

Part 1 General

1.1 RELATED SECTIONS:

- .1 Section 32 11 23 - Aggregate Base Course.
- .2 Section 33 41 00 – Storm Utility Drains.
- .3 Section 33 65 73 – Concrete Encased Duct Banks and Manholes.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 136-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM D 698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .3 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 8.2-M88-CAN/CGSB Sieves, Testing, Woven Wire, Metric
- .3 Ontario Provincial Standard Specifications (OPSS)
 - .1 OPSS.MUNI 1010-13 Material Specification for Aggregates – Granular A, B, M and Select Subgrade Material.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: any solid material in excess of 1.00m³ and which cannot be removed by means of heavy duty mechanical excavating equipment with 0.95 to 1.15 m³ bucket. Frozen material is not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.
 - .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .3 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .4 Approved Native Backfill: excavated site material, free of construction debris, with no stones or rubble larger than 200mm, approved for re-use by Departmental Representative.
- .5 Unsuitable materials:
 - .1 Excessively wet material which can not achieve indicated compaction.

- .2 Weak and compressible materials under excavated areas.
- .3 Frost susceptible materials under excavated areas.
- .4 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified when tested to ASTM C136 : CAN/CGSB-8.2.
 - .2 Table:

Sieve Designation	% Passing
2.00 mm	100
0.10 mm	45 - 100
0.02 mm	10 - 80
0.005 mm	0 - 45
- .5 Coarse grained soils containing more than 20 % by mass passing 0.075 mm sieve.

1.4 SUBMITTALS

- .1 Make submittals in accordance with Section 01 00 10 – General Instructions.
- .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority.

1.5 PROTECTION OF EXISTING FEATURES

- .1 Existing buried utilities and structures:
 - .1 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .2 Prior to beginning excavation Work, notify applicable authorities having jurisdiction, establish location and state of use of buried utilities and structures. Authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .3 Confirm locations of buried utilities by careful test excavations in advance of main work.
 - .4 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
 - .5 Where unknown utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing or re-routing. Costs for such Work to be paid by Departmental Representative.
 - .6 Record location of maintained, re-routed and abandoned underground lines.
 - .7 Confirm locations of recent excavations adjacent to area of excavation.

1.6 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work establish location of buried services on and adjacent to site.

Part 2 Products

2.1 MATERIALS

- .1 Granular Base material, refer to Section 32 11 23 – Aggregate Base Course
- .2 Type 1 Fill:
 - .1 Approved Native Backfill or select subgrade to OPSS.MUNI 1010.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures. Refer to Section 01 35 43 – Environmental Procedures.

3.2 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement neatly along limits of proposed excavation in order that surface may break evenly and cleanly.

3.3 STOCKPILING

- .1 Stockpile fill materials in area indicated.
 - .1 Stockpile granular materials in manner to prevent segregation.
 - .2 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies, refer to Section 01 35 43 – Environmental Procedures.

3.4 SHORING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 30 - Health and Safety Requirements.
- .2 Engage Services of qualified Professional Engineer who is registered or licensed in the province of Ontario to design and inspect shoring, bracing and underpinning required for work.
- .3 During backfill operation:
 - .1 Remove shoring from excavations.

3.5 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.

- .3 Dispose of water in accordance with Section 01 35 43 - Environmental Procedures and in manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .4 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.6 EXCAVATION

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Do not disturb soil or rock below bearing surfaces.
- .3 Remove concrete, paving, and rubble and other obstructions encountered during excavation.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 10 m of trench in advance of installation operations and do not leave open more than 5m at end of day's operation.
 - .1 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of bedding material on solid and undisturbed ground.
- .6 Keep excavated and stockpiled materials safe distance away from edge of trench.
- .7 Restrict vehicle operations directly adjacent to open trenches.
- .8 Dispose of surplus and unsuitable excavated material off site.
- .9 Do not obstruct flow of surface drainage or natural watercourses.
- .10 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .11 Notify Departmental Representative when bottom of excavation is reached.
- .12 Obtain Departmental Representative approval of completed excavation.
- .13 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed Departmental Representative.
- .14 Correction of unauthorized over-excavation:
 - .1 Excavations taken below depths shown without Departmental Representative's written authorization to be filled with granular base material compacted to 95% of maximum density obtained from ASTM D698, refer to Section 32 11 23 – Aggregate Base Course at Contractor's expense.
- .15 Hand trim, make firm and remove loose material and debris from excavations.

- .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.

3.7 FILL TYPES AND COMPACTION

- .1 Use types of fill as indicated. Compaction densities are percentages of maximum densities obtained from ASTM D698.
 - .1 Type 1 Fill: from conduit or duct bank surround material to underside of granular sub-base and granular base. Compact to 95%.

3.8 BEDDING AND SURROUND OF UNDERGROUND SERVICES

- .1 Place and compact granular material for bedding and surround of underground services as indicated and as specified in:
 - .1 Section 33 41 00 – Storm Utility Drains.
 - .2 Section 33 65 73 – Concrete Encasement Duct Banks and Manholes
- .2 Place bedding and surround material in unfrozen condition.

3.9 BACKFILLING

- .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of shoring and bracing; backfilling of voids.
 - .5 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .2 Do not use backfill material which is frozen or contains ice, snow or debris.
- .3 Place backfill material in uniform layers not exceeding 150 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .4 Backfilling around installations.
 - .1 Place bedding and surround material as specified elsewhere.
 - .2 Place layers simultaneously on both sides of installed Work to equalize loading.

3.10 SHORTAGE AND SURPLUS

- .1 Supply necessary fill to meet backfilling and grading requirements and with minimum and maximum rough grade variance.

Dispose of surplus material off site.

END OF SECTION

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BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: March 28, 2013

RECORD OF BOREHOLE 13-2

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT, PERCENT					
							20	40	60	80	nat. V - rem. V -	+ ⊕	Q - U -	● ○		
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	82.57													
		Soil stratigraphy not logged														
1																
2																
		End of borehole	80.44 2.13													
3																
4																
5																

Bentonite
seal

Filter sand

51 mm
Diameter,
0.61 metres
long well
screen
No
groundwater
was
observed in
borehole on
April 17,
2013.

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEI BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-3

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: March 28, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT, PERCENT					
								20	40	60	80	nat. V - rem. V -	+ Φ			Q - U - O	Wp
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		83.96													
		Dark brown silty sandy topsoil (TOPSOIL)		83.78 0.18													
		Brown to grey silty sand and gravel, trace clay (GLACIAL TILL)			1	50 D.O.	4										
1					2	50 D.O.	50 blows for 130 mm										
2					3	50 D.O.	66										
3		End of borehole		81.83 2.13													
4																	
5																	

Backfilled with soil cuttings

DEPTH SCALE
1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.
CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: March 28, 2013

RECORD OF BOREHOLE 13-4

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat. V - + rem. V - ⊖		Q - ● U - ○	WATER CONTENT, PERCENT					
							20	40	60	80		10 ⁻⁷	10 ⁻⁶			10 ⁻⁵	10 ⁻⁴
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	82.09														
		Soil stratigraphy not logged															
1																	
2																	
		End of borehole	79.80 2.29														
3																	
4																	
5																	

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-5

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: March 28, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m												
								SHEAR STRENGTH Cu, kPa		nat. V - + rem. V - ⊕		Q - ● U - ○		WATER CONTENT, PERCENT					
								20	40	60	80	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵			10 ⁻⁴	Wp	W
								20	40	60	80	20	40	60	80				
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		82.75															
		Dark brown silty sandy topsoil (TOPSOIL FILL)		82.52 0.23	1	50 D.O.	5							○					
		Dark brown silty sand (FILL MATERIAL)		81.99 0.76										○					
1		Compact to dense, grey silty sand and gravel, trace clay (GLACIAL TILL)			2	50 D.O.	15							○					
2					3	50 D.O.	32							○					
		End of borehole		80.62 2.13															
3																			
4																			
5																			

Backfilled
with soil
cuttings

BOREHOLE RECORD WITH LAB WC: HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-6

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT					
							Cu, kPa	naL. V - rem. V -	+ ⊕	Q - U -	Wp	W	WI			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	82.48													
		Soil stratigraphy not logged														
1																
		End of borehole	81.03 1.45													
2																
3																
4																
5																

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-6 B

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 4, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH Cu, kPa		nat. V - rem. V -	+ ⊕	Q - U -	WATER CONTENT, PERCENT				
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		82.46													
		Soil stratigraphy not logged															
1																	
2																	
		End of borehole		80.33 2.13													
3																	
4																	
5																	

Backfilled with soil cuttings

DEPTH SCALE
1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.
CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-7

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION			
		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT						
				DEPTH (m)				Cu, kPa				nat. V - + Q - rem. V - ⊕ U - O						
								20	40	60	80	10 ⁻⁷	10 ⁻⁶			10 ⁻⁵	10 ⁻⁴	
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		82.30											Flushmount protector			
		Dark brown silty sand trace rootlets (TOPSOIL)		82.10 0.20	1	50 D.O.	4									Bentonite seal		
		Reddish brown fine to medium grained SAND, some silt															Filter sand	
		Compact, grey silty sand, trace clay and gravel (GLACIAL TILL)		81.69 0.61														32 mm Diameter, 0.61 metres long well screen
1					2	50 D.O.	15											
2																		
		End of borehole		80.17 2.13														
3																		
4																		

PROJECT: 12-553

RECORD OF BOREHOLE 13-9

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat. V - + Q - ● rem. V - Ø U - O		WATER CONTENT, PERCENT					
								20	40	60	80	10 ⁻⁷	10 ⁻⁶			10 ⁻⁵	10 ⁻⁴
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		82.77													
		Soil stratigraphy not logged															
1																	
2																	
		End of borehole		80.64 2.13													
3																	
4																	
5																	

Backfilled
with soil
cuttings

DEPTH SCALE

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

1 to 25

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: April 1, 2013

RECORD OF BOREHOLE 13-10

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV.	NUMBER	TYPE	BLOWS/0.3m	20 40 60 80				10 ⁻⁷ 10 ⁻⁶ 10 ⁻⁵ 10 ⁻⁴					
				DEPTH (m)				SHEAR STRENGTH Cu, kPa				WATER CONTENT, PERCENT					
								nat. V - rem. V -	+ ⊕	Q - U -							
								20 40 60 80					Wp 20 40 60 80	W	WI		
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		85.12													
		Dark brown silty sand, trace organics and gravel (FILL MATERIAL)			1	50 D.O.	4										
				84.51 0.61													
1		Brown silty sand, trace gravel (POSSIBLE FILL MATERIAL)			2	50 D.O.	1							○			
2					3	50 D.O.	2						○				
		End of borehole		82.99 2.13													
3																	
4																	
5																	

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-12

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63,5 kg; 0,76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH Cu, kPa		nat. V - rem. V -	+ ⊖	Q - ● U - ○	WATER CONTENT, PERCENT				
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		85.47													
		Soil stratigraphy not logged															
2		End of borehole		83.62 1.85													
		Practical auger refusal															
3																	
4																	
5																	

Backfilled
with soil
cuttings

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-13

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		WATER CONTENT, PERCENT						
							Cu, kPa	nat. V - + rem. V - ⊕	Q - ● U - ○	Wp	W	Wi			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	84.17												
		Dark brown fine silty sand, trace organics (TOPSOIL)		1	50 D.O.	4									
			83.64 0.53												
		Brown SILTY SAND													
			83.36 0.81												
1		Compact to dense, grey silty sand, trace clay and gravel (GLACIAL TILL)		2	50 D.O.	24									
2				3	50 D.O.	22									
3															
4															
5															
		End of borehole	82.04 2.13												

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-15

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH				WATER CONTENT, PERCENT					
								Cu, kPa	nat. V - + rem. V - ⊕	Q - ● U - ○		Wp	W	WI			
								20	40	60	80	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴		
								20	40	60	80	20	40	60	80		
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		84.86													
		Dark brown silty sand, trace organics (TOPSOIL FILL)		84.73 0.13													
		Grey brown and reddish brown silty sand, some gravel (FILL MATERIAL)			1	50 D.O.	6										
1					2	50 D.O.	7										
2		Very stiff, grey brown SILTY CLAY		83.03 1.83	3	50 D.O.	10										
		End of borehole		82.73 2.13													
3																	
4																	
5																	

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-16

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 3, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH				WATER CONTENT, PERCENT					
								Cu, kPa				nat. V - + Q - ● rem. V - ⊕ U - ○					
								20	40	60	80	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴		
								20	40	60	80	Wp	W		Wi		
												20	40	60	80		
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		82.67													
		Dark brown silty sand, some organic material (TOPSOIL)		82.47													
				0.20													
		Very stiff, grey brown SILTY CLAY			1	50	5										
						D.O.											
1	Power Auger 200 mm Diameter Hollow Stem				2	50	13										
						D.O.											
2	Power Auger 200 mm Diameter Hollow Stem				3	50	9										
						D.O.											
3	Power Auger 200 mm Diameter Hollow Stem																
4	Power Auger 200 mm Diameter Hollow Stem																
5	Power Auger 200 mm Diameter Hollow Stem																
		End of borehole		80.54													
				2.13													

Bentonite seal

32 mm Diameter, 0.76 metres long well screen

No groundwater was observed in borehole on April 17, 2013.

Bentonite
seal32 mm
Diameter,
0.76 metres
long well
screenNo groundwater
was
observed in
borehole on
April 17,
2013.

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-17

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 3, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
							SHEAR STRENGTH Cu, kPa		nat. V - + rem. V - ⊕		Q - ● U - ○		WATER CONTENT, PERCENT			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	82.88													
		Soil stratigraphy not logged														
1																
2																
		End of borehole	80.75 2.13													
3																
4																
5																

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCE BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-18

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 3, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat. V - + Q - ● rem. V - ⊕ U - ○		WATER CONTENT, PERCENT					
								20	40	60	80	10 ⁻⁷	10 ⁻⁶			10 ⁻⁵	10 ⁻⁴
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		81.67													
		Dark brown fine silty sand, trace organic material (TOPSOIL)		81.52													
		Dark brown SILTY SAND		0.15	1	50 D.O.	4										
		Very stiff, grey brown SILTY CLAY		81.11													
				0.56													
1					2	50 D.O.	11										
2					3	50 D.O.	14										
		End of borehole		79.54													
				2.13													
3																	
4																	
5																	

Backfilled with soil cuttings

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-20

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
							SHEAR STRENGTH Cu, kPa				WATER CONTENT, PERCENT					
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	85.47													
		Soil stratigraphy not logged														
1																
2																
		End of borehole	83.34 2.13													
3																
4																
5																

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-21

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH				WATER CONTENT, PERCENT					
								Cu, kPa	nat. V - rem. V -	+ ⊕	Q U -	Wp	W	WI			
								20	40	60	80	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵	10 ⁻⁴		
								20	40	60	80	Wp — W — WI					
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		81.52													
		Dark brown silty sand and organics (TOPSOIL)		81.39 0.13													
		Brown SILTY SAND, trace gravel			1	50 D.O.	3										
												</					

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-21 B

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 4, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		WATER CONTENT, PERCENT						
								Cu, kPa	nat. V - + rem. V - ⊕	Q - ● U - ○	Wp	W	Wi			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		81.80												Flushmount and filter sand
		Soil stratigraphy not logged														
1	NQ Diamond Core															Bentonite seal
		Weathered, fractured, grey limestone bedrock		80.17 1.63	1	R.C.										
2																32 mm Diameter, 0.3 metres long well screen
		End of borehole		79.44 2.36												
3																No groundwater was observed in borehole on April 17, 2013.
4																
5																

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-22

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 1, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa		nat. V - + Q - ● rem. V - ⊕ U - ○		WATER CONTENT, PERCENT					
								20	40	60	80	10 ⁻⁷	10 ⁻⁶			10 ⁻⁵	10 ⁻⁴
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		79.29													
		Soil stratigraphy not logged															
1																	
2																	
2		End of borehole		77.16 2.13													
3																	
4																	
5																	

Backfilled
with soil
cuttings

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: April 2, 2013

RECORD OF BOREHOLE 13-23

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH				WATER CONTENT, PERCENT					
								Cu, kPa				Wp					
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		82.11													
		Dark brown silty sand trace organic material (TOPSOIL)		81.91 0.20	1	50 D.O.	7										
		Compact to dense, grey silty sand, some gravel (GLACIAL TILL)															
1					2	50 D.O.	30										
					3	50 D.O.	35										
2		End of borehole		79.98 2.13													
3																	
4																	
5																	

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: April 2, 2013

RECORD OF BOREHOLE 13-24

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63,5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		WATER CONTENT, PERCENT					
								Cu, kPa	nat. V - rem. V -	+ ⊕	Q - U -	Wp	W		
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		83.30											
		Dark brown silty sand trace organic material (TOPSOIL)		83.17 0.13											
		Loose to very dense, grey silty sand, some gravel (GLACIAL TILL)			1	50 D.O.	25								
1					2	50 D.O.	30								
2					3	50 D.O.	5								
		End of borehole		81.17 2.13											

Backfilled
with soil
cuttings

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

LOCATION: See Borehole Location Plan, Figure 2

BORING DATE: April 2, 2013

RECORD OF BOREHOLE 13-25

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
							SHEAR STRENGTH Cu, kPa		naL V - + rem. V - ⊖		Q - ● U - ○		WATER CONTENT, PERCENT			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	85.80												Backfilled with soil cuttings	
		Soil stratigraphy not logged														
1																
2																
		End of borehole	83.67 2.13													
3																
4																
5																

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-26

SHEET 1 OF 1

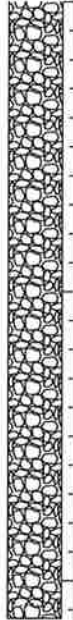
LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 2, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
							SHEAR STRENGTH Cu, kPa		nat. V - rem. V -		+ Q -		WATER CONTENT, PERCENT			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	84.90													
		Soil stratigraphy not logged														
1																
2																
		End of borehole	82.77 2.13													
3																
4																
5																

Backfilled
with soil
cuttings

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BORING DATE: April 2, 2013

RECORD OF BOREHOLE 13-27

SHEET 1 OF 1

DATUM: Geodetic

SPT HAMMER: 63.5 kg; 0.76 m

[illegible]

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

BORING DATE: April 2, 2013

SPT HAMMER: 63.5 kg; 0.76 m

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-30

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 2, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT					
							Cu, kPa	nat. V - rem. V -	+ ⊕	Q - U -	Wp	W	Wi			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	82.26													Backfilled with soil cuttings
		Soil stratigraphy not logged														
1																
2																
		End of borehole	80.13 2.13													
3																
4																
5																

DEPTH SCALE
1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.
CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-31





SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 2, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH				WATER CONTENT, PERCENT					
								Cu, kPa	nat. V - rem. V -	+ ⊕	Q - U -	Wp	W	Wi			
0		Ground Surface		80.87													
	Power Auger 200 mm Diameter Hollow Stem	Grey brown crushed sand and gravel (FILL MATERIAL)			1	50 D.O.	15										
				80.26 0.61													
		Brown SILTY SAND, trace gravel															
1			Very stiff, grey brown SILTY CLAY			2	50 D.O.	5									
					79.90 0.97												
		Compact to dense, grey silty sand, trace clay and gravel (GLACIAL TILL)															
				79.19 1.68													
2		End of borehole		78.74 2.13		3	50 D.O.	28									
3																	
4																	
5																	

Backfilled
with soil
cuttings

DEPTH SCALE

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

1 to 25

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-32

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 2, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT					
							Cu, kPa	nat. V - rem. V -	+ ⊕	Q - U -	Wp	W	WI			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	78.58													Backfilled with soil cuttings
		Soil stratigraphy not logged														
1																
2																
		End of borehole	76.45 2.13													
3																
4																
5																

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-33

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 2, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
								SHEAR STRENGTH				WATER CONTENT, PERCENT					
								Cu, kPa				nat. V - + Q - rem. V - ⊕ U - ○					
0		Ground Surface		78.64													
		Grey crushed sand and gravel (FILL MATERIAL)		78.28 0.36	1	50 D.O.	28										
		Brown, fine silty sand (FILL MATERIAL)		78.03 0.61													
		Very stiff to firm, grey brown SILTY CLAY															
1	Power Auger 200 mm Diameter Hollow Stem				2	50 D.O.	2										
2					3	50 D.O.	1										
		End of borehole		76.51 2.13													
3																	
4																	
5																	

Backfilled
with soil
cuttings

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-34

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 3, 2013

SPT HAMMER: 63,5 kg; 0,76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT					
							Cu, kPa	nat. V - rem. V -	+ ⊕	Q U - O	Wp	W	WI			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	78.90													
		Soil stratigraphy not logged														
1																
2																
		End of borehole	76.77 2.13													
3																
4																
5																

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-35

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 4, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION						
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH Cu, kPa				WATER CONTENT, PERCENT									
								nat. V - + rem. V - ⊕				Q - ● U - ○				Wp — W — Wi					
								20	40	60	80	10 ⁻⁷	10 ⁻⁶			10 ⁻⁵	10 ⁻⁴				
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		79.21																	
		Dark brown silty sand trace organic material (TOPSOIL)		79.14 0.07																	
		Brown SILTY SAND			1	50 D.O.	5														
1																					
		Very stiff, grey brown SILTY CLAY		78.25 0.96		2	50 D.O.	6													
2																					
		End of borehole		77.08 2.13																	
3																					
4																					
5																					

Bentonite seal

Filter sand

32 mm Diameter, 0.76 metres long well screen

No groundwater was observed in borehole on April 17, 2013.

Bentonite
seal

Filter sand

32 mm
Diameter,
0.76 metres
long well
screenNo groundwater
was
observed in
borehole on
April 17,
2013.

DEPTH SCALE

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

1 to 25

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

BORING DATE: April 3, 2013

DATUM: Geodetic

SPT HAMMER: 63.5 kg; 0.76 m

Backfilled
with soil
cuttings

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-37

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 3, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
							20	40	60	80	20	40	60			80
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	78.59													
		Soil stratigraphy not logged														
1																
2																
		End of borehole	76.46 2.13													
3																
4																
5																

Backfilled with soil cuttings

BOREHOLE RECORD WITH LAB W/C HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE
1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.
CHECKED:

PROJECT: 12-553

RECORD OF BOREHOLE 13-38

SHEET 1 OF 1

LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 3, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT					
							Cu, kPa	nat. V -	+ rem. V -	Q - U -	Wp	W	WI			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	78.39													
		Dark brown silty sand trace organic material (TOPSOIL)	78.29 0.10													
		Very stiff, brown SILTY CLAY		1	50 D.O.	6										
1				2	50 D.O.	6										
2				3	50 D.O.	10										
		End of borehole	76.26 2.13													

Backfilled
with soil
cuttings

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

PROJECT: 12-553

RECORD OF BOREHOLE 13-39

SHEET 1 OF 1

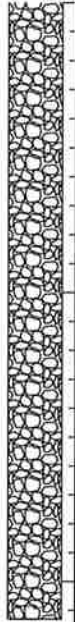
LOCATION: See Borehole Location Plan, Figure 2

DATUM: Geodetic

BORING DATE: April 3, 2013

SPT HAMMER: 63.5 kg; 0.76 m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION	
		DESCRIPTION	STRATA PLOT ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m										
							SHEAR STRENGTH Cu, kPa		nat. V - rem. V -		+ Q - ● U - O		WATER CONTENT, PERCENT			
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface	78.08													
		Soil stratigraphy not logged														
1																
2																
		End of borehole	75.95 2.13													
3																
4																
5																

Backfilled
with soil
cuttings

BOREHOLE RECORD WITH LAB WC HCEL BOREHOLE LOGS.GPJ HCE DATA TEMPLATE.GDT 5/9/13

DEPTH SCALE

1 to 25

Houle Chevrier Engineering Ltd.

LOGGED: M.L.

CHECKED:

PROJECT: 07-078

RECORD OF BOREHOLE 08-08

SHEET 1 OF 1

LOCATION: See Site Plan, Figure 2

DATUM: Not Applicable

BORING DATE: February 2, 2009

SPT HAMMER: 63.6 kg; drop 0.76m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, K, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT					
								Cu, kPa	nat. V - rem. V -	+ Q -	U -	Wp	W			Wi	
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		83.80													
		Grey crushed sand and gravel (BASE MATERIAL)		83.67	1	CS											
		Asphaltic Concrete		83.47	2	CS											
		Grey crushed sand and gravel, some silt (BASE MATERIAL)		83.33	3	CS											
		Grey brown silty sand, trace clay, some gravel (FILL)		83.04													
		Compact grey brown silty sand (GLACIAL TILL)		82.76	4	DO	50 for 0.15m										
1			Auger refusal on inferred bedrock		82.66												
		End of borehole		82.14													
2																	
3																	
4																	
5																	
6																	
7																	
8																	

Groundwater
conditions
not
observed.

DEPTH SCALE

Houle Chevrier Engineering Ltd.

LOGGED: A.N.

CHECKED:

1 to 40

BOREHOLE RECORD 07-078 BH LOGS FEB 2009 G.P.J. MHECL.GDT 3/3/09

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m		HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION								
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH		WATER CONTENT, PERCENT												
								Cu, kPa	nat. V - + rem. V - 0	Q - ● U - ○	Wp	W			Wi							
																20	40	60	80	10 ⁻⁷	10 ⁻⁶	10 ⁻⁵
0	Power Auger 200 mm Diameter Hollow Stem	Ground Surface		80.20											Native Backfill							
		TOPSOIL		79.80 0.40												Bentonite						
		Grey brown silty clay and silty sand (FILL MATERIAL)															Native Backfill					
1		Very stiff to stiff grey brown SILTY CLAY (weathered crust)		79.14 1.07	1	50 DO	8				○							Bentonite				
																			Filler sand			
																				31mm diameter, 1.32m long PVC well screen		
																					Native Backfill	
2		2	50 DO	12							○			Groundwater level in well screen at 2.00 metres below ground surface on February 18, 2009.								
3	Compact grey brown to grey silty sand, trace clay, some gravel, occasional cobbles (GLACIAL TILL)		77.48 2.72	3	50 DO	18				○												
4	4	50 DO	17						○													
5	Loose gray silty sand, trace clay, some gravel, occasional cobbles (GLACIAL TILL)		75.63 4.57	5	50 DO	11				○												
6	End of borehole		74.26 5.94	6	50 DO	10				○												
7																						

DEPTH SCALE

1 10 40

Houle Chevrier Engineering Ltd.

LOGGED® A.N

CHECKED:

BOREHOLE RECORD 07-078 BH LOGS FEB 2009 GPJ MHECL GOT 3/9/09

PROJECT: 07-078

RECORD OF BOREHOLE 08-12

SHEET 1 OF 1

LOCATION: See Site Plan, Figure 2

DATUM: Not Applicable

BORING DATE: February 4, 2009

SPT HAMMER: 63.5 kg; drop 0.76m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, K, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION		
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT					
								Cu, kPa	20	40	60	80	nat. V - rein. V -			+ - Q - U -	Wp
								20	40	60	80						
0		Ground Surface		75.30													
		Grey brown sandy silt, trace organic material (TOPSOIL)		74.77 0.53	1	CS									Native Backfill		
		Very stiff grey brown silty clay, trace sand and gravel (FILL)													Bentonite		
1					2	50 DO	8								Native Backfill		
					3	50 DO	4										
2																	
		Grey brown fine to medium sand, trace silt, some silty clay pockets (FILL)		72.92 2.38	4	50 DO	22										
3																	
		Stiff grey brown SILTY CLAY (weathered crust)		71.92 3.38	5	50 DO	6								Filter sand		
4															Bentonite		
					6	50 DO	2										
5					7	50 DO	6								31mm diameter, 1.52m long PVC well screen		
		Compact grey silty sand, trace clay, some gravel, occasional cobbles (GLACIAL TILL)		70.17 5.13													
					8	50 DO	12										
6															Native Backfill		
					9	50 DO	21										
7		End of borehole		68.59 6.71											Groundwater level in well screen at 4.67 metres below ground surface on February 16, 2009		
8																	

DEPTH SCALE

1 to 40

Houle Chevrier Engineering Ltd.

LOGGED: A.N.

CHECKED:

BOREHOLE RECORD 07-078 BH LOGS FEB 2009.GPJ MHECL.CDT 3/3/09

[illegible]

Groundwater
conditions
not
observed.

DEPTH SCALE

1 lo 40

Houle Chevrier Engineering Ltd.

LOGGED: A.N.

CHECKED

COREHOLE RECORD 07-078 BH LOGS FEB 2009.GPJ MHECL.GDT 3/9/09

PROJECT: 07-078

RECORD OF BOREHOLE 08-16

SHEET 1 OF 2

LOCATION: See Site Plan, Figure 2

DATUM: Not Applicable

BORING DATE: February 3, 2009

SPT HAMMER: 63.8 kg; drop 0.76m

DEPTH SCALE METRES	BORING METHOD	SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE, BLOWS/0.3m				HYDRAULIC CONDUCTIVITY, k, cm/s				ADDITIONAL LAB. TESTING	PIEZOMETER OR STANDPIPE INSTALLATION				
		DESCRIPTION	STRATA PLOT	ELEV. DEPTH (m)	NUMBER	TYPE	BLOWS/0.3m	SHEAR STRENGTH				WATER CONTENT, PERCENT							
								Cu, kPa		nat. V - + rem. V - ⊕		Q - ● U - ⊙				Wp — W — Vh			
								20	40	60	80	20	40			60	80	10 ⁻⁷	10 ⁻⁶
0		Ground Surface		80.70															
		Dark grey brown silty sand (TOPSOIL)		80.52 0.18	1	CS													
		Very stiff grey brown silty clay, trace gravel, red brick fragments (FILL MATERIAL)																	
1					2	50 DO	5												
					3	50 DO	5												
2				78.42 2.28	4	50 DO	8												
		Very stiff to stiff grey brown SILTY CLAY, trace sand (weathered crust)																	
3					5	50 DO	6												
4					6	50 DO	2												
		Firm grey SILTY CLAY		78.21 4.50	7	50 DO	WH												
5																			
		Compact grey silty sand, trace sand, some gravel, occasional cobbles (GLACIAL TILL)		74.91 5.79	8	50 DO	10												
6																			
7					9	50 DO	25												
8					10	50 DO	29												

Power Auger
200 mm Diameter Hollow Stem

Native Backfill

Bentonite

Native Backfill

</

DEPTH SCALE

1 to 40

Houle Chevrier Engineering Ltd.

LOGGED: A.N.

CHECKED:

BOREHOLE RECORD 07-078 BH LOGS FEB 2009 (SPJ MHEC) (SDT 3/9/09)

31mm
diameter,
1.52m long
PVC well
screen

