

**Brandon Research Centre  
Contract 40 – Service Road Paving  
Standard Specifications – July 2015**

**Scope of Work:** Reconstruction of a service road within the Brandon Research Station complete with asphalt top.

**Background:** Brandon Research Centre (BRC) is located at 18<sup>th</sup> Street North and Grand Valley Road in Brandon, Mb. The Centre currently has several buildings that are served by a gravel road running North up the side of the Assinboine River Valley. This road requires constant maintenance, due to heavy traffic and poor drainage during heavy precipitation. From a safety and maintenance stand point, this road requires an upgrade to asphalt.

**Drawing:** sketch attached

Engineering report attached.

**General Requirements:**

*Base and sub-base is to be a minimum of 500mm of granular below asphalt and is to be constructed as follows:*

- Proof roll the existing roadway using a smooth faced roller in non-vibratory mode.
- Place granular “C” base in 150mm thick lifts and uniformly compact each lift to 98% of maximum dry density (MDD) near optimum moisture content in areas where there is less than 350mm granular material.
- Place +/- 150mm of granular or limestone “A” base in a single lift and compact the lift to 100% MDD to 100mm below the final asphalt design elevation.
- Place 100mm (in 2 lifts) of asphalt conforming to Manitoba Department of Highways Bituminous “A” (or the City of Brandon equivalent type) and compact each lift to 97% of Marshall Density
- Finished black top to be the same width as the paved service road leading to it from the South (approx. 20’ W)
- Finished road will extend from where paving ends on Service entrance to the beginning of the intersection directly West of bldg. 50 (approx. 860’).
- All intersecting roads, approaches, and driveways must be built up, graded and packed at a gentle angle to meet the new road elevation.
- Approach to Bldg 106 will require a culvert approximately 30’ long with a diameter no less than 12” to accommodate drainage.
- Approach on the North side of bldg. 13 will require a culvert approx. 25’ long with a diameter no less than 12”
- Approach to the South side of bldg. #13 will require a culvert approx. 70’ long with a diameter no less than 12”.
- Area immediately East of the road will be excavated and/or graded so asphalt gently transitions into drainage runway.
- Disturbed areas must be left suitable for re-seeding grass (which will be done in-house)
- Entrance around culvert running under road (North of bldg. 9) must be excavated to accommodate drainage.

**Completion of the Work:** The work shall complete on or before October 15, 2015.

**Constraints:**

1. The successful bidder shall be qualified to undertake the necessary work;
2. Time - time is of the essence. The Contractor shall pursue completion of the work immediately upon award.
3. Site Safety - see below;
4. The work shall be subject to inspection by agencies having authority and/or other staff appointed by AAFC.
5. The contractor is responsible for any and all clearances from utility companies before digging.
6. The contractor must consult with the site authority before digging to locate any privately owned communication lines.
7. Heavy trucks and equipment must access station at Rd 111 W (34<sup>th</sup> St.).
8. The contractor is responsible for any subtrades required.

**Site Contact:**

Dan Froese  
Acting Facility Manager  
Agriculture and Agrifood Canada  
Brandon Research Centre  
Box 1000A, RR #3  
18<sup>th</sup> St. N. & Grand Valley Rd  
Brandon, Mb  
R7A 5Y3  
Phone: (204)578-6553  
Fax: (204)728-6528  
Cell : (204)724-7361

**Backup contact:**

Everett Smith  
Phone: (204) 578-6535  
Cell: (204) 720-4302

**Site Visit:** Before submitting his tender, each bidder should perform a pre-tender site visit to examine the jobsite conditions, familiarize themselves with the facility, control system(s) and all matters required for the completion of the work under this contract. Failure to acquaint himself fully with all available conditions affecting the work shall not relieve the Contractor of the responsibility for estimating the difficulties and costs of satisfactorily performing the work.

**Protection of Persons and Property:** The Contractor shall use due care and take all necessary precautions to ensure the protection of persons and property and shall comply with the provision of the applicable federal and provincial government agencies including but not limited to the Workers' Compensation Board and the Provincial Labour Occupational Health and Safety Board. The Contractor shall have a site safety management plan prior to mobilizing to site. This plan shall include provisions to ensure the safety of the public, those engaged in the work under this contract, and those employed by other agencies or contractors who may require access to the site against accident and injury. The Contractor shall post on site all necessary and applicable signs regarding safety hazards, and the required personal safety equipment. Further to the provisions of the General Conditions, the Contractor shall appoint a competent site supervisor who shall be

responsible for all daily construction activities with authority over all contractors, subcontractors, and workers on site, including the implementation of the site safety management plan.

The Contractor shall without additional instructions, supply and maintain at all times during the progress or suspension of the work, suitable barricades, fences and signs as are necessary to ensure the safety of the public, those engaged in the work under this contract, and those employed by other agencies or contractors who may require access to the site against accident and injury.

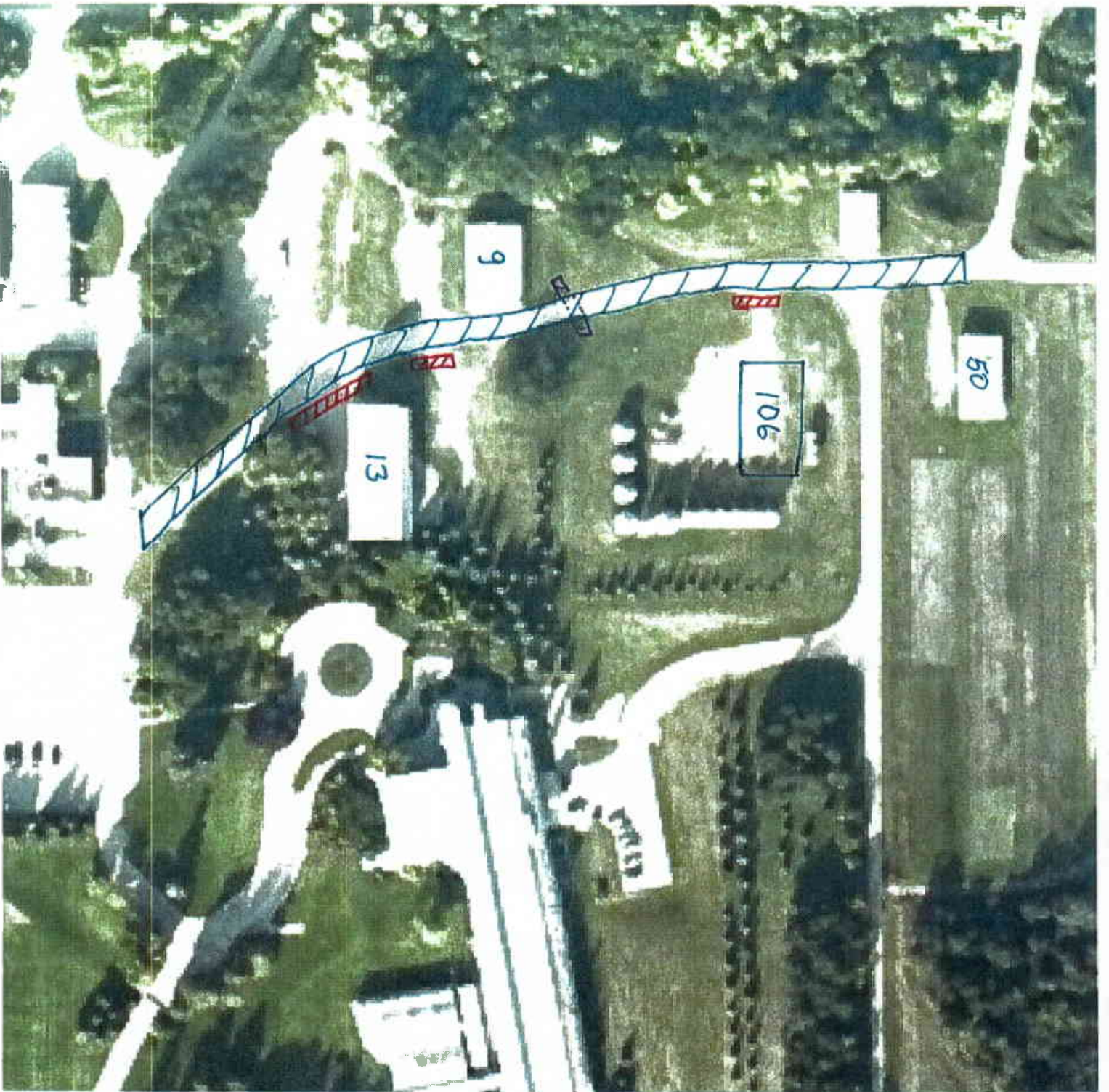
Notwithstanding the provisions of the General Conditions, in any emergency affecting the safety of life, or of the work, or of adjoining property, the Contractor, without direction from the Site Contact, shall act in a reasonable manner to prevent loss or injury.

**Protection of Constructed Works:** The Contractor shall be responsible for the protection of all materials, equipment and constructed works until acceptance of the work.

**AAFC Site Contact to Direct Course of the Work:** The Contractor's construction operations shall be subject to the approval of the AAFC Site Contact. The capacity of the Contractor's equipment, labour force, sequence of operations and methods of operation shall be such as to ensure the completion of the work as specified herein. All work performed will be subject to inspection. Acceptance of all works to be performed under this contract will be subject to the discretion and approval of the AAFC Site Contact or his representative.

**Permits, Licenses, Regulations and Acts:** The Contractor shall be responsible for obtaining and paying for any permits or licenses as may be required for any portion of this contract. The Contractor shall comply with all Municipal, Provincial Government and Government of Canada regulations.

**Payment:** The work shall be paid for at the lump sum price bid for the work in the Price Table.



N

Blue hatched area represents proposed asphalt  
Red represents new culverts  
Purple represents old culvert

Prepared For:

# DGH ENGINEERING LTD.

ROAD RECONSTRUCTION

BRANDON RESEARCH STATION  
BRANDON, MANITOBA



OCTOBER 2014

FILE NO. 14-030-08



*"Engineering and Testing Solutions That Work for You"*

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**Attachments**

- Figure 1 – Site Location Plan
- Figure 1 – Test Hole Location Plan
- Modified Unified Classification System for Soils
- Stratigraphic Test Hole Logs (8)
- Sieve Analysis Report (1)

## **1.0 INTRODUCTION**

ENG-TECH Consulting Limited (ENG-TECH) completed the requested investigation for the proposed reconstruction of a service road within the Brandon Research Center in Brandon, Manitoba, as shown in Figures 1 and 2. ENG-TECH was informed that there are plans to asphalt the existing gravel service road to prevent erosion from surface run-off during heavy rain events.

### **1.1 Scope of Work**

ENG-TECH completed the following scope of work:

- A test hole drilling and soil sampling program.
- A laboratory testing program.
- An assessment and engineering report outlining the investigation and recommendations for an asphalt roadway.

## **2.0 TEST HOLE DRILLING, SOIL SAMPLING, LABORATORY TESTING**

ENG-TECH supervised the drilling of eight (8) test holes (TH1 to TH8) on September 18, 2014 at the locations shown on Figure 2. The test holes were drilled using a track mounted RM30 drill rig equipped with 125 mm diameter solid stem continuous flight augers owned and operated by Paddock Drilling Limited. Six test holes were advanced to 1.5 m below existing grade, with the remaining two (2) test holes advanced to 3.0 m below existing grade. All test holes were backfilled using auger cuttings upon completion of the drilling.

The soil stratigraphy was visually classified at the time of drilling using the modified Unified Soil Classification System (USCS). Soil samples were collected off the auger flights and all soil samples collected were retained for testing in ENG-TECH's Winnipeg laboratory.

Moisture contents were determined on all samples (29), while one (1) Atterberg Limits and Sieve Analysis test were completed on select samples. The results are shown on the test hole summary logs, and a sieve analysis report.

## **3.0 STRATIGRAPHY**

Overall, the stratigraphy consisted of a 150 to 900 mm layer of sand fill underlain by black clay then brown clay to the depths explored. The sand fill was medium brown, moist, medium dense, poorly graded, fined grained, and contained trace clay, with gravel. The black clay was moist, stiff to very stiff, highly plastic and contained trace silt & gravel sizes, at TH1, TH6, TH8 the consistency varied from soft to firm. The underlain clay layer was medium brown, moist, stiff to very stiff, medium plastic, containing trace silt, except at TH1 and TH8 the consistency was firm.

All test holes were dry and no sloughing was observed during drilling. Detailed stratigraphy descriptions are outlined on the test hole summary logs.

#### 4.0 RECOMMENDATIONS

The asphalt pavement for the service road was designed for vehicles and some heavy truck traffic. Manitoba Department of Highways (specification 900) or the City of Brandon aggregate grading specifications shall be used for the base and sub-base materials recommended in this report. Overall, at 5 test hole locations (TH1, TH4, TH6, TH7 and TH8) have insufficient granular support for an asphalt roadway. Sub-excavation of the clay followed by placement of more granular material could be completed, although it may be more economical to increase the road elevation and adjusting the grading. Either option would suffice providing there is a minimum of 500 mm of granular below the asphalt. If sub-excavation is the method chosen, then the asphalt roadway could be constructed as follows:

- Excavate as required in order to obtain a minimum depth of 600 mm below the top of the final asphalt surface design elevation. The subgrade at the base of the excavation must consist of firm to very stiff clay or granular material, and must be free of any organic content.
- Proof roll the sub-grade using a heavy sheeps foot or smooth faced roller in non-vibratory mode. If any soft areas are encountered, they should be sub-excavated an additional 300 mm followed by placement of a geotextile (Mirafi HP370 woven or equivalent) and then 50 - 150 mm diameter granular sub-base material in a single lift followed by light compact with a smooth faced roller in the non-vibratory mode.
- Place 350 mm of granular "C" base in two lifts and uniformly compact each lift to 98% of maximum dry density (MDD) near optimum moisture content.
- Place +/- 150 mm of granular or limestone "A" base in a single lift and compact the lift to 100% MDD to 100 mm below the final asphalt surface design elevation.
- Place 100 mm (in 2 lifts) of asphalt conforming to Manitoba Department of Highways Bituminous "A" (or the City of Brandon equivalent type) and compact each lift to 97% of Marshall Density.

If the option is increasing the road elevation, then the roadway could be constructed as follows:


- Proof roll the existing roadway using a smooth faced roller in non-vibratory mode.
- Place granular "C" base in 150 mm thick lifts and uniformly compact each lift to 98% of maximum dry density (MDD) near optimum moisture content in areas where there is less than 350 mm of granular material.
- Place +/- 150 mm of granular or limestone "A" base in a single lift and compact the lift to 100% MDD to 100 mm below the final asphalt surface design elevation.
- Place 100 mm (in 2 lifts) of asphalt conforming to Manitoba Department of Highways Bituminous "A" (or the City of Brandon equivalent type) and compact each lift to 97% of Marshall Density.



## 5.0 CLOSURE

ENG-TECH trusts this is all the information you require. If you have any questions or require additional information, please contact the undersigned.

Sincerely,  
ENG-TECH Consulting Limited



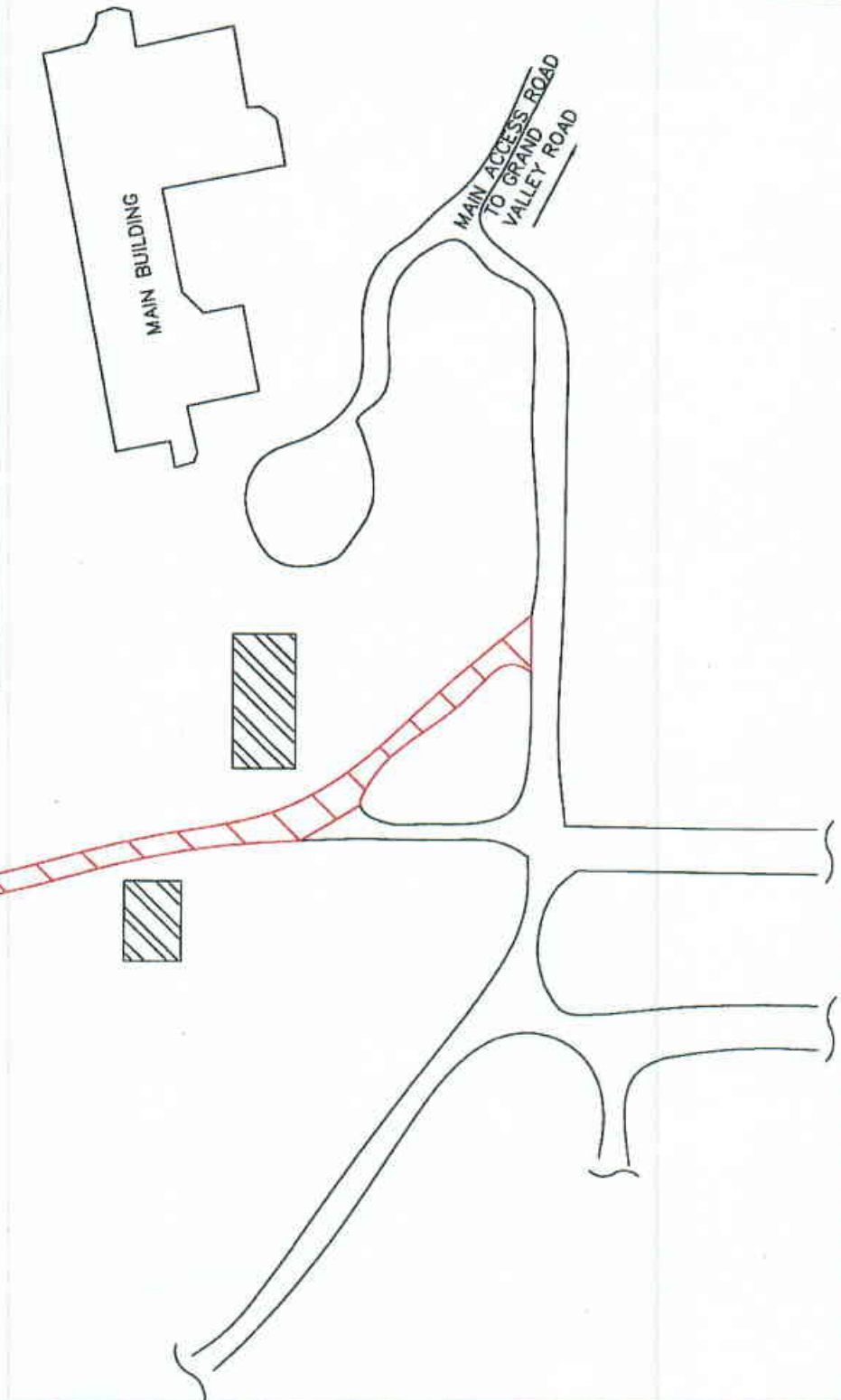
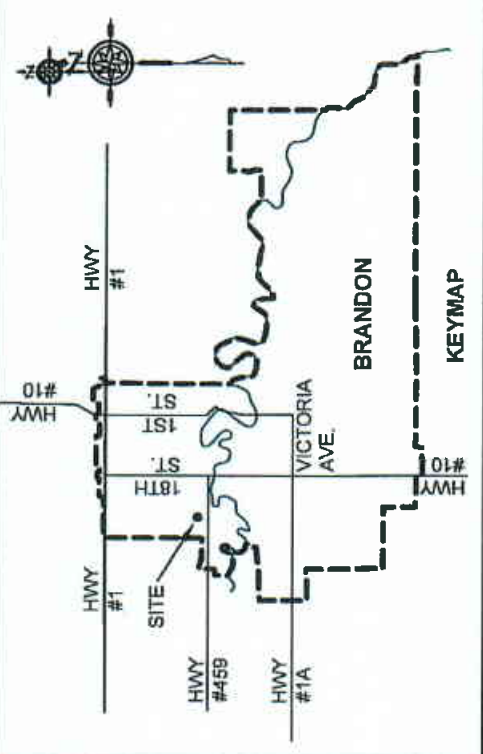
Clark Hryhoruk, M.Sc., P.Eng.  
Principal, Geotechnical Engineer

CDH/tdr

**LEGEND**

 INVESTIGATION AREA

 OUTBUILDINGS



NO.	DATE	ISSUE / REVISION
0	OCT 2014	Report

**ENG-TECH**  
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**PEGM**  
 Certificate of Authorization  
 ENG-TECH Consulting Limited  
 No. 2475 Expiry: April 30, 2015

**CLIENT:**  
 DGH ENGINEERING LIMITED

**PROJECT:**  
 ROAD RECONSTRUCTION  
 BRANDON RESEARCH STATION  
 BRANDON, MANITOBA

**DWG DESCRIPTION:**  
 GENERAL SITE LOCATION PLAN

**SCALE:**  
 N/A

**DRAWN BY:**  
 TDR

**DATE:**  
 OCTOBER 2014

**FILE NO.:**  
 14-030-08

**ENG-TECH DRAWING NO.:**  
 1



MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS									
MAJOR DIVISION		GROUP SYMBOL	GRAPH SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA				
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75 µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75 mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4; C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ TO } 3$			
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GP		POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS			
			GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4			
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE AND P.I. MORE THAN 7			
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75 mm	CLEAN SANDS (TRACE OR NO FINES)	SW		WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6; C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ TO } 3$			
		DIRTY SANDS (WITH SOME OR MORE FINES)	SP		POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS			
			SM		SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4			
			SC		CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE AND P.I. MORE THAN 7			
FINE GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75 µm)	SILTS BELOW "A" LINE NEGLECTIBLE ORGANIC CONTENT	LL ≤ 50%	ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHTY PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)			
		LL > 50%	MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS				
	CLAYS ABOVE "A" LINE NEGLECTIBLE ORGANIC CONTENT	LL ≤ 30%	CL		INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS				
		30% < LL ≤ 50%	CI		INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS				
		LL > 50%	CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS				
	ORGANIC SILTS & CLAYS BELOW "A" LINE	LL < 50%	OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY				
		LL > 50%	OH		ORGANIC CLAYS OF HIGH PLASTICITY				
HIGHLY ORGANIC SOILS	PI		PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE					
ADDITIONAL SYMBOLS			PLASTIC SOILS						
TILL		SANDSTONE		MOISTURE	PLASTICITY	INTRUSIONS	CONSISTENCY	POCKET PEN (TSF)	(N)
FILL		GRANITE		DRY	LOW	ROOTLETS	VERY SOFT		< 2
TOPSOIL				DAMP	MEDIUM	OXIDES	SOFT	0 - 0.5	2 - 4
CONCRETE				MOIST	HIGH	MICA	FIRM	0.5 - 1.0	4 - 6
SHALE				WET		GYPHUM	STIFF	1.0 - 2.0	8 - 15
LIMESTONE						ETC.	VERY STIFF	2.0 - 4.0	15 - 30
							HARD	> 4.0	> 30
				$T_b f \times 95 \theta = kPa (q_u) \quad S_u = \frac{1}{2} \times q_u$					
PLASTICITY CHART FOR SOILS PASSING 425 µm SIEVE			SOIL DESCRIPTIONS						
PLASTICITY INDEX (%)	LOW ← INTERMEDIATE (MEDIUM) → HIGH		TRACE: 0 - 10%	BOULDERS: > 200 mm	COARSE SAND: 2 - 4.75 mm				
			SOME: 10 - 20%	COBBLES: 75 - 200 mm	MEDIUM SAND: 0.425 - 2 mm				
		WITH: 20 - 35%	COURSE GRAVEL: 19 - 75 mm	FINE SAND: 0.075 - 0.425 mm					
		AND: 35 - 50%	FINE GRAVEL: 4.75 - 75 mm	FINES: < 0.075 mm					
GRANULAR SOILS			SPT (N)						
MOISTURE	DENSITY	GRADATION	INTRUSIONS	SPT (N)					
DRY	VERY LOOSE	POORLY	ROOTLETS	0 - 4					
DAMP	LOOSE	WELL	OXIDES	4 - 10					
MOIST	MED. DENSE		MICA	10 - 30					
WET	DENSE		FINES	30 - 50					
	VERY DENSE		ETC.	> 50					
DEFINITIONS			$C_c$ = COMPRESSION INDEX						
LL = LIQUID LIMIT			PL = PLASTIC LIMIT						
P.I. = PLASTICITY INDEX									
$C_u$ = COEFFICIENT OF UNIFORMITY									
$q_u$ = UNCONFINED COMPRESSIVE STRENGTH									
$S_u$ = UNDRAINED SHEAR STRENGTH									



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**Engineering And Testing  
Solutions That Work For You**

**Test Hole #: TH1**  
**Client:** DGH Engineering Limited  
**Site:** Brandon, Manitoba  
**Location:** See Figure 1 & 2  
**Project:** Road Reconstruction, Brandon Research Center, Brandon, Manitoba

**File No.:** 14-030-08  
**Date Drilled:** September 18, 2014  
**Grade Elevation:** 100.0 m  
**Water Elevation:** --

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)			
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)			
								PL	X	LL	P. Pen
0.0		<b>Ground Surface</b>	100.0								
		<b>Sand Fill (SP) (200 mm)</b> - medium brown, moist, medium dense, poorly graded, fined grained, trace clay, with gravel.		S1		8.2					
		<b>Clay (CH)</b> - black, moist, soft to firm, highly plastic, trace gravel.		S2		42.3			24		
1.0		<b>Clay (CI)</b> - grey, moist, firm, medium plastic, some to with silt.	99.0	S3		26.4			48		
2.0		<b>End of Test Hole</b> - end of test hole at 1.5 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with auger cuttings upon completion of drilling.	98.0								

ENG-TECH Consulting Limited

Logged by: TDR

Reviewed by:

Drilled By: Paddock Drilling (Manitoba) Limited

Drill Rig: RM30

Auger Size: 125 mm Solid Stem

Completion Depth: 1.5 m

Completion Elevation: 98.5 m

Sheet: 1 of 1

SAMPLE TYPE





**Engineering And Testing  
Solutions That Work For You**

**Test Hole #: TH2**

**Client:** DGH Engineering Limited

**Site:** Brandon, Manitoba

**Location:** See Figure 1 & 2

**Project:** Road Reconstruction, Brandon Research Center, Brandon, Manitoba

**File No.:** 14-030-08

**Date Drilled:** September 18, 2014

**Grade Elevation:** 100.0 m

**Water Elevation:** -

SUBSURFACE PROFILE				SAMPLE DATA			SHEAR STRENGTH (kPa)					
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)				
								PL	X	LL	P. Pen	Torvane
0.0		Ground Surface	100.0									
		<b>Sand Fill (SP)</b> - medium brown, moist, medium dense, poorly graded, fined grained, trace clay, with gravel.		S1		6.0						
				S2		8.8						
1.0		<b>Clay (CH)</b> - black, moist, stiff, highly plastic, trace silt.	99.0									
				S3		23.5						
		<b>End of Test Hole</b> - end of test hole at 1.5 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with auger cuttings upon completion of drilling.										
2.0			98.0									

ENG-TECH Consulting Limited

Logged by: TDR

Reviewed by: *CA*

Drilled By: Paddock Drilling (Manitoba) Limited

Drill Rig: RM30

Auger Size: 125 mm Solid Stem

Completion Depth: 1.5 m

Completion Elevation: 98.5 m

Sheet: 1 of 1

SAMPLE TYPE





Engineering And Testing  
Solutions That Work For You

**Test Hole #: TH3**  
**Client:** DGH Engineering Limited  
**Site:** Brandon, Manitoba  
**Location:** See Figure 1&2  
**Project:** Road Reconstruction, Brandon Research Center, Brandon, Manitoba

**File No.:** 14-030-08  
**Date Drilled:** September 18, 2014  
**Grade Elevation:** 100.0 m  
**Water Elevation:** --

SUBSURFACE PROFILE			SAMPLE DATA				SHEAR STRENGTH (kPa)				
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)			
								PL	X	LL	P. Pen
0.0		<b>Ground Surface</b> <b>Sand Fill (SP)</b> - medium brown, moist, medium dense, poorly graded, fined grained, with gravel.	100.0	S1		4.8					
		<b>Clay (CH)</b> - dark brown to black, moist, very stiff, highly plastic, trace silt and gravel.		S2		15.1				120	
1.0		<b>Clay (CH)</b> - medium brown, moist, stiff, highly plastic, trace silt.	99.0	S3		22.2				64	
2.0		<b>End of Test Hole</b> - end of test hole at 1.5 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with auger cuttings upon completion of drilling.	98.0								

ENG-TECH Consulting Limited

Logged by: TDR

Reviewed by:

Drilled By: Paddock Drilling (Manitoba) Limited

Drill Rig: RM30

Auger Size: 125 mm Solid Stem

Completion Depth: 1.5 m

Completion Elevation: 98.5 m

Sheet: 1 of 1

SAMPLE TYPE

SPLIT BARREL

SHELBY TUBE

AUGER CUTTINGS

SPLIT SPOON



Engineering And Testing  
Solutions That Work For You

**Test Hole #: TH4**  
**Client:** DGH Engineering Limited  
**Site:** Brandon, Manitoba  
**Location:** See Figure 1 & 2  
**Project:** Road Reconstruction, Brandon Research Center, Brandon, Manitoba

**File No.:** 14-030-08  
**Date Drilled:** September 18, 2014  
**Grade Elevation:** 100.0 m  
**Water Elevation:** -

SUBSURFACE PROFILE			SAMPLE DATA				SHEAR STRENGTH (kPa)					
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)				
								PL	X	LL	P. Pen	Torvane
0.0		<b>Ground Surface</b>	100.0									
		<b>Sand Fill (SP) (50 mm)</b> - medium brown, moist, medium dense, poorly graded, fined grained, trace clay, with gravel.		S1		3.1						
		<b>Clay (CH)</b> - black, moist, very stiff, highly plastic, trace silt.		S2		25.6				48		
1.0		<b>Clay (CI)</b> - medium to dark brown, moist, stiff, medium plastic, trace silt.	99.0	S3		18.3				60		
2.0		<b>Gravel (GM)</b> - medium brown, moist, medium dense, poorly graded, fine grained, trace clay, silt, and coarse gravel	98.0	S4		12.9						
				S5		9.5	32					
3.0		<b>End of Test Hole</b> - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with auger cuttings upon completion of drilling.	97.0	S6		12.2						
4.0			96.0									
5.0			95.0									

ENG-TECH Consulting Limited

Logged by: TDR

Reviewed by:

Drilled By: Paddock Drilling (Manitoba) Limited

Drill Rig: RM30

Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m

Completion Elevation: 97.0 m

Sheet: 1 of 1

SAMPLE TYPE







Engineering And Testing  
Solutions That Work For You

**Test Hole #: TH5**  
**Client:** DGH Engineering Limited  
**Site:** Brandon, Manitoba  
**Location:** See Figure 1&2  
**Project:** Road Reconstruction, Brandon Research Center, Brandon, Manitoba

**File No.:** 14-030-08  
**Date Drilled:** September 18, 2014  
**Grade Elevation:** 100.0 m  
**Water Elevation:** --

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)				
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)				
								PL	X	LL	P. Pen	Torvane
0.0		Ground Surface	100.0									
		<b>Sand Fill (SP) (381 mm)</b> - medium brown, moist, medium dense, poorly graded, fined grained, with gravel.		S1	▲	8.2						
		<b>Clay (Cl)</b> - black, moist, very stiff, medium plastic, trace silt.		S2	▲	23.3				36		
1.0			99.0									
		<b>Clay (Cl)</b> - medium brown, moist, stiff, medium plastic, with to some silt.		S3	▲	20.4				72		
		-below 1.5 m, trace gravel										
2.0			98.0									
				S4	▲	17.5				48		
3.0			97.0									
		<b>End of Test Hole</b> - end of test hole at 3.0 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with auger cuttings upon completion of drilling.		S5	▲	19.0				72		
4.0			96.0									
5.0			95.0									

ENG-TECH Consulting Limited

Logged by: TDR

Reviewed by: *CTA*

Drilled By: Paddock Drilling (Manitoba) Limited

Drill Rig: RM30

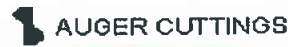
Auger Size: 125 mm Solid Stem

Completion Depth: 3.0 m

Completion Elevation: 97.0 m

Sheet: 1 of 1

SAMPLE TYPE





**Engineering And Testing  
Solutions That Work For You**

**Test Hole #: TH6**  
**Client:** DGH Engineering Limited  
**Site:** Brandon, Manitoba  
**Location:** See Figure 1&2  
**Project:** Road Reconstruction, Brandon Research Center, Brandon, Manitoba

**File No.:** 14-030-08  
**Date Drilled:** September 18, 2014  
**Grade Elevation:** 100.0 m  
**Water Elevation:** -

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)				
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)				
								PL	X	LL	P. Pen	Torvane
0.0		Ground Surface	100.0									
		<b>Gravel Fill (GP) (100 mm)</b> - medium brown, moist, medium dense, poorly graded, fined grained, trace clay and gravel.		S1		4.1						
		<b>Clay (CH)</b> - black, moist, firm, highly plastic, trace silt.										
		<b>Clay (CH)</b> - medium brown, moist, stiff, highly plastic, trace silt.	99.0	S2		21.3				72		
1.0												
		<b>Clay (CH)</b> - medium brown, moist, stiff, highly plastic, trace silt.										
		<b>End of Test Hole</b> - end of test hole at 1.5 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with auger cuttings upon completion of drilling.		S3		19.9				96		
2.0			98.0									

ENG-TECH Consulting Limited

Logged by: TDR

Reviewed by: *CH*

Drilled By: Paddock Drilling (Manitoba) Limited

Drill Rig: RM30

Auger Size: 125 mm Solid Stem

Completion Depth: 1.5 m

Completion Elevation: 98.5 m

Sheet: 1 of 1

SAMPLE TYPE





Engineering And Testing  
Solutions That Work For You

**Test Hole #: TH7**  
**Client:** DGH Engineering Limited  
**Site:** Brandon, Manitoba  
**Location:** See Figure 1&2  
**Project:** Road Reconstruction, Brandon Research Center, Brandon, Manitoba

**File No.:** 14-030-08  
**Date Drilled:** September 18, 2014  
**Grade Elevation:** 100.0 m  
**Water Elevation:** --

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)				
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)				
								PL	X	LL	P. Pen	Torvane
0.0		<b>Ground Surface</b>	100.0									
		<b>Gravel Fill (GP) (100 mm)</b> - medium brown, moist, medium dense, poorly graded, fined grained, trace clay, with gravel.		S1		3.2						
		<b>Clay (CH)</b> - black, moist, stiff, highly plastic, trace silt.										
		<b>Clay (CH)</b> - medium brown, moist, very stiff, highly plastic, trace silt.		S2		20.1				72		
1.0			99.0									
		<b>End of Test Hole</b> - end of test hole at 1.5 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with auger cuttings upon completion of drilling.		S3		17.5				108		
2.0			98.0									

ENG-TECH Consulting Limited

Logged by: TDR

Reviewed by: *CTA*

Drilled By: Paddock Drilling (Manitoba) Limited

Drill Rig: RM30

Auger Size: 125 mm Solid Stem

Completion Depth: 1.5 m

Completion Elevation: 98.5 m

Sheet: 1 of 1

SAMPLE TYPE

SPLIT BARREL

SHELBY TUBE

AUGER CUTTINGS

SPLIT SPOON



**Engineering And Testing  
Solutions That Work For You**

**Test Hole #: TH8**  
**Client:** DGH Engineering Limited  
**Site:** Brandon, Manitoba  
**Location:** See Figure 1&2  
**Project:** Road Reconstruction, Brandon Research Center, Brandon, Manitoba

**File No.:** 14-030-08  
**Date Drilled:** September 18, 2014  
**Grade Elevation:** 100.0 m  
**Water Elevation:** --

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)		
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture Content (%)	Blows/300 mm	Moisture Content (%)		
								PL	LL	UC
0.0		<b>Ground Surface</b> <b>Gravel Fill (GP) (150 mm)</b> - medium brown, moist, medium dense, poorly graded, fined grained, trace clay, with gravel.	100.0	S1		3.1				
		<b>Clay (CH)</b> - black, moist, soft, highly plastic, trace silt.								
1.0		<b>Clay (CH)</b> - medium brown, moist, firm, highly plastic, trace silt.	99.0	S2		16.0				
		<b>End of Test Hole</b> - end of test hole at 1.5 m below grade. - no sloughing or seepage was encountered upon completion of drilling. - test hole was backfilled with auger cuttings upon completion of drilling.		S3		19.9			24	
2.0			98.0							

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Logged by: TDR

Reviewed by: *CTA*

Drilled By: Paddock Drilling (Manitoba) Limited

Drill Rig: RM30

Auger Size: 125 mm Solid Stem

Completion Depth: 1.5 m

Completion Elevation: 98.5 m

Sheet: 1 of 1

SAMPLE TYPE





Unit 6 - 854 Marion Street  
 Winnipeg, Manitoba  
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 eng\_tech@mts.net  
 www.eng-tech.ca

**SIEVE ANALYSIS REPORT**

DGH Engineering Ltd.  
 12 Aviation Blvd.  
 St. Andrews, Manitoba  
 R1A 3N5

FILE NO.: 14-030-08  
 REF. NO.: 14-30-8-1

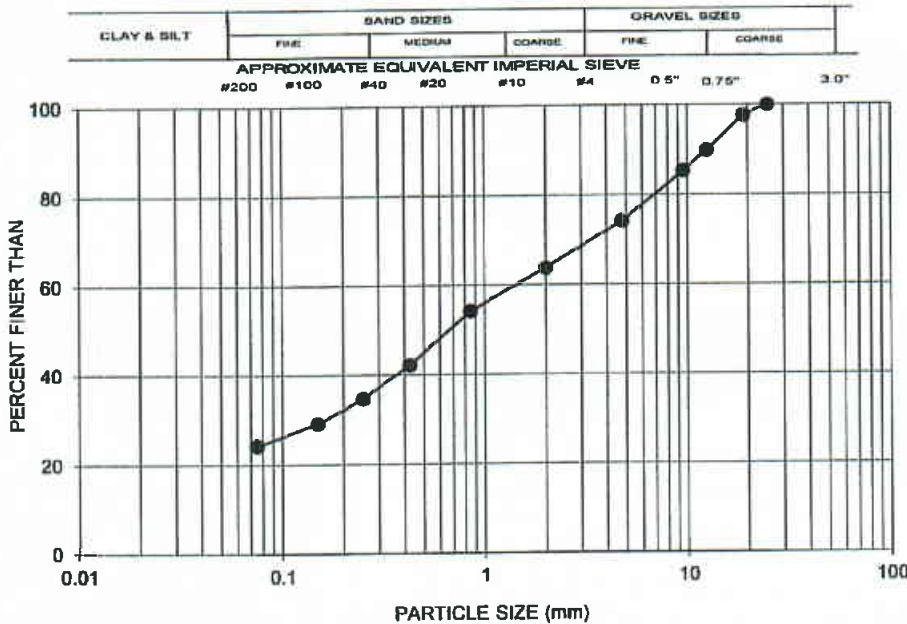
**ATTENTION:** Doug Small, P. Eng  
**PROJECT:** ROAD RECONSTRUCTION, BRANDON RESEARCH STATION, BRANDON, MANITOBA

**DATE SAMPLED:** Sept 18/14    **SAMPLED BY:** ENG-TECH    **TYPE OF SAMPLE:** Grab  
**DATE RECEIVED:** Sept 18/14    **DATE TESTED:** Sept 25/14    **SOURCE:** TH 1, S1

**SAMPLE DESCRIPTION:**

**COMMENTS:**

Cu = 21.4  
 Cc = 0.2



PARTICLE SIZE (mm)	PERCENT PASSING	SPECIFICATION	
		LOW	HIGH
25.0	100.0	-	-
19.0	97.6	-	-
12.5	89.8	-	-
9.5	85.4	-	-
4.75	74.1	-	-
2.00	63.8	-	-
0.850	54.3	-	-
0.425	42.3	-	-
0.250	34.6	-	-
0.150	29.1	-	-
0.075	24.2	-	-

ENG-TECH Consulting Limited

per:   
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