



Engineering Ltd.

Report for:

GARY MACNAB

NE-07-50-19 W3

GRAVEL RESORCE INVESTIGATION

Prepared By:

**Chris McRae, B.Sc., E.I.T.
Geotechnical Engineer**

**MPE Engineering Ltd.
122, 103 Marquis Court
Saskatoon Saskatchewan
P: (360) 668-1966
Email: cmcrae@mpe.ca**

Date: September 27, 2018

Project #: 7991-001-00

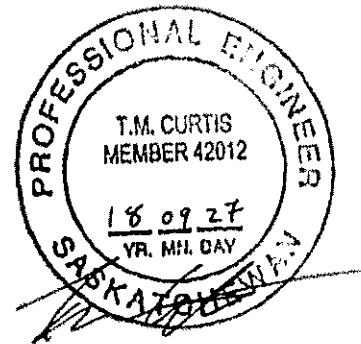
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Respectfully submitted,
MPE ENGINEERING LTD.



Prepared by:
Chris McRae, B.Sc., E.I.T. (SK)
Geotechnical Engineer
Tel: 306-668-1966
Email: cmcrae@mpe.ca

Reviewed by:
Trevor Curtis, P.Eng.
Geotechnical Manager
Tel: 403-317-3638
Email: tcurtis@mpe.ca

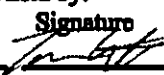
Association of Professional Engineers & Geoscientists of Saskatchewan		
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MPE Engineering Ltd.		
Number C1334		
Permission to Consult held by:		
Discipline	Sk. Reg. No.	Signature
Geotechnical	42012	

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1.0 INTRODUCTION

1.1 PROJECT OVERVIEW

MPE Engineering Ltd. (MPE) was retained to conduct preliminary gravel exploration and testing at various locations within the NE 07-50-19 W3. The purpose of the exploration is to determine the estimated amount of sand and gravel available for potential extraction.

1.2 SCOPE OF WORK

The scope of work for this evaluation included four components: A field program comprised of topographic GPS survey, 11 boreholes, 6 testpits, testing of recovered soil samples in MPE's laboratory, and engineering analysis/reporting. The engineering report for this project includes a description of field activities and drilling program, descriptions of interpreted subsurface conditions, figures depicting the site and associated deposits, and an estimate of granular quantities.

The value of the estimated deposits or the suitability of the pit run for specific applications was outside of the scope of this assessment. However, grain size distributions of the in place resource are provided.

2.0 FIELD INVESTIGATION

The geotechnical drilling field program was carried out on July 17, 2018, using a drill rig contracted from Mobile Augers and Research of Saskatoon, SK. Testpitting was completed on July 17, 2018 using an excavator provided by Mr. MacNab. The drill rig was equipped with solid stem continuous-flight augers. Soil samples were retrieved at select locations based on encountered stratigraphy. The soil was classified and logged by MPE's field representative, Mr. Chris McRae, E.I.T.

The testhole locations are depicted in Figure 1 in Appendix A. The testhole locations were selected by MPE to provide sufficient coverage of the study area. Testhole locations and elevations were surveyed by MPE after completion.

Laboratory testing was conducted on samples to aid in the determination of granular gradation properties. The test results are summarized in Section 3.2.2, and attached in Appendix C.

3.0 SITE CONDITIONS

3.1 SITE DESCRIPTION

The following is a summary of the surface conditions observed during the site reconnaissance. Generally, the study area relatively is flat with little topographic relief in areas that have remained undisturbed. In the south central portion of the property, the vegetation is mostly grasses and low brush while to the south and west of the area is forested with fairly mature stands of trees. Active gravel mining has occurred along the eastern edge of the property to the west of the Saskatchewan Ministry of Highways and Infrastructure (SMHI) gravel pit. The active area floor in this area has approached

groundwater level (as indicated by areas of standing water). Near the southern and western perimeter of the SMHI gravel pit area areas of piled topsoil or overburden were observed.



Picture 3.1: Picture in the sidewall of Testpit excavated near 18BH002 (excavator unknown).



Picture 3.2: Southern active face of the mined area. On the east side of the property.

3.2 SOIL STRATIGRAPHY

The soil conditions at the site were generally comprised of surficial topsoil (50 mm to 600 mm thick), underlain by pit run or overburden near the west boundary. Below the pit run is a layer of sand, overlying clay till. A summary of the soil layers encountered is provided below. For consistency and brevity it should be understood that all depths are below existing ground surface and all elevations are metres above mean sea level, unless otherwise stated. For a more detailed view of the soil conditions, refer to the borehole logs attached in Appendix B. A description of the terms and symbols used on the borehole logs is also included in Appendix B.

It must be noted that boundaries and elevations of topsoil, overburden, sand, and gravel indicated on the borehole logs are inferred from continuous sampling and observations during drilling. These boundaries are intended to reflect transition zones for the main purpose of volume calculation and should not be interpreted as exact planes of geological change.

3.2.1 Overburden

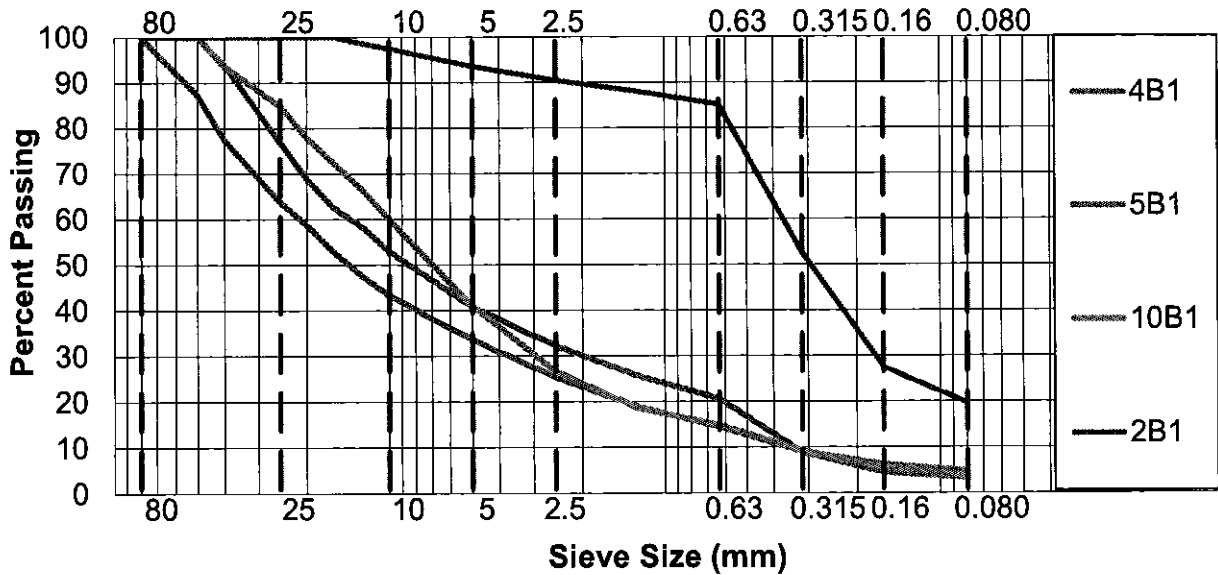
Overburden Clay was generally encountered beneath the topsoil, and extended to the gravel surface or borehole termination depth in 18BH008. The overburden clay was generally silty, some sand, moist, medium plastic, firm to stiff, brown.

3.2.2 Pit Run

Pit run was generally encountered between the topsoil or overburden, and the sand or clay till. For the purpose of this project granular material with an observed gravel content greater than 40% was described as Pit Run. Pit Run was generally described as Gravel, sandy, with trace silt, well graded, damp, brown and grey. While not represented in the borehole logs and gran size distributions the ground surface near boreholes 18BH005, 18BH006, 18BH009 and 18BH011, showed the presence of cobble sized material. It should be noted that refusal was not encountered in any of the borehole locations.

Pit run sieve analysis was performed on samples retrieved from three borehole sites. The individual sieve analysis for each test hole are included in Appendix C. It is important to note that the retrieved samples were collected from the tailings of the drill unit and flight auger, and likely represents a finer gradation than what is existing. Samples collected from open pit excavation would provide a more representative test sample and likely yield a coarser gradation average. However, the samples represent discrete locations across the property and actual gradations across the property may vary. Table A shows the grain size distributions of the collected gravel samples 18BH004 (4B1), 18BH005 (5B1), and 18BH010 (10B1). For comparison, Table A also contains a grain size distribution completed on a sand sample from 18BH002 (2B1). Full grain size analysis results can be found in Appendix C.

Table A: Grain Size Distribution



3.2.3 Sand

Sand was generally encountered between the pit run and clay till in the south central area of the study area. The sand was described as trace to some silt, trace gravel, poorly graded, fine grained, damp, light brown. The sand contained within the area was somewhat variable and in some locations may contain over 10% gravel.

3.2.4 Clay Till

Clay Till was generally encountered beneath granular layers, and extended to borehole termination depths in all boreholes except 18BH008. The clay till was generally silty, some sand, trace gravel, moist, medium to low plastic, stiff to very stiff, grey.

3.3 GROUNDWATER CONDITIONS

Standpipe piezometers were not installed as part of this drilling program; however, wet granular material was noted during drilling and recorded on the borehole logs. The approximate groundwater elevation may be inferred from the standing water within the mined out areas of the ¼ Section as well as the elevation of the encountered wet granular material. Groundwater levels are expected to fluctuate seasonally and in response to climatic conditions.

4.0 ANALYSIS

Gravel resource mapping of the subsurface strata is estimated based on an interpolation of the borehole and survey information. Note that not all boreholes extended to the clay till surface. One borehole and 4 test pits were terminated within the gravel deposit such that the actual bottom of gravel elevation is not known. Actual gravel depth at 18BH006 is likely deeper than shown on the cross-section.

Volume calculations were derived from surveys, surface modeling and material strata obtained from the drilling investigation. Material layer types were generally categorized into overburden (which includes topsoil and subsoils), sand and pit run gravel. Using AutoCAD Civil 3D software, quantities for each layer type were interpolated from the borehole elevations and incorporated into a triangulated irregular network (TIN). The cross sections depicting these layers can be found on Figure 3. The resulting material volumes are represented in Table B.

Table B: Material Volumes

Material Type	Volume of Material (m ³)
Topsoil+ Overburden	199,000
Pit Run Gravel	489,000
Sand	262,000

Utilizing the developed gravel resource model we are able to estimate the anticipated gravel within the site. The following basic assumptions were made for the volume estimates:

- Vertical edges of comparison at area edges. (no allowance for cut back slopes)
- No allowance for site stockpiles for topsoil and overburden materials.
- No allowance for loss of material during processing.
- Southern pit boundary based on the conservative location of Husky pipelines with at 30 m offset.
- While the topsoil and overburden quantity appear high, much of the available gravel is beneath only a thin layer of topsoil. For planning purposes please see the generated cross sections.

It is important to note that interpolation is a best estimate at how the strata of the various material types relate to each other within the elevation model and may vary as geological formations, especially granular deposits, can be highly variable.

5.0 RECOMMENDATIONS

Generally, MPE considers this site suitable for development of the gravel resource. Prior to the sale or further development of the property in question, MPE recommends that the following be completed:

- i. Based on our discussions and visual observations during the field program, it is probable that past Contractors working for SMHI have stockpiled Topsoil and/or Overburden outside the boundary of the SMHI owned pit, within the boundary of this project's study area. It is recommended that written documentation be obtained from SMHI acknowledging ownership of the material and a plan and/or timeline for this materials removal. It is anticipated that SMHI will eventually require this material for final reclamation of their pit.
- ii. Precise delineation of Husky Energy right of ways, abandoned pipelines, and leases be obtained to generate an accurate southern boundary of the possible pit. At this time, information provided by Sask 1st Call has indicated that three leases (Husky 11/10/-07, Husky 11/09/-07, and Husky 11/16/-07) and 4 pipelines (Husky 617057-144 (O), Husky 617057-145(A), Husky 617057-61(O), and Husky 617057-78(O)) were identified within the study area; however, only Husky 617057-61(O) pipeline was able to be located by Sask 1st Call. Given the lack of verified pipeline locations, a conservative estimate of the southern pit boundary was used within the report. Significant quantities of gravel may be present south of 18BH005 if location, or even existence of the pipeline, can be confirmed.
- iii. While not within the scope of this project, prior to the development of the study area it is recommended that the developer prepare a pit management and closure plan and review applicable environmental regulations regarding pit operations.

APPENDIX A:

FIGURES

SW 18-50-19 W3M
EXT 0
PARCEL 128571464
OWNED BY MACNAB, SHARON, MACNAB-STUART

NW 07-50-19 W3M
EXT 0
PARCEL 128576942
OWNED BY MACNAB, SHARON, MACNAB-STUART

SE 18-50-19 W3M
EXT 0
PARCEL 128574432
OWNED BY BICKLEY, CAROL ANN, DAVIS,
MONICA, SHELTON WILLIAMS

NE 07-50-19 W3M
EXT 1
PLAN 50804288
PARCEL 128576537
OWNED BY HER MAJESTY
THE QUEEN (AS SUCCESSION)
SMHI GRAVEL PIT

TOWNSHIP ROAD 502

1432 ROAD

SITE BOUNDARY

OIL WELL
TYPICAL

18BH010

18BH004

18BH003

18BH009

18BH006

18BH007

18BH006

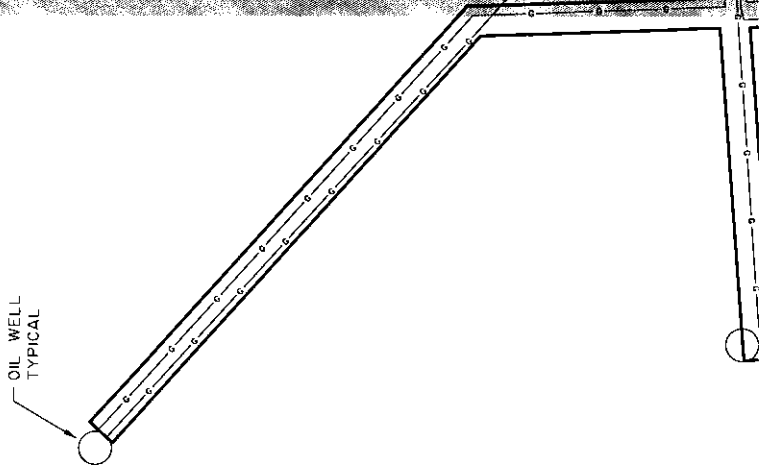
18BH005

18BH006

18BH000

18BH003

18BH005



SW 18-50-19 W3M
EXT 0
PARCEL 128571464
OWNED BY MACNAB, SHARON, MACNAB, STUART

NW 07-50-19 W3M
EXT 0
PARCEL 128576942
OWNED BY MACNAB, SHARON, MACNAB, STUART

Se 18-50-19 W3M
EXT 0
PARCEL 128571442
OWNED BY BICKLEN, CAROL ANN, DAVID,
MONYETH, SRELDON, WILSON

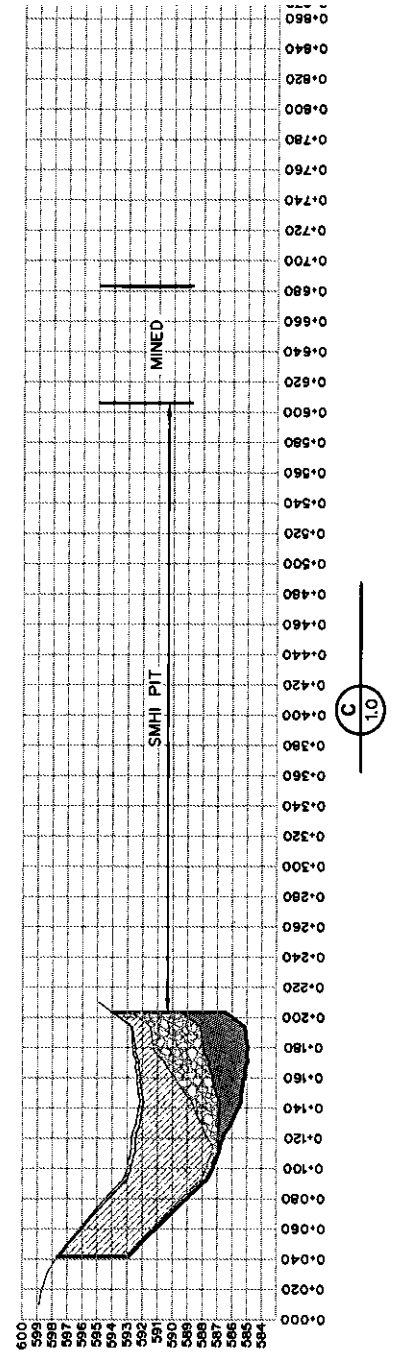
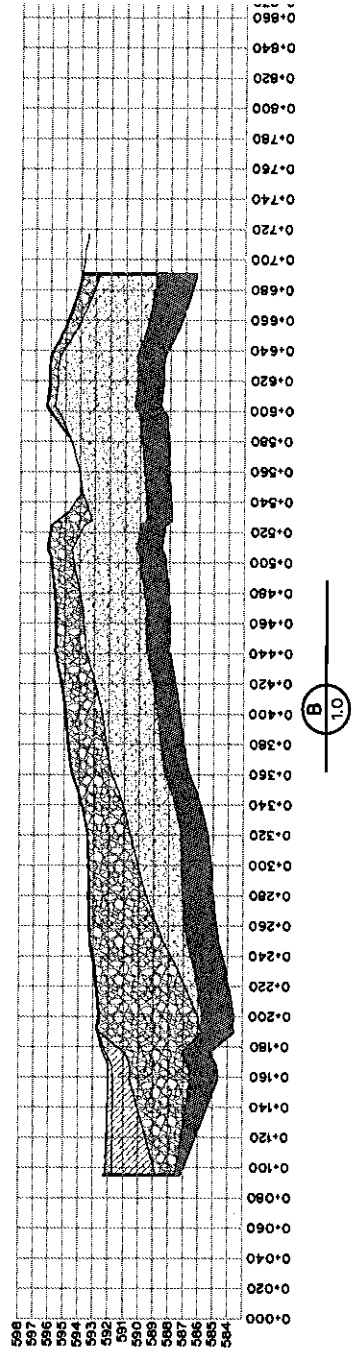
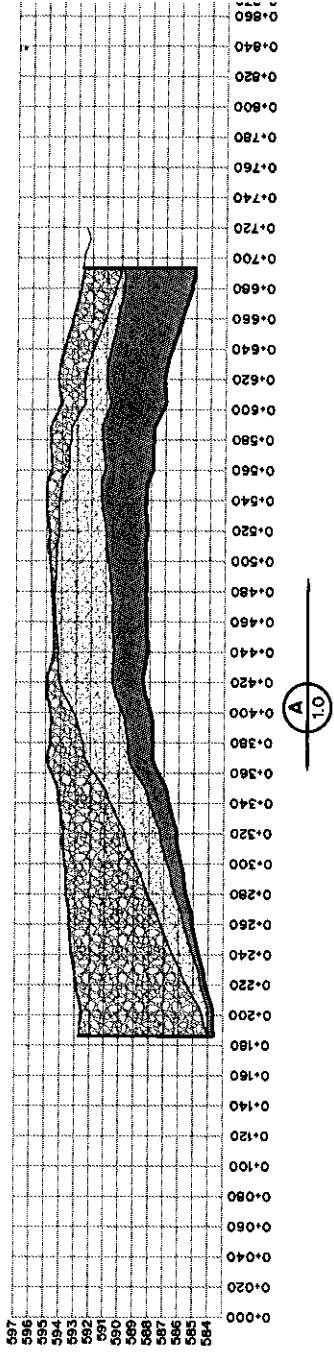
NE 07-50-19 W3M
EXT
PLAN 60604289
PARCEL 128576937
OWNED BY HERMANN, JESSE
HE, QUEEN (SASKATCHEWAN)
SMH GRAVEL PIT

PROJ
EXC
BOUR

PROPOSED MAXIMUM
EXCAVATION BOUNDARY

OIL WELL
TYPICAL





APPENDIX B:

BOREHOLE LOGS

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 592.30m N 5908138.000 E 649305.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument Elevation (m)
						● MOISTURE CONTENT	▬ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)		
0		TOPSOIL (100 mm)									592
1		PIT RUN - Sand and Gravel, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.									591
2		...becomes wet									590
3		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.									589
4											588
5											587
6											586
7											585
8		End of Borehole @7.6 m									584
9											583

Notes:

Logged By: Chris McRae
 Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 595.75m N 5908204.000 E 649189.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument Elevation (m)
						● MOISTURE CONTENT	┌ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)		
						10	20	30	40		
						100	200	300	400		
0		TOPSOIL (50 mm)									595
0.5		PIT RUN - Sand and Gravel, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.									594
1		SAND - trace gravel, trace silt, poorly graded, fine sand, damp, light brown.		B1							593
2											592
3											591
4											590
5											589
6		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.									588
7											587
8		End of Borehole @7.6 m									586

Notes:

Logged By: Chris McRae
 Reviewed By: Trevor Cutris

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 594.55m N 5908102.000 E 649061.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument Elevation (m)
						● MOISTURE CONTENT	▭ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)		
						10	20	30	40		
						100	200	300	400		
0		TOPSOIL (50 mm)									594
0.1		SAND - some gravel, trace silt, poorly graded, fine sand, damp, light brown.		B1							593
0.2											592
0.3											591
0.4		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.									590
0.5											589
0.6											588
0.7											587
0.8											586
0.9											585
6.1		End of Borehole @6.1 m									

Notes:

Logged By: Chris McRae

Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 593.23m N 5908210.000 E 648973.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	REMARKS	Standpipe/Instrument	Elevation (m)
0-0.1		TOPSOIL (100 mm)		B1					593
0.1-1.0		PIT RUN - Sand and Gravel, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.							592
1.0-2.0		SAND - some gravel, trace silt, poorly graded, fine sand, damp, light brown.							591
2.0-3.0									590
3.0-4.0									589
4.0-5.0									588
5.0-6.0		...becomes wet							587
6.0-7.0		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.							586
7.0-8.0		End of Borehole @7.6 m							585
8.0-9.0									584

Notes:

Logged By: Chris McRae
 Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 594.79m N 5908110.000 E 648809.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/ Instrument	Elevation (m)
						● MOISTURE CONTENT	▬ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)			
						10	20	30	40			
						100	200	300	400			
0		TOPSOIL (100 mm)										594
1		PIT RUN - Sand and Gravel, trace silt, trace cobble, well graded, fine to coarse gravel, subrounded, damp, brown and grey.										593
2												592
3				B1								591
4												590
5												589
6		...becomes moist to wet										588
6		...becomes wet										587
7												586
8												585
9		End of Borehole @9.1 m										

Notes:

Logged By: Chris McRae
 Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 592.64m N 5908306.000 E 648799.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument Elevation (m)
						● MOISTURE CONTENT	┌ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)		
						10	20	30	40		
						100	200	300	400		
0		TOPSOIL (100 mm)									592
1		PIT RUN - Sand and Gravel, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.									591
2											590
3											589
4		...becomes moist									588
5		...becomes wet									587
6											586
7		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.									585
8											584
9		End of Borehole @9.1 m									583

Notes:

Logged By: Chris McRae

Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 592.52m N 5908509.000 E 648780.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument	Elevation (m)
						● MOISTURE CONTENT	▬ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)			
						10	20	30	40			
						100	200	300	400			
0		TOPSOIL (200 mm)										
0.1		OVERBURDEN - Clay, silty, some sand, moist, firm to stiff, medium plastic, brown.										592
1		PIT RUN - Sand and Gravel, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.										591
2												590
3												589
4		...becomes wet										588
5		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.										587
6												586
7												585
8		End of Borehole @7.6 m										584
9												583

Notes:

Logged By: Chris McRae

Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 592.58m N 5908464.000 E 648626.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument Elevation (m)
						● MOISTURE CONTENT	┌ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)		
						10	20	30	40		
						100	200	300	400		
0		TOPSOIL (200 mm)									592
0.2		OVERBURDEN - Clay, silty, some sand, moist, firm to stiff, medium plastic, brown.									591
1											590
2											589
3											588
4											587
4.6		End of Borehole @4.6 m									586
5											585
6											584
7											583
8											
9											

Notes:

Logged By: Chris McRae
 Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 595.91m N 5908720.000 E 648777.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/ Instrument	Elevation (m)
						● MOISTURE CONTENT	▬ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)			
						10	20	30	40			
						100	200	300	400			
0		TOPSOIL (150 mm)										
0.15		PIT RUN - Gravel, sandy, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.		B1								595
0.3												594
0.45												593
0.6		...becomes wet										592
0.75		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.										591
0.9		End of Borehole @7.6 m										590
1.05												589
1.2												588
1.35												587
1.5												586

Notes:

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 Reviewed By: Trevor Curtis

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 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 595.77m N 5908306.000 E 649057.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument Elevation (m)
						● MOISTURE CONTENT	□ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)		
						10	20	30	40		
						100	200	300	400		
0		TOPSOIL (100 mm)									
0.1		PIT RUN - Sand and Gravel, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.		B1							595
0.2											594
0.3											593
0.4		SAND - trace gravel, trace silt, poorly graded, fine sand, damp, light brown.									592
0.5											591
0.6											590
0.7		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.									589
0.8		End of Borehole @7.6 m									588
0.9											587
1.0											586

Notes:

Logged By: Chris McRae

Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/17/2018 COMPLETED 07/17/2018 GROUND ELEVATION 589.62m N 5908707.000 E 649267.000
 DRILLING CONTRACTOR Mobile Augers and Research Ltd. GROUND WATER LEVEL: _____
 DRILLING METHOD 6" SSA

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument	Elevation (m)
						● MOISTURE CONTENT	▬ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)			
0.0 - 0.2		TOPSOIL (0.2 m)										589
0.2 - 5.8		PIT RUN - Gravel, sandy, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey. ...becomes wet										588
5.8 - 6.1		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.										584
6.1 - 6.1		End of Borehole @6.1 m										583

Notes:

Logged By: Chris McRae
 Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/27/2018 COMPLETED 07/27/2018 GROUND ELEVATION N 5908168.000 E 648711.000
 DRILLING CONTRACTOR _____ GROUND WATER LEVEL: _____
 DRILLING METHOD _____

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	REMARKS	Standpipe/Instrument Elevation (m)
		TOPSOIL (600 mm)						
1		OVERBURDEN - Clay, silty, some sand, moist, firm to stiff, medium plastic, brown.						-1
2		...becomes very moist						-2
3								-3
4		PIT RUN - Gravel, sandy, trace silt, well graded, fine to coarse gravel, subrounded, wet, brown and grey.						-4
5		End of Borehole @4.4 m						-5
6								-6
7								-7
8								-8
9								-9

Notes:

Logged By: Chris McRae
 Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/27/2018 COMPLETED 07/27/2018 GROUND ELEVATION N 5908171.000 E 648758.000
 DRILLING CONTRACTOR _____ GROUND WATER LEVEL: _____
 DRILLING METHOD _____

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	REMARKS	Standpipe/Instrument Elevation (m)
0.0 - 0.3		TOPSOIL (300 mm)						
0.3 - 3.9		OVERBURDEN - Clay, silty, some sand, moist, firm to stiff, medium plastic, brown. ...becomes very moist						
3.9 - 4.0		PIT RUN - Gravel, sandy, trace silt, well graded, fine to coarse gravel, subrounded, wet, brown and grey. End of Borehole @4.0 m						
4.0 - 9.0								

Notes:

Logged By: Chris McRae
 Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/27/2018 COMPLETED 07/27/2018 GROUND ELEVATION N 5908181.000 E 648796.000
 DRILLING CONTRACTOR _____ GROUND WATER LEVEL: _____
 DRILLING METHOD _____

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/Instrument Elevation (m)
						10	20	30	40		
		TOPSOIL (200 mm)									
		PIT RUN - Gravel, sandy, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.									
1		End of Borehole @0.6 m									
2											
3											
4											
5											
6											
7											
8											
9											

Notes:

Logged By: Chris McRae

Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/27/2018 COMPLETED 07/27/2018 GROUND ELEVATION N 5908178.000 E 648784.000
 DRILLING CONTRACTOR _____ GROUND WATER LEVEL: _____
 DRILLING METHOD _____

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/ Instrument Elevation (m)
						● MOISTURE CONTENT	▬ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)		
						10	20	30	40		
						100	200	300	400		
0.0 - 0.2		TOPSOIL (200 mm)									
0.2 - 0.6		OVERBURDEN - Clay, silty, some sand, moist, firm to stiff, medium plastic, brown.									
0.6 - 0.6		PIT RUN - Gravel, sandy, trace silt, well graded, fine to coarse gravel, subrounded, damp, brown and grey.									
0.6 - 0.6		End of Borehole @0.6 m									

Notes:

Logged By: Chris McRae

Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/27/2018 COMPLETED 07/27/2018 GROUND ELEVATION N 5908492.000 E 648720.000
 DRILLING CONTRACTOR _____ GROUND WATER LEVEL: _____
 DRILLING METHOD _____

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)	REMARKS	Standpipe/Instrument	Elevation (m)
0 - 0.3		TOPSOIL (300 mm)							
0.3 - 6.0		OVERBURDEN - Clay, silty, some sand, moist, firm to stiff, medium plastic, brown.							
6.0 - 6.2		PIT RUN - Gravel, sandy, trace silt, trace cobbles, well graded, fine to coarse gravel, subrounded, moist, brown and grey.							
6.2 - 6.0		CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey.							
6.0 - 6.0		End of Borehole @6.0 m							

Notes:

Logged By: Chris McRae

Reviewed By: Trevor Curtis

CLIENT Gary MacNab PROJECT NAME Gravel Resource Investigation
 PROJECT NUMBER 7991-001-00 PROJECT LOCATION NE-07-50-19 W3
 DATE STARTED 07/27/2018 COMPLETED 07/27/2018 GROUND ELEVATION N 5908655.000 E 648743.000
 DRILLING CONTRACTOR _____ GROUND WATER LEVEL: _____
 DRILLING METHOD _____

Depth (m)	SOIL SYMBOL	Soil Description	Sample Type	Sample Number	SPT (N)	Moisture Content (%)				REMARKS	Standpipe/ Instrument	Elevation (m)
						● MOISTURE CONTENT	┌ PLASTIC - LIQUID	■ SPT (N) Blows/300 mm	▲ POCKET PEN (kPa)			
0 - 0.2		TOPSOIL (200 mm)										
0.2 - 5.5		OVERBURDEN - Clay, silty, some sand, moist, firm to stiff, medium plastic, brown. PIT RUN - Gravel, some sand, some cobbles, well graded, fine to coarse gravel, subrounded, moist, brown and grey. CLAY - silty, some sand, moist, stiff to very stiff, medium to low plastic, grey. End of Borehole @5.5 m										

Notes:

Logged By: Chris McRae

Reviewed By: Trevor Curtis

APPENDIX C:
LABORATORY TESTING

SIEVE ANALYSIS REPORT

Project: Gravel Resource Investigation
Project No.: 7991-001-00
Owner: Gary McNab
File No.: SA - 01

Sample No.: 1
Source: 18BH002
Sample By: Chris McRae
Date Sampled: 06-Aug-18

Tested in accordance with ASTM C117, C136, C702, D5821 (Size Analysis of Aggregates)

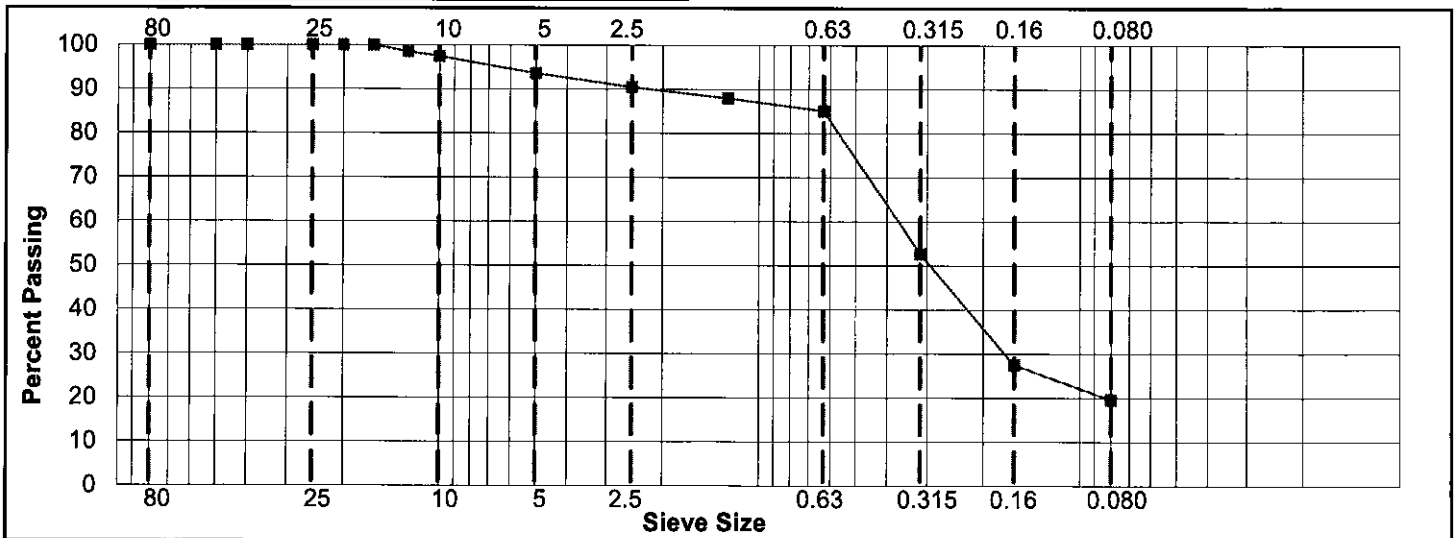
Aggregate Specification: Pit Run

SIEVE SIZE (mm)	PERCENT PASSING	Gradation Limits	
80	100		
50	100		
40	100		
25	100		
20	100		
16	100		
12.5	99		
10.0	97		
5.0	94		
2.5	90		
1.25	88		
0.630	85		
0.315	53		
0.160	27.5		
0.080	19.6		

Additional Tests:

Moisture of crushed aggregate: 0.4%

Comments:



Reviewed By: _____
Kasz Leavitt, P.Tech. (Eng.)

SIEVE ANALYSIS REPORT

Project: Gravel Resource Investigation
Project No.: 7991-001-00
Owner: Gary McNab
File No.: SA - 02

Sample No.: 4B1
Source: 18BH004
Sample By: Chris McRae
Date Sampled: 06-Aug-18

Tested in accordance with ASTM C117, C136, C702, D5821 (Size Analysis of Aggregates)

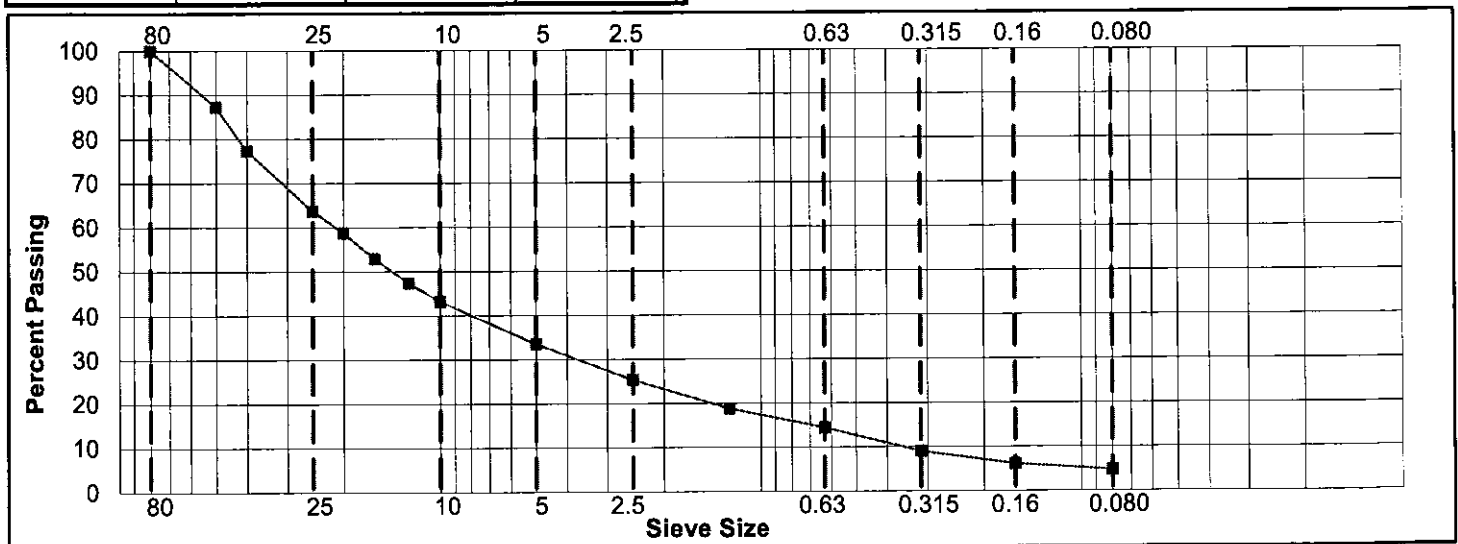
Aggregate Specification: Pit Run

SIEVE SIZE (mm)	PERCENT PASSING	Gradation Limits	
80	100		
50	87		
40	77		
25	64		
20	59		
16	53		
12.5	47		
10.0	43		
5.0	34		
2.5	25		
1.25	19		
0.630	14		
0.315	9		
0.160	6.2		
0.080	4.8		

Additional Tests:

Moisture of crushed aggregate: N/A

Comments:



Reviewed By: _____
Kasz Leavitt, P.Tech. (Eng.)

SIEVE ANALYSIS REPORT

Project: Gravel Resource Investigation
Project No.: 7991-001-00
Owner: Gary McNab
File No.: SA - 03

Sample No.: 5B1
Source: 18BH005
Sample By: Chris McRae
Date Sampled: 06-Aug-18

Tested in accordance with ASTM C117, C136, C702, D5821 (Size Analysis of Aggregates)

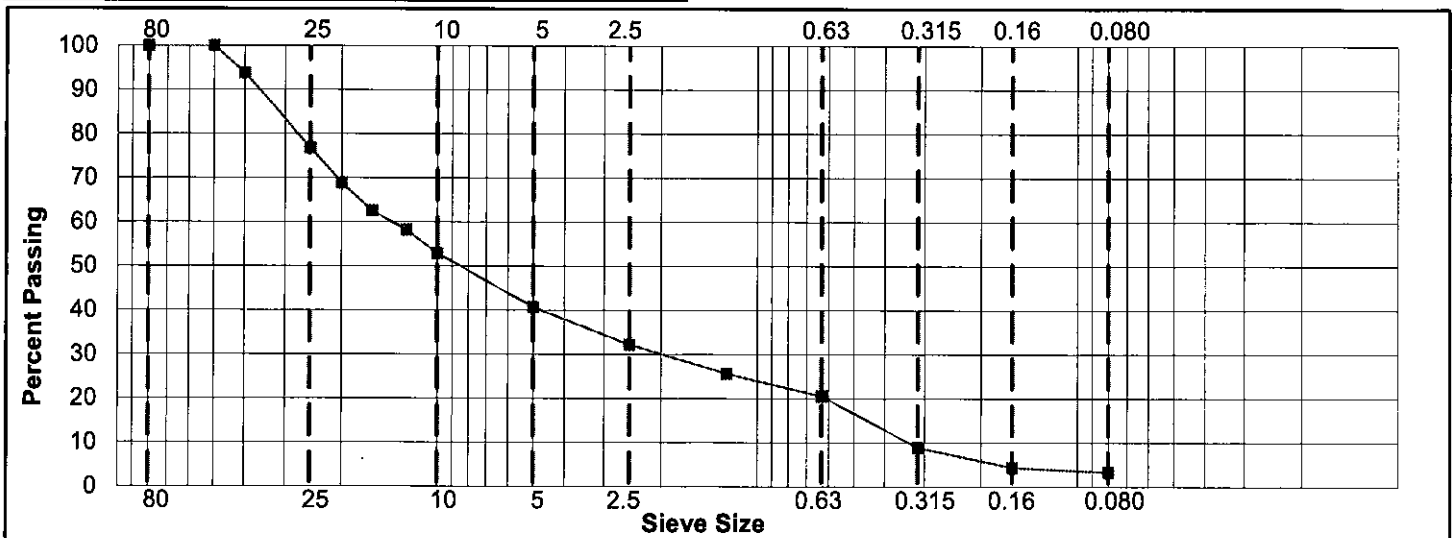
Aggregate Specification: Pit Run

SIEVE SIZE (mm)	PERCENT PASSING	Gradation Limits	
80	100		
50	100		
40	94		
25	77		
20	69		
16	63		
12.5	58		
10.0	53		
5.0	41		
2.5	32		
1.25	26		
0.630	21		
0.315	9		
0.160	4.4		
0.080	3.3		

Additional Tests:

Moisture of crushed aggregate: N/A

Comments:



Reviewed By: _____
Kasz Leavitt, P.Tech. (Eng.)

SIEVE ANALYSIS REPORT

Project: Gravel Resource Investigation
Project No.: 7991-001-00
Owner: Gary McNab
File No.: SA - 04

Sample No.: 10B1
Source: 18BH010
Sample By: Chris McRae
Date Sampled: 06-Aug-18

Tested in accordance with ASTM C117, C136, C702, D5821 (Size Analysis of Aggregates)

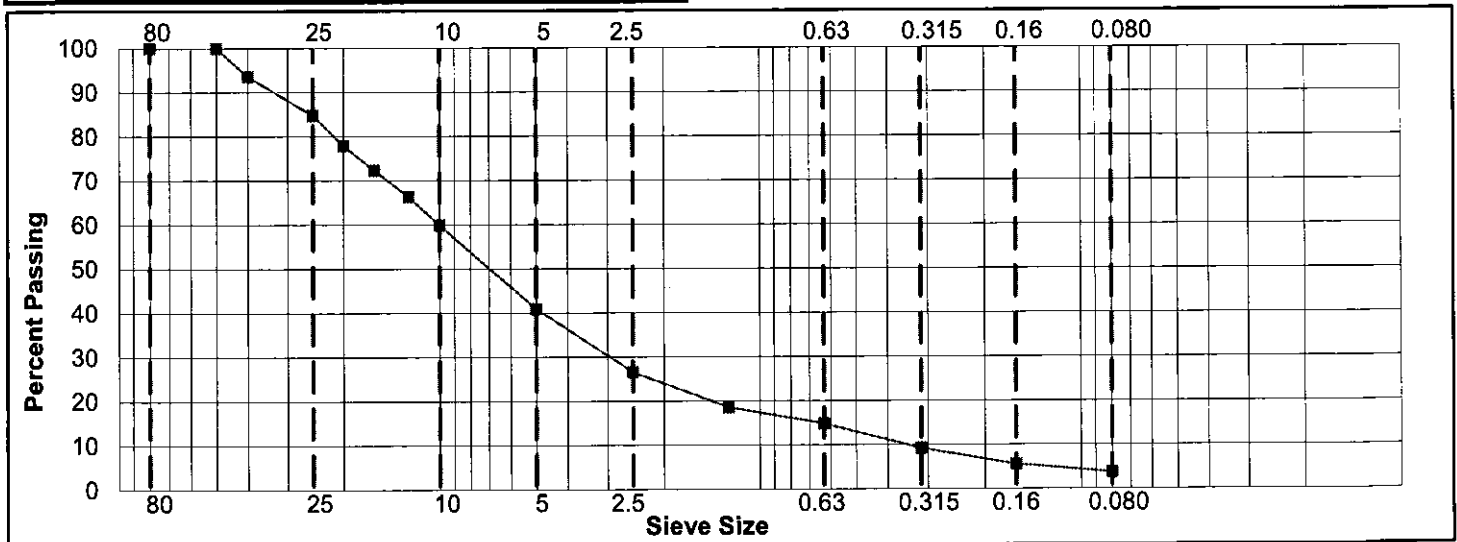
Aggregate Specification: Pit Run

SIEVE SIZE (mm)	PERCENT PASSING	Gradation Limits	
80	100		
50	100		
40	94		
25	85		
20	78		
16	72		
12.5	66		
10.0	60		
5.0	41		
2.5	27		
1.25	19		
0.630	15		
0.315	9		
0.160	5.5		
0.080	3.8		

Additional Tests:

Moisture of crushed aggregate: N/A

Comments:



Reviewed By: _____
Kasz Leavitt, P.Tech. (Eng.)