.7	2.86	17.9	0.2	3.7	0.044	5.31	46.7	21.4	2.63	380	0.5	
P98	P98-01.1_0.0-2.2	Gravel/Sand	0.05	2.58	2.4	260	0.58	0.09	12.45	0.03	35	3.7	23	1.14	7.2	1.21	5.6	0.15	3.1	0.02	1.28	17.2	13.7	7.99	409	0.53
	P98-07_0.3-0.6	Gravel	0.02	1.08	1.8	100	0.25	0.05	17.3	0.02	16.6	2.1	11	0.54	4.9	0.69	2.35	0.16	1.1	0.012	0.59	8.1	7.9	11.15	247	0.33
	P98-12-0.1-0.3	Silt/Gravel	0.03	1.04	2.4	90	0.26	0.05	18.1	<0.02	13.75	2.1	12	0.52	3.9	0.66	2.26	0.18	0.9	0.009	0.57	6.7	9.6	11.5	303	0.34
P76	P76-04_0.1-0.4	Sand	0.02	4.51	1.5	590	0.69	0.09	1.08	0.02	46.1	3.5	21	1.06	3.5	1.36	9.37	0.21	6.2	0.017	2.39	22	10.5	0.52	149	0.49
	P76-05_20-2.5	Silt	0.03	3.67	1.7	360	0.72	0.13	12.55	0.03	53.6	5.4	24	1.86	10.9	1.38	8.37	0.22	3.2	0.021	2.12	26	11.4	6.95	276	0.42
	P76-09_0.1-0.4	Silt	0.03	4.42	3.1	500	0.88	0.14	8.97	<0.02	57	5.8	27	1.92	9.7	1.71	9.76	0.23	4.8	0.029	2.46	28.5	13.6	5.22	362	0.44
P69	P69-05-0.0-7.2	Gravel	0.01	0.75	0.9	80	0.21	0.04	19.45	0.02	11.65	1.7	8	0.37	2.6	0.41	1.8	0.19	0.8	0.008	0.33	5.6	5.4	12.15	228	0.23
	P69-03-0.1-0.2	Gravel	0.01	0.84	0.6	90	0.14	0.04	19.5	0.02	11.8	2	6	0.3	3.3	0.39	1.95	0.22	0.7	0.006	0.43	5.9	6.1	11.95	177	0.32
Crustal Abundance			0.075	8.23	1.8	425	2.8	0.0085	4.15	0.15	66.5	25	102	3	60	5.63	19	1.5	3	0.16	2.09	39	20	2.33	950	1.2
10x Crustal Abundance			0.75	82.3	18	4250	28	0.085	41.5	1.5	665	250	1020	30	600	56.3	190	15	30	1.6	20.9	390	200	23.3	9500	12

Average crustal abundance values for all rock types. Multiple sources as compiled at https://en.wikipedia.org/wiki/Abundance_of_elements_in_Earth's_crust

Metal concentrations exceeding the average crustal abundance are bold

Metal concentrations exceeding 10 times the average crustal abundance are bold shaded

Table 7: Trace Element by ICP-MS Analysis Results

Prospect	Sample ID	Sample Type	Na	Nb	Ni	P	Pb	Rb	Re	S	Sb	Sc	Se	Sn	Sr	Ta	Te	Th	Ti	Tl	U	V	W	Y	Zn	Zr
			%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	ppm	%	ppm	ppm	ppm	ppm	ppm
P1	P1-02_2.0-2.4	Sand/Gravel	0.85	1.7	5.2	240	7.5	37.1	<0.002	0.01	0.14	2	<1	0.4	157	0.13	<0.05	3.96	0.057	0.25	1.1	14	0.2	4.6	15	48.4
	P1-10.2_0.9-1.0	Sand	0.72	1.1	3.7	230	6.4	29.8	<0.002	0.01	0.09	1.4	<1	0.3	94.8	0.1	<0.05	4.18	0.045	0.22	0.7	10	0.1	4.1	8	43.9
	P1-18_3.0-3.5	Sand	0.73	1.3	4	200	7.2	36.1	<0.002	0.01	0.09	1.3	<1	0.3	93.2	0.1	<0.05	5	0.04	0.2	0.8	9	0.1	4.2	9	53
P13B/C	P13B-01.2_4.8-5.0	Clay	1.02	7.2	19.8	580	14.5	87.3	<0.002	0.03	0.17	6.3	1	1.3	179.5	0.53	<0.05	12.95	0.233	0.53	2.5	43	0.7	15.4	36	202
	P13B-03_3.5-4.0	Sand	0.71	1.4	4.4	290	6.4	31.9	<0.002	0.01	0.11	1.7	1	0.3	97.3	0.11	<0.05	4.8	0.051	0.17	0.9	11	0.1	6.3	8	97.8
	P13B-07.2_2.5-2.6	Rock Fragments	0.08	0.3	2.1	40	1	4.7	<0.002	0.04	0.1	0.5	1	<0.2	160.5	<0.05	<0.05	0.92	0.012	0.04	0.7	5	<0.1	1.6	2	15.1
	P13B-09.2_3.7-3.9	Clay	0.67	7.9	23.2	540	15	102.5	<0.002	0.02	0.17	7.2	1	1.4	180.5	0.56	<0.05	13.5	0.228	0.56	2.6	47	0.7	16.6	37	194
	P13C-01_2.5-3.5	Sand	0.77	1.6	5.3	270	7.4	40.2	<0.002	0.01	0.11	1.7	<1	0.3	107.5	0.12	<0.05	4.56	0.053	0.25	0.9	12	0.2	5.5	9	76.3
	P13C-09_3.0-3.5	Sand	0.81	1.5	6	270	7.4	40.3	<0.002	0.01	0.11	1.7	1	0.3	108	0.15	<0.05	4.44	0.051	0.27	1	14	0.2	5.5	10	73.3
P116	P116-01_2.8-3.3	Sand/Gravel	0.34	7.6	17.2	860	20.3	115	<0.002	0.03	0.21	7.1	1	1.1	156	0.63	<0.05	14.05	0.202	0.47	2.6	36	0.8	22.4	28	144.5
	P116-02_3.6-4.0	Sand	0.4	9.4	19.7	740	17.4	133	0.002	0.04	0.15	8	1	1.5	189	0.7	<0.05	16	0.247	0.54	2.9	48	0.8	17.7	31	170
	P116-11.1_2.0-3.5	Sand/Gravel	0.24	9.6	19.7	740	15.8	128.5	<0.002	0.02	0.12	8	1	1.3	178.5	0.7	<0.05	14.9	0.252	0.51	2.6	44	0.7	18.2	24	138.5
	P116-13_1.8-1.9	Sand	0.32	9.9	18	640	19.7	147	<0.002	0.01	0.12	8.2	1	1.3	197	0.74	<0.05	16.6	0.257	0.62	3.2	43	0.8	21.5	24	247
	P116-17-0.6-0.8	Sand/Gravel	0.31	5	11.9	850	13.5	75.9	<0.002	0.02	0.12	4.9	1	0.7	115	0.38	<0.05	10.3	0.138	0.34	2.3	26	0.5	18.3	17	123.5
	P116-18_3.6-3.8	Sand	0.38	10.7	22.7	630	19.3	133.5	<0.002	0.02	0.13	8.5	1	1.6	197.5	0.77	<0.05	15.6	0.274	0.56	2.6	52	0.9	16.6	32	131
P98	P98-01.1_0.0-2.2	Gravel/Sand	0.34	3.9	7	140	11	44.3	<0.002	<0.01	0.13	3	<1	0.6	93.3	0.3	<0.05	6.47	0.11	0.25	1.6	22	1	9.8	17	109
	P98-07_0.3-0.6	Gravel	0.14	1.8	3.5	120	5.8	19.3	<0.002	<0.01	0.08	1.6	<1	0.3	68.5	0.14	<0.05	2.72	0.046	0.1	0.9	10	0.3	5	6	40.4
	P98-12-0.1-0.3	Silt/Gravel	0.14	1.6	3.7	100	7.9	19.2	<0.002	<0.01	0.07	1.6	1	0.3	65.9	0.12	<0.05	2.54	0.045	0.09	0.9	11	0.2	4.7	8	30.9
P76	P76-04_0.1-0.4	Sand	1.02	5.2	7.2	140	14.9	74.1	<0.002	0.01	0.16	3.2	<1	0.7	150.5	0.42	<0.05	9.93	0.153	0.41	2.2	24	0.5	12	15	224
	P76-05_20-2.5	Silt	0.51	5.6	11.3	380	10.8	66.5	<0.002	<0.01	0.11	4.1	1	0.9	155	0.44	<0.05	10.25	0.153	0.33	2.4	28	0.5	10.8	22	117.5
	P76-09_0.1-0.4	Silt	0.73	5.6	14	410	13.7	80.7	<0.002	0.01	0.15	4.9	<1	0.9	162.5	0.44	<0.05	11.6	0.161	0.46	2.6	33	0.5	15.2	21	174.5
P69	P69-05-0.0-7.2	Gravel	0.13	1.1	2.4	80	2.8	13.3	<0.002	<0.01	0.06	1	<1	0.2	71.3	0.08	<0.05	2.07	0.033	0.1	1	10	0.2	3.1	7	30.5
	P69-03-0.1-0.2	Gravel	0.17	1.2	2.6	70	2.9	18.4	0.003	0.01	0.07	1.2	<1	0.2	89.4	0.11	<0.05	2.98	0.032	0.12	1.4	12	0.1	3	7	26.4
Crustal Abundance			2.36	20	84	1050	14	90	0.0015	0.035	0.2	22	0.05	2.3	370	2	0.002	9.6	0.565	0.6	2.7	120	1.25	33	70	165
10x Crustal Abundance			23.6	200	840	10500	140	900	0.015	0.35	2	220	0.5	23	3700	20	0.02	96	5.65	6	27	1200	12.5	330	700	1650

Average crustal abundance values for all rock types. Multiple sources as compiled at https://en.wikipedia.org/wiki/Abundance_of_elements_in_Earth's_crust

Metal concentrations exceeding the average crustal abundance are bold

Metal concentrations exceeding 10 times the average crustal abundance are bold shaded

Table 8: Whole Rock XRF Analysis Results

Prospect	Sample ID	Al2O3	BaO	CaO	Cr2O3	Fe2O3	K2O	MgO	MnO	Na2O	P2O5	SO3	SiO2	SrO	TiO2	LOI 1000	Total
		%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
P1	P1-02_2.0-2.4	5.2	0.03	15.95	0.01	1.28	1.6	3.14	0.02	1.14	0.05	0.06	55.17	0.01	0.11	15.63	99.41
	P1-10.2_0.9-1.0	4.18	0.03	3.59	0.01	1.07	1.26	1.41	0.02	0.97	0.05	0.03	83.17	0.01	0.08	3.92	99.81
	P1-18_3.0-3.5	4.47	0.03	4.79	<0.01	1.04	1.4	1.54	0.02	1.02	0.04	0.04	80.28	0.01	0.08	5.04	99.81
P13B/C	P13B-01.2_4.8-5.0	9.99	0.08	6.63	0.01	2.94	3.37	2.87	0.04	1.36	0.12	0.08	63.67	0.02	0.42	7.55	99.21
	P13B-03_3.5-4.0	4.43	0.03	2.76	<0.01	1.13	1.3	0.97	0.02	0.98	0.06	0.03	85.26	0.01	0.1	2.65	99.76
	P13B-07.2_2.5-2.6	0.59	<0.01	32.9	<0.01	0.27	0.17	15.15	0.01	0.08	0.01	0.14	6.8	0.01	0.02	42.74	98.91
	P13B-09.2_3.7-3.9	11.27	0.08	5.69	0.01	3.38	4.33	3.82	0.04	0.95	0.12	0.06	60.53	0.02	0.42	8.44	99.21
	P13C-01_2.5-3.5	5.08	0.04	3.61	0.01	1.27	1.66	1.36	0.02	1.06	0.06	0.04	81.98	0.01	0.1	3.89	100.2
	P13C-09_3.0-3.5	4.99	0.03	3.34	<0.01	1.27	1.56	0.89	0.02	1.09	0.06	0.04	82.98	0.01	0.09	3.24	99.63
P116	P116-01_2.8-3.3	10.61	0.07	8.07	0.01	3.54	5.48	6.15	0.08	0.44	0.17	0.09	50.99	0.02	0.35	13.42	99.54
	P116-02_3.6-4.0	12.3	0.07	5.38	0.01	3.85	5.64	4.76	0.05	0.54	0.15	0.11	56.37	0.02	0.42	9.71	99.43
	P116-11.1_2.0-3.5	12.4	0.08	6.68	0.01	3.67	6.3	5.78	0.04	0.33	0.15	0.07	51.17	0.02	0.43	12.02	99.21
	P116-13_1.8-1.9	12.52	0.1	5.1	0.01	3.56	6.37	4.44	0.06	0.43	0.13	0.03	57.04	0.02	0.46	9.18	99.51
	P116-17-0.6-0.8	7.31	0.06	12.3	<0.01	2.94	4.16	8.55	0.12	0.39	0.17	0.06	43.32	0.01	0.25	19.58	99.26
	P116-18_3.6-3.8	13.68	0.07	4.55	0.01	4.1	6.33	4.38	0.05	0.49	0.13	0.07	56	0.02	0.45	8.73	99.09
P98	P98-01.1_0.0-2.2	4.81	0.03	18	0.01	1.78	1.56	12.85	0.06	0.43	0.03	0.04	28.82	0.01	0.2	30.51	99.19
	P98-07_0.3-0.6	2.04	0.01	25.4	<0.01	1.05	0.72	17.95	0.04	0.17	0.02	0.05	11.92	<0.01	0.08	40.25	99.74
	P98-12-0.1-0.3	1.89	0.01	25.6	<0.01	0.93	0.69	17.85	0.04	0.17	0.02	0.05	10.38	<0.01	0.07	41.21	98.95
P76	P76-04_0.1-0.4	8.47	0.07	1.4	0.01	1.99	2.95	0.89	0.02	1.36	0.03	0.03	78.77	0.01	0.27	3.14	99.46
	P76-05_2.0-2.5	6.61	0.04	18.15	0.01	2	2.55	11.05	0.04	0.63	0.08	0.05	31.05	0.01	0.26	26.68	99.25
	P76-09_0.1-0.4	7.57	0.05	11.55	0.01	2.3	2.78	7.8	0.05	0.87	0.07	0.04	47.2	0.02	0.26	18.35	98.96
P69	P69-05-0.0-7.2	1.36	0.01	27.2	<0.01	0.58	0.38	18.8	0.03	0.15	0.02	0.05	8.02	<0.01	0.05	42.78	99.47
	P69-03-0.1-0.2	1.52	0.01	27.4	<0.01	0.56	0.5	18.55	0.03	0.2	0.01	0.07	7.91	<0.01	0.05	42.52	99.37

Table 9: Whole Rock XRF Analysis Normalized Results

Sample ID	Proportion in class (%)		
	Impurities	Calcite	Dolomite
P1-02_2.0-2.4	79.01	17.16	3.84
P1-10.2_0.9-1.0	95.64	2.88	1.48
P1-18_3.0-3.5	94.25	4.11	1.64
P13B-01.2_4.8-5.0	91.37	5.44	3.19
P13B-03_3.5-4.0	96.74	2.25	1.01
P13B-07.2_2.5-2.6	17.25	50.49	32.26
P13B-09.2_3.7-3.9	91.86	3.82	4.32
P13C-01_2.5-3.5	95.66	2.92	1.42
P13C-09_3.0-3.5	96.15	2.92	0.93
P116-01_2.8-3.3	87.26	5.27	7.47
P116-02_3.6-4.0	91.64	2.87	5.48
P116-11.1_2.0-3.5	89.29	3.80	6.91
P116-13_1.8-1.9	92.18	2.75	5.07
P116-17-0.6-0.8	78.96	9.56	11.48
P116-18_3.6-3.8	92.84	2.16	5.00
P98-01.1_0.0-2.2	62.10	16.78	21.12
P98-07_0.3-0.6	33.15	29.88	36.96
P98-12-0.1-0.3	30.40	31.52	38.08
P76-04_0.1-0.4	98.17	0.90	0.93
P76-05_20-2.5	65.82	17.39	16.79
P76-09_0.1-0.4	80.72	8.99	10.28
P69-05-0.0-7.2	23.54	34.91	41.55
P69-03-0.1-0.2	23.84	35.45	40.72

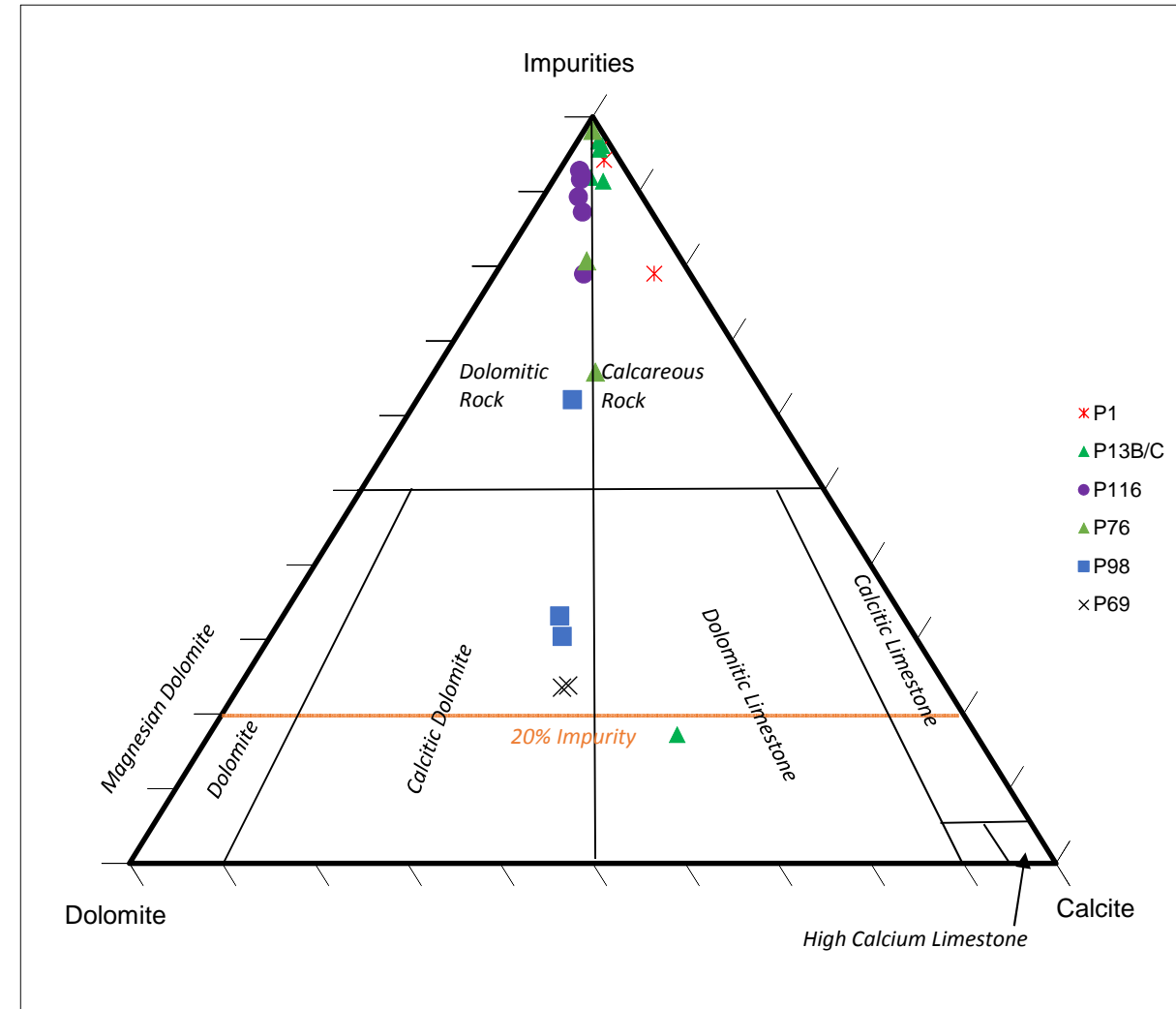


Table 10: Shake Flask Extraction (SFE) Analysis Results

Client Sample ID	Lowest Detection Limit	Units	P1-02_2.0-2.4	P1-10.2_0.9-1.0	P1-18_3.0-3.5	P13B-01.2_4.8-5.0	P13B-03_3.5-4.0	P13B-07.2_2.5-2.6	P13B-09.2_3.7-3.9	P13C-01_2.5-3.5	P13C-09_3.0-3.5	P116-01_2.8-3.3	P116-02_3.6-4.0	CCME - AL	BCAWQG - AL
ALS Sample ID			L1984719-1	L1984719-2	L1984719-3	L1984719-4	L1984719-5	L1984719-6	L1984719-7	L1984719-8	L1984719-9	L1984719-10	L1984719-11	mg/L	mg/L
Material Type			Sand/Gravel	Sand	Sand	Clay	Sand	Rock Fragments	Clay	Sand	Sand	Sand/Gravel	Sand		
Physical Tests															
Moisture	0.25	%	<0.25	0.29	<0.25	0.94	<0.25	<0.25	1.56	0.34	<0.25	0.78	1.34		
Leachable Anions & Nutrients															
Acidity (as CaCO3)	4.0	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0		
Alkalinity, Total (as CaCO3)	1.0	mg/L	31.2	20.9	26.5	42.6	22.2	42.5	52.1	30.3	22.6	33.4	26.7		
Bromide (Br)	0.050	mg/L	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	<0.050	0.060	<0.050		
Chloride (Cl)	0.50	mg/L	3.67	<0.50	1.21	0.69	1.10	1.93	1.30	0.50	<0.50	4.28	0.67	120	-
Conductivity	2.0	uS/cm	81.2	39.1	53.8	84.5	47.5	93.8	109	62.1	48.6	83.5	84.1	-	-
Fluoride (F)	0.020	mg/L	0.271	0.051	0.110	0.245	0.064	0.508	0.355	0.106	0.064	0.167	0.361	0.12	-
Nitrate (as N)	0.0050	mg/L	0.0082	<0.0050	<0.0050	<0.0050	0.0067	0.0140	0.0060	<0.0050	<0.0050	0.0067	0.0303	13	-
Nitrite (as N)	0.0010	mg/L	0.0158	0.0145	0.0128	0.0403	0.0165	0.0312	0.0460	0.0188	0.0192	0.0265	0.0364	0.06	-
pH	0.10	pH	9.03	9.09	9.21	8.78	9.28	9.41	8.75	9.37	8.74	9.11	8.80	6.5-9.0	6.5-9.0
Sulfate (SO4)	0.50	mg/L	3.66	<0.50	1.12	0.70	0.61	2.32	1.28	0.81	<0.50	0.94	12.6	-	-
Leachable Metals															
Aluminum (Al)-Leachable	0.0050	mg/L	0.415	0.500	0.597	0.360	0.624	0.100	0.175	0.209	0.440	0.532	0.083	0.1	0.1
Antimony (Sb)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	0.000	0.000	<0.00010	0.000	<0.00010	<0.00010	<0.00010	<0.00010	0.02	-
Arsenic (As)-Leachable	0.0010	mg/L	0.001	<0.0010	<0.0010	0.003	0.003	<0.0010	0.001	0.002	0.001	0.001	<0.0010	0.005	0.005
Barium (Ba)-Leachable	0.0010	mg/L	0.015	0.004	0.005	0.072	0.009	0.006	0.060	0.045	0.003	0.030	0.118	-	1
Beryllium (Be)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Bismuth (Bi)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	1	-
Boron (B)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	0.014	<0.010	<0.010	0.033	<0.010	<0.010	0.026	0.048	1.5	1.2
Cadmium (Cd)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00009**	0.000015**
Calcium (Ca)-Leachable	0.10	mg/L	8.360	6.260	7.780	12.600	6.810	5.730	14.800	6.810	6.590	7.980	7.370	-	-
Chromium (Cr)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	0.001	<0.00050	0.001	<0.00050	<0.00050	<0.00050	0.001	0.0089	0.001
Cobalt (Co)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	0.000	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.000	<0.00010	-	0.11
Copper (Cu)-Leachable	0.0010	mg/L	0.001	0.001	0.002	0.004	0.003	<0.0010	0.001	<0.0010	0.002	0.0025	<0.0010	0.002	0.002**
Iron (Fe)-Leachable	0.030	mg/L	<0.030	0.153	0.116	0.210	0.192	<0.030	0.086	<0.030	0.155	0.202	<0.030	0.3	0.35
Lead (Pb)-Leachable	0.00010	mg/L	<0.00010	0.000	<0.00010	0.000	0.000	<0.00010	0.000	<0.00010	<0.00010	0.000	<0.00010	0.0024**	0.020**
Lithium (Li)-Leachable	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	-
Magnesium (Mg)-Leachable	0.050	mg/L	2.370	0.875	1.650	2.260	1.130	8.010	3.150	2.350	0.943	3.950	3.940	-	-
Manganese (Mn)-Leachable	0.00050	mg/L	<0.00050	0.002	0.002	0.002	0.002	<0.00050	0.001	<0.00050	0.002	0.001	<0.00050	-	-
Mercury (Hg)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000026	-
Molybdenum (Mo)-Leachable	0.00010	mg/L	0.00144	0.00014	0.00099	0.00062	0.00063	0.00043	0.02010	0.00082	0.00034	0.00063	0.00326	0.073	-
Nickel (Ni)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.025**	0.025**
Phosphorus (P)-Leachable	0.30	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.015	-
Potassium (K)-Leachable	0.050	mg/L	2.180	0.445	0.997	1.930	0.953	0.985	2.790	0.848	0.440	3.640	3.730	-	373
Selenium (Se)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.001	0.002
Silicon (Si)-Leachable	0.050	mg/L	2.840	1.240	2.370	4.990	2.230	1.180	5.240	1.910	1.090	3.880	1.890	-	-
Silver (Ag)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0001	**
Sodium (Na)-Leachable	0.050	mg/L	2.150	0.285	0.802	0.970	0.638	0.990	1.450	0.488	0.255	0.701	0.645	-	-
Strontium (Sr)-Leachable	0.00050	mg/L	0.02630	0.00529	0.00978	0.01120	0.00943	0.02460	0.01190	0.00938	0.00694	0.00937	0.02720	-	-
Thallium (Tl)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0008	0.0003
Tin (Sn)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Titanium (Ti)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	0.016	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	2
Uranium (U)-Leachable	0.000010	mg/L	0.00015	0.00006	0.00010	0.00019	0.00009	0.00011	0.00044	0.00007	0.00009	0.00015	0.00007	0.015	0.3
Vanadium (V)-Leachable	0.0010	mg/L	0.005	0.003	0.003	0.004	0.003	0.004	0.002	0.003	0.004	0.002	<0.0010	-	0.006
Zinc (Zn)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.03	0.033**

- Not analyzed or no standard exists. Aluminum guideline is provided only for the dissolved fraction.
 < Concentration is less than the laboratory detection limit indicated.
 CCME - AL Canadian Council of Ministers of the Environment (CCME) (1999). Canadian Water Quality Guidelines for the Protection of Aquatic Life (Freshwater).
 BCWQG-AL British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture, Summary Report (January 2017).
Bold Bold indicates an exceedance of one or both of the guideline values.
 Shaded Shaded cell indicates an exceedance of one or both of the guideline values by an order of magnitude or more.
 ** Indicates that the guideline is derived from an equation or matrix, based on water hardness

Table 10: Shake Flask Extraction (SFE) Analysis Results

Client Sample ID	Lowest Detection Limit	Units	P116-11.1_2.0-3.5	P116-13_1.8-1.9	P116-17-0.6-0.8	P116-18_3.6-3.8	P98-01.1_0.0-2.2	P98-07_0.3-0.6	P98-12-0.1-0.3	P76-05_20-2.5	P76-09_0.1-0.4	P69-05-0.0-7.2	P69-03-0.1-0.2	CCME - AL	BCAWQG - AL
ALS Sample ID			L1984719-12	L1984719-13	L1984719-14	L1984719-15	L1984719-16	L1984719-17	L1984719-18	L1984719-20	L1984719-21	L1984719-22	L1984719-23	mg/L	mg/L
Material Type			Sand/Gravel	Sand	Sand/Gravel	Sand	Gravel/Sand	Gravel	Silt/Gravel	Silt	Silt	Gravel	Gravel		
Physical Tests															
Moisture	0.25	%	1.16	0.98	0.43	1.05	0.83	0.38	0.32	0.61	0.87	0.30	0.26		
Leachable Anions & Nutrients															
Acidity (as CaCO3)	4.0	mg/L	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0	<4.0		
Alkalinity, Total (as CaCO3)	1.0	mg/L	37.1	29.2	35.3	23.4	123	67.3	140	53.8	91.0	112	109		
Bromide (Br)	0.050	mg/L	<0.050	<0.050	0.139	<0.050	0.132	0.113	0.209	<0.050	0.069	0.090	0.161		
Chloride (Cl)	0.50	mg/L	1.88	0.80	10.1	0.63	12.9	10.9	18.1	1.54	8.47	11.3	24.5	120	-
Conductivity	2.0	uS/cm	82.1	66.0	106	54.5	274	162	317	108	197	237	280	-	-
Fluoride (F)	0.020	mg/L	0.312	0.338	0.172	0.220	0.167	0.124	0.131	0.385	0.404	0.128	0.209	0.12	-
Nitrate (as N)	0.0050	mg/L	0.0090	<0.0050	0.0063	0.0590	0.156	<0.0050	0.0105	<0.0050	0.0315	0.0286	0.0069	13	-
Nitrite (as N)	0.0010	mg/L	0.0478	0.0302	0.0412	0.0427	0.0235	0.0040	0.0148	0.0232	0.0734	0.0212	<0.0010	0.06	-
pH	0.10	pH	8.84	8.75	9.03	8.64	7.91	8.26	8.01	8.73	8.39	7.91	8.35	6.5-9.0	6.5-9.0
Sulfate (SO4)	0.50	mg/L	1.46	1.63	1.17	1.11	<0.50	<0.50	0.54	0.51	0.69	<0.50	0.80	-	-
Leachable Metals															
Aluminum (Al)-Leachable	0.0050	mg/L	1.110	5.560	0.266	1.170	0.082	0.215	0.098	0.088	0.125	0.187	0.149	0.1	0.1
Antimony (Sb)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	0.000	<0.00010	<0.00010	0.000	<0.00010	<0.00010	<0.00010	0.02	-
Arsenic (As)-Leachable	0.0010	mg/L	<0.0010	0.002	<0.0010	<0.0010	<0.0010	<0.0010	0.001	<0.0010	0.001	<0.0010	<0.0010	0.005	0.005
Barium (Ba)-Leachable	0.0010	mg/L	0.026	0.063	0.026	0.026	0.013	0.007	0.016	0.011	0.011	0.020	0.026	-	1
Beryllium (Be)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Bismuth (Bi)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	1	-
Boron (B)-Leachable	0.010	mg/L	0.034	0.048	0.015	0.026	0.019	0.013	0.022	0.030	0.035	0.011	0.011	1.5	1.2
Cadmium (Cd)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.00009**	0.000015**
Calcium (Ca)-Leachable	0.10	mg/L	8.160	7.400	10.100	4.970	27.400	16.000	27.400	11.500	21.500	24.300	20.800	-	-
Chromium (Cr)-Leachable	0.00050	mg/L	0.001	0.005	<0.00050	0.001	<0.00050	<0.00050	<0.00050	0.001	<0.00050	<0.00050	<0.00050	0.0089	0.001
Cobalt (Co)-Leachable	0.00010	mg/L	0.000	0.004	<0.00010	0.000	0.001	0.000	0.000	<0.00010	0.000	0.000	0.000	-	0.11
Copper (Cu)-Leachable	0.0010	mg/L	0.0040	0.0238	0.0041	0.0048	0.0040	0.0021	0.0021	0.002	0.005	0.002	<0.0010	0.002	0.002**
Iron (Fe)-Leachable	0.030	mg/L	0.551	3.430	0.163	0.522	0.073	0.249	<0.030	0.054	0.248	0.114	0.036	0.3	0.35
Lead (Pb)-Leachable	0.00010	mg/L	0.000	0.002	0.000	0.000	<0.00010	0.000	<0.00010	<0.00010	0.000	<0.00010	<0.00010	0.0024**	0.020**
Lithium (Li)-Leachable	0.0050	mg/L	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	<0.0050	-	-
Magnesium (Mg)-Leachable	0.050	mg/L	4.810	4.760	5.440	2.670	15.400	9.620	18.200	4.280	8.690	13.100	15.300	-	-
Manganese (Mn)-Leachable	0.00050	mg/L	0.003	0.014	0.002	0.003	0.052	0.021	0.029	0.001	0.008	0.017	0.009	-	-
Mercury (Hg)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	0.00016	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.000026	-
Molybdenum (Mo)-Leachable	0.00010	mg/L	0.00075	0.00114	0.00049	0.00067	0.00292	0.00239	0.00073	0.00617	0.00175	0.00067	0.00147	0.073	-
Nickel (Ni)-Leachable	0.00050	mg/L	0.001	0.006	0.001	0.001	0.001	0.001	0.001	<0.00050	0.002	0.001	<0.00050	0.025**	0.025**
Phosphorus (P)-Leachable	0.30	mg/L	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	<0.30	0.015	-
Potassium (K)-Leachable	0.050	mg/L	2.830	4.600	2.310	2.240	1.970	0.624	3.840	2.220	2.030	1.690	2.150	-	373
Selenium (Se)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	0.001	0.002
Silicon (Si)-Leachable	0.050	mg/L	4.770	11.700	2.550	3.910	3.480	1.910	2.880	4.780	4.700	1.310	1.960	-	-
Silver (Ag)-Leachable	0.000050	mg/L	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	<0.000050	0.0001	**
Sodium (Na)-Leachable	0.050	mg/L	0.509	0.505	1.240	0.315	1.840	1.460	2.420	1.080	2.590	2.760	7.400	-	-
Strontium (Sr)-Leachable	0.00050	mg/L	0.00908	0.00874	0.01180	0.00465	0.01740	0.01240	0.02960	0.00779	0.01240	0.02050	0.03380	-	-
Thallium (Tl)-Leachable	0.00010	mg/L	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	<0.00010	0.0008	0.0003
Tin (Sn)-Leachable	0.00050	mg/L	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	<0.00050	-	-
Titanium (Ti)-Leachable	0.010	mg/L	0.011	0.039	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	-	2
Uranium (U)-Leachable	0.000010	mg/L	0.00016	0.00014	0.00014	0.00004	0.00019	0.00015	0.00016	0.00042	0.00063	0.00026	0.00036	0.015	0.3
Vanadium (V)-Leachable	0.0010	mg/L	0.002	0.006	<0.0010	0.001	<0.0010	<0.0010	<0.0010	0.001	0.002	<0.0010	0.001	-	0.006
Zinc (Zn)-Leachable	0.010	mg/L	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	<0.010	0.03	0.033**

- Not analyzed or no standard exists. Aluminum guideline is provided only for the dissolved fraction.
 < Concentration is less than the laboratory detection limit indicated.
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 BCAWQG-AL British Columbia Approved Water Quality Guidelines: Aquatic Life, Wildlife & Agriculture, Summary Report (January 2017).
Bold Bold indicates an exceedance of one or both of the guideline values.
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****** Indicates that the guideline is derived from an equation or matrix, based on water hardness