



**FINAL REPORT - GEOTECHNICAL INVESTIGATION
(MAYFIELD WEST – PHASE 2)**

**WIDENING OF MCLAUGHLIN ROAD AND CONSTRUCTION
OF EAST-WEST SPINE ROAD**

**THE CORPORATION OF THE TOWN OF CALEDON
RFP 2016-62**

Submitted to:

The Corporation of the Town of Caledon

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Appendix B:	Borehole Logs
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EXECUTIVE SUMMARY

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (“Amec Foster Wheeler”), was retained by the Town of Caledon (“Town”) to provide engineering services for geotechnical investigation, environmental permitting, and detailed structure design for widening of McLaughlin Road from 2 to 4 lanes, from Mayfield Road to 1.7 km north of Mayfield Road and new construction of Spine Road, 1.2 km west of Hwy 10 (Huronario St) to railway crossing (4-lanes), 1.6 km from west of railway crossing to Chinguacousy Road (2-lanes) within the Town of Caledon, Ontario.

The visual pavement condition survey shows that the existing asphalt along McLaughlin Road varied from fair to poor condition.

The minimum pavement structural design for widening of McLaughlin Road and the New Alignment of Spine Road was determined using the 1993 AASHTO Guide for the Design of Pavement Structures (DARWin Software Program). Design Parameters were selected using the MTO Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions, Final Report, March 2008. A summary of the recommended pavement design is presented below:

Recommended Minimum Structural Pavement Design

Material Description	AASHTO'93 Pavement Design for 20 years	
	McLaughlin Road	Spine Road
Hot Mix Asphalt Concrete Surface Course HL3 or HL 1 or SP 12.5 Binder Course HDBC or HL 8 or SP 19	HMA = 150 mm 50 mm / PGAC 58-28 50+50 mm/ PGAC 58-28 Traffic Category 'C'	HMA = 150 mm 50 mm / PGAC 58-28 50+50 mm/ PGAC 58-28 Traffic Category 'C'
Granular Base 'A'	150 mm	150 mm
Granular Subbase 'B' Type II	300 mm	400 mm
Design Structure Number (DSN) mm	DSN = 123 mm	DSN = 140 mm
Selected Structure Number (SSN) mm	SSN = 126 mm	SSN = 140 mm
Total Pavement Thickness (mm)	600 mm	700 mm

Notes:

Pavement design shall be over approved subgrade.

Granular A and Granular B Type II: Compaction as per OPSS Form 1010 (100% SPMDD).

For widening sufficient granular to match the excavation level of the adjacent driving lane to promote positive lateral drainage.

Aside from fill material (i.e., silty sand and gravel) in select boreholes, no other evidence (i.e., visual/olfactory) of environmental impacts were observed in any of the soil samples collected from this project area. However, four (4) soil samples exceeded the Table 1 and Table 3 site condition standards for sodium adsorption ratio and one (1) soil sample failed the Table 1 site condition standards for petroleum hydrocarbons (F4). The details of the environmental investigation are summarized in Section 3.2 of the report.

1.0 INTRODUCTION

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (“Amec Foster Wheeler”), was retained by the Town of Caledon (“Town”) to provide engineering services for geotechnical investigation, environmental permitting, and detailed structure design for widening of McLaughlin Road from 2 to 4 lanes, 1.7 km north of Mayfield Road and new construction of Spine Road, 1.2 km west of Hwy 10 (Hurontario St) to railway crossing (4-lanes), 1.6 km from west of railway crossing to Chinguacousy Road (2-lanes) within the Town of Caledon, Ontario.

Summary details of the road network, based on the information provided in the RFP and as estimated by Amec Foster Wheeler is shown in Table 1.1

Table 1.1 – Widening of McLaughlin Road and New Construction of Spine Rd

Corridor	Plan Work	From/To	Current Lanes	Planned Lanes	Appx. Length (km)
McLaughlin Rd.	Widening	From Mayfield Rd. to 1,700 m north	2	4	1.7
Spine Rd.	New Alignment	1,200 m west of Hwy 10 (Hurontario St) to railway crossing	- (new)	4	1.2
		1,600 m from west of railway crossing to Chinguacousy Rd		2	1.6
TOTAL					4.5

The purpose of the geotechnical and pavement investigation was to obtain information on the sub-surface and existing pavement conditions along the investigated road section by means of a visual pavement inspection, a limited number of boreholes, in-situ tests and laboratory tests on selected soil samples. The work carried out for the investigation was completed in accordance with the Terms of reference (TOR) of the Corporation of the Town of Caledon’s RFP #2016-62.

This report contains the findings of Amec Foster Wheeler’s geotechnical and pavement investigation, together with recommendations and comments. These recommendations and comments are based on factual information, and are intended only for use by the design engineers. The number of boreholes may not be sufficient to determine all the factors that may affect construction methods and costs. Subsurface and groundwater conditions between and beyond the boreholes may differ from those encountered at the borehole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. The anticipated construction conditions are also discussed, but only to the extent that they may influence design decisions. Construction methods discussed, however, express Amec Foster Wheeler’s opinion only and are not intended to direct the contractors on how to carry out the construction. Contractors should also be aware that the data and their interpretation presented in this report may not be sufficient to assess all the factors that may have an effect upon the construction.

The report is prepared with the condition that the design will be in accordance with all applicable standards and codes, regulations of authorities having jurisdiction, and good engineering practice. Further, the recommendations and opinions in this report are applicable only to the proposed project as described above.

On-going liaison with Amec Foster Wheeler construction phase of the project is recommended to confirm that the recommendations in this report are applicable and/or correctly interpreted and implemented. Also, any queries concerning the geotechnical aspects of the proposed project should be directed to Amec Foster Wheeler for further elaboration and/or clarification.

1.1 Project Description

1.1.1 McLaughlin Road (Widening)

At the time of the investigation, McLaughlin Road, within the project limits is north / south oriented with 2-lane rural road, with asphaltic concrete paved surface, gravel shoulders and drainage ditches on both sides. McLaughlin Road is designated as Arterial Road with an average existing road width of 7.6 m, and average lane width of 3.8 m. The road embankment was approximately 1.0 m to 2.5 m above surrounding grades. The road is planned to be reconstructed and widened to a four-lane urban road.

1.1.2 Spine Road (New Alignment)

Spine Road which is designated east-west from Chinguacousy Road to Hurontario Street approx 2.8 km. Within the project limit, and as per the Town's official plan, Spine Road is designated as Arterial Road.

1.2 Geology

Based on Map 2223, "Quaternary Geology of Brampton Area" prepared by Ontario Geological Survey, the surficial soil in the area is composed of Halton Till (Pleistocene, Late Wisconsin), red to brown, gritty to clayey silt till. According to the Map 2179, "Drift Thickness Sheet, Brampton Area", the drift thickness in the area varies from 10 m to 40 m. Map P.953, "Paleozoic Geology of the Brampton Area, Southern Ontario", indicates the bedrock in the project site area consists of red shale of Queenston Formation.

2.0 INVESTIGATION PROCEDURE

Based on the requirements set out in the TOR, the following tasks were carried out for the geotechnical investigation along McLaughlin Road and Spine Road:

- ▶ Visual pavement condition survey of existing road;
- ▶ Borehole investigation for existing pavement; and
- ▶ Laboratory testing for soil classification, including soil chemical analyses; and
- ▶ Pavement Design and Rehabilitation Strategies.

2.1 Visual Pavement Condition Survey

Amec Foster Wheeler completed a visual pavement condition survey of the existing road surface within the project area to identify any distresses. The identification and classification of the pavement distresses were carried out in accordance with MTO's "Flexible Pavement Condition Rating Manual – Guidelines for Municipalities", SP-022.

Generally, the existing asphaltic concrete surface condition was rated in 'Fair' to 'Poor' condition. A summary of the pavement condition surveys, including predominant surface defects, surface deformation and cracking is tabulated in Table 2.1 and selected photographs showing the existing condition of the investigated road section are presented in Appendix A.

Table 2.1 - Summary of Pavement Condition

Predominant Distress	2017 Condition
<ul style="list-style-type: none"> • Ravelling- Moderate/Extensive • Rippling and shoving- Severe/Few • Wheel track rutting- Severe/Throughout • Longitudinal wheel track cracking- Moderate/Frequent (Single and multiple) • Centreline cracking- Moderate/Frequent (Single and multiple) • Pavement edge cracking- Very Severe/Extensive (Single, multiple and alligator) • Transverse cracking- Slight/Intermittent • Potholes- Moderate/Few 	Fair to Poor

2.2 Geotechnical Investigation

Prior to drilling, utility locates were carried out to obtain clearances for existing underground utilities. The borehole drilling activities for this investigation were carried out between October 17 and November 6, 2017. Boreholes were advanced at 107 locations (BH1 to BH107) to a depth of 1.5 m. below surface grade. Appendix Figures show the borehole locations for McLaughlin Road and Spine Road.

All the boreholes were located and marked by our geotechnical engineering staff. Our staff arranged for underground utility locates for all borehole locations. The NAD 83 coordinates at each borehole location were recorded by Amec Foster Wheeler using a handheld device.

The ground surface elevations, NAD 83 coordinates, and detailed subsurface conditions encountered in the boreholes are provided on the borehole logs attached. The boreholes were advanced in alternating driving lanes.

The boreholes were advanced using solid-stem continuous-flight augers with truck-mounted and track-mounted power-auger drill rigs, equipped with an automatic hammer, supplied and operated by Drilltech Drilling Ltd. of Newmarket, Ontario. Soil samples were obtained from auger cuttings. The samples were then evaluated to determine the soil composition, which is noted in the borehole logs at the corresponding depths and have been used to infer the conditions of the subsurface soils. Pavement borehole logs, abbreviation prepared using appropriate terminology as per OPSD 100.60, are presented in Appendix B.

Upon completion of drilling, the boreholes without monitoring well were backfilled in accordance with the general requirements of Ontario Regulation 903.

The soil stratigraphy within each borehole was visually examined and classified at the time of drilling in accordance with the modified Unified Soil Classification System (USCS) and the Canadian Foundation Manual (2006). Soil samples were collected from each borehole at selected depths and retained in sealed plastic bags for further detailed examination and laboratory testing of water content determination, grain size analysis and Atterberg Limits on selected samples are included in Appendix C.

Upon recovery, selected soil samples were screened to assess for evidence of potential contamination, which included visual inspections. Samples were tested in the field for combustible gases using a portable detector (RKI Eagle 2). The results are presented on the Record of Boreholes. Selected soil samples were transported to AGAT laboratories, an accredited CALA laboratory located in Mississauga for soil chemical analysis. The Certificates of Analyses for the soil chemical analyses are included in Appendix D.

2.3 Sub-Surface Conditions

The geotechnical investigation for McLaughlin Road included boreholes located in the mid-driving lane, and shoulder rounding. All boreholes were advanced to a depth of 1.5m below ground surface.

The sub-surface conditions for boreholes drilled in the mid driving lane typically consisted of asphaltic concrete overlaying a granular base, with a layer of gravelly sand fill underlain by native silty clay / clayey silt tills which are predominant at the 1.5m depth below grade. Boreholes drilled in the shoulder rounding typically consisted of a granular material or topsoil overlaying a layer of fill, which commonly consisted of silty sand & gravel and was underlain by native silty clay/clayey silt till.

The geotechnical investigation for Spine Road included boreholes placed at the centreline and toe-of-slope of the proposed road. All boreholes were advanced to a depth of 1.5 m. The sub-surface conditions for the boreholes drilled on the spine road alignment typically consisted of a layer of topsoil underlain by a layer of silty sand which is overlaying native clayey silt. A summary of the soil conditions is presented in Section 2.3.3.

2.3.1 McLaughlin Road - Existing Pavement

The investigation of the pavement structure at the 17 boreholes drilled in the mid-driving-lane of McLaughlin Road showed an average hot mix asphalt thickness of 57 mm and ranged from 40mm to 70mm. The underlying granular thickness had an average thickness of 615 mm and ranged from 340 mm to 785 mm. Table 2.2a summarizes the hot mix asphalt thickness and the granular thicknesses for the boreholes drilled in the mid driving lane, as well as the predominant underlying material. Additional details are provided in the Borehole Log Data.

Table 2.2a - McLaughlin Road - Summary of Pavement Structure Thickness

BH#	Location	Approx. Station	Total Thickness (mm)		Underlying Material
			HMA	Granular/Fill	
1	MDL	Sta. (0+050)	70	530	Lt Br Si(y) Cl Till, some Sa, Tr Gr
3	MDL	Sta. (0+150)	60	540	Br Cl(y) Si Till, some Sa, Tr Gr
5	MDL	Sta. (0+250)	60	590	Lt Br Cl(y) Si Till
7	MDL	Sta. (0+350)	40	510	Gry Si(y) Cl
9	MDL	Sta. (0+450)	50	550	Lt Br Cl(y) Si Till
11	MDL	Sta. (0+550)	40	640	Gry Si(y) Cl, Tr OCC Gr
13	MDL	Sta. (0+650)	40	610	Br Cl(y) Si Till
15	MDL	Sta. (0+750)	50	600	Br Cl(y) Si Till
17	MDL	Sta. (0+850)	55	695	Br Cl(y) Si Till
19	MDL	Sta. (0+950)	65	785	Si(y) Sa & Gr, some Cob
21	MDL	Sta. (1+050)	60	690	Br Si(y) Cl Till
23	MDL	Sta. (1+150)	60	340	Br Si(y) Cl Till
25	MDL	Sta. (1+250)	60	650	Br Si(y) Cl Till, Tr Sa, OCC Gr
27	MDL	Sta. (1+350)	60	690	Br Si(y) Cl Till, Tr Sa, OCC Gr
29	MDL	Sta. (1+450)	65	635	Br & Gry Cl(y) Si Till
31	MDL	Sta. (1+550)	60	690	Dk Gry Si(y) Cl, Tr Org
33	MDL	Sta. (1+650)	65	695	Br Si(y) Cl to Cl(y) Si, some Sa & Gr
			Minimum	340 mm	Only applicable to boreholes drilled in the mid-driving lane
			Maximum	785 mm	
			Average	615 mm	

BH = Borehole MDL=Mid-Driving Lane.

2.3.2 McLaughlin Road - Widening

The sub-surface conditions in the widening areas were investigated through the drilling of 17 boreholes at the shoulder rounding (SHR). Ten (10) of the 17 shoulder boreholes contained a layer of granular at the surface with an average granular thickness of 500 mm which ranged from 250 mm to 850 mm.

The remaining boreholes contained a layer of topsoil at the surface. The investigation revealed an average thickness of topsoil of 200 mm, and ranged from 150 mm to 170 mm in depth. A summary of the boreholes drilled in the shoulder rounding is shown in Table 2.3.

Table 2.3 - McLaughlin Road - Summary of Topsoil and Granular Thicknesses

BH#	Location	Approx. Station	Total Thickness (mm)		Predominant Underlying Material
			Topsoil/ Organics	Granular/ Fill	
2	MSH	Sta. (0+050)	-	300	Lt Br Si(y) Cl Till
4	SHR	Sta. (0+150)	150	-	Lt Br Si(y) Cl Till
6	SHR	Sta. (0+250)	200	-	Si W Sa & Cl, Tr Gr
8	SHR	Sta. (0+350)	200	-	Gry Si(y) Cl Till
10	SHR	Sta. (0+450)	-	500	Lt Br Cl(y) Si Till
12	SHR	Sta. (0+550)	150	330	Dk Gry Si(y) Cl, Tr Org
14	SHR	Sta. (0+650)	-	-	Lt Br Cl(y) Si, Tr Gr
16	SHR	Sta. (0+750)	200	250	Gry Si(y) Sa, some Cl
18	SHR	Sta. (0+850)	200	380	Gry Si(y) Cl Till
20	SHR	Sta. (0+950)	150	850	Sa, Tr Gr, some Cob
22	SHR	Sta. (1+050)	150	800	Br Si(y) Cl Till
24	SHR	Sta. (1+150)	150	-	Si W Cl & Sa, Tr Gr
26	SHR	Sta. (1+250)	160	-	Br Cl(y) Si Till, some Sa & Gr
28	SHR	Sta. (1+350)	150	300	Gry Si(y) Cl, some Sa & Gr, Tr Org
30	SHR	Sta. (1+450)	150	850	Br Si(y) Cl to Cl(y) Si Till, some Sa
32	SHR	Sta. (1+550)	-	650	Gry Si(y) Cl Till
34	SHR	Sta. (1+650)	200	250	Br Si(y) Cl Till, some Sa Tr Gr
Minimum			150 mm	250 mm	Only applicable to boreholes drilled at Mid-Shoulder and Shoulder Rounding
Maximum			200 mm	850 mm	
Average			170 mm	500 mm	

Notes: BH = Borehole SHR=Shoulder Rounding; MSH=Mid-Shoulder.

2.3.3 Spine Road – New Construction

There were 71 boreholes drilled along the new alignment of Spine Road to a depth of 1.5 m with 2 additional boreholes advanced at mid-driving lanes of Chinguacousy Road. The existing topsoil was measured at each borehole to provide stripping information for the proposed roadway.

The thickness of the topsoil measured ranged between 180 mm and 400 mm with an average thickness of approximately 265 mm. A summary of the boreholes drilled along the proposed road is presented in Table 2.4.

Table 2.4 - Spine Road - Summary of Topsoil Thickness

BH#	Location	Approx. Station	Topsoil / Organics Thickness (mm)	Predominant Underlying Material
35	CL	Sta. (2+550)	200	Lt Br Cl(y) Si Till, some Sa, Tr Gr
36	CL	Sta. (2+500)	210	Lt Br Cl(y) Si Till, some Sa, Tr Gr
37	CL	Sta. (2+500)	200	Lt Br Cl(y) Si Till, some Sa, Tr Gr
38	TOS	Sta. (2+450)	180	Si W Cl & Sa, Tr Gr
39	CL	Sta. (2+400)	205	Lt Br Cl(y) Si Till, some Sa, Tr Gr
40	TOS	Sta. (2+400)	200	LT Br Cl(y) Si Till, some Sa, Tr Gr
41	CL	Sta. (2+350)	200	Lt Br Si(y) Cl to Cl(y) Si Till, some Sa, Tr Gr
42	CL	Sta. (2+300)	210	Lt Br Cl(y) Si Till, some Sa & Gr
43	TOS	Sta. (2+300)	210	Lt Br Cl(y) Si Till, some Sa
44	CL	Sta. (2+250)	250	Lt Br Cl(y) Si Till
45	CL	Sta. (2+200)	200	Lt Br Cl(y) Si Till
46	TOS	Sta. (2+200)	195	Lt Br Cl(y) Si Till, some Sa, Tr Gr
47	CL	Sta. (2+150)	210	Lt Br Cl(y) Si Till, some Sa
48	CL	Sta. (2+100)	245	Lt Br Cl(y) Si Till
49	TOS	Sta. (2+100)	220	Lt Br Cl(y) Si Till, some Sa, Tr Gr
50	CL	Sta. (2+050)	205	Lt Br Cl(y) Si / Si(y) Cl Till, some Sa, Tr Gr
51	CL	Sta. (2+000)	200	Lt Br Cl(y) Si Till, some Sa
52	TOS	Sta. (2+000)	230	Lt Br Cl(y) Si Till, some Sa, Tr Gr
53	CL	Sta. (1+950)	220	Lt Br Cl(y) Si Till, Tr Gr & Sa
54	CL	Sta. (1+850)	290	Lt Br Si(y) Sa to Cl(y) Si, Tr Gr
55	CL	Sta. (1+800)	300	Lt Br Si(y) Sa to Cl(y) Si Tr Gr
56	TOS	Sta. (1+800)	300	Lt Br Si(y) Sa to Cl(y) Si, Tr Gr
57	CL	Sta. (1+750)	300	Lt Br Cl(y) Si, Till some Sa, Tr Occ Gr
58	CL	Sta. (1+700)	300	Br Si(y) Cl to Cl(y) Si Till
59	TOS	Sta. (1+700)	310	Br Cl(y) Si to Si(y) Cl Till, Tr Gr
60	CL	Sta. (1+650)	320	Br Cl(y) Si to Si(y) Sa, Tr Gr
61	CL	Sta. (1+600)	320	Br Cl(y) Si to Si(y) Sa, Tr Gr
62	TOS	Sta. (1+600)	310	Br Cl(y) Si to Si(y) Sa, Tr Gr
63	CL	Sta. (1+550)	300	Cl(y) Si, some Sa, Tr Gr
64	CL	Sta. (1+500)	290	Si W Cl & Sa, Tr Gr
65	TOS	Sta. (1+500)	280	Br Cl(y) Si, some Sa, Tr Gr
66	CL	Sta. (1+450)	260	Si(y) Sa W Pockets of F Sa to Si(y) Cl W Sa
67	CL	Sta. (1+350)	300	Lt Br Si(y) Sa to Cl(y) Si Till, some Sa, Tr Gr
68	CL	Sta. (1+300)	300	Lt Br Cl(y) Si Till to Si(y) Sa, Tr Gr
69	TOS	Sta. (1+300)	310	Lt Br Cl(y) Si Till, some Sa, Tr Gr
70	CL	Sta. (1+250)	300	Lt Br Cl(y) Si Till, some Sa, Tr Gr & Cob
71	CL	Sta. (1+200)	290	Lt Br Cl(y) Si Till, Tr Gr & Cob
72	TOS	Sta. (1+200)	300	Lt Br Cl(y) Si Till, Tr Gr
73	CL	Sta. (1+150)	300	Lt Br Cl(y) Si Till, some Sa, Tr Gr
74	CL	Sta. (1+100)	280	Lt Br Cl(y) Si Till, some Sa, Tr Gr
75	TOS	Sta. (1+100)	300	Lt Br Cl(y) Si Till, some Sa, Tr Gr
76	CL	Sta. (1+050)	290	Lt Br Cl(y) Si Till, some Sa & Gr
77	CL	Sta. (1+000)	300	Lt Br Si(y) Sa to Cl(y) Si Till
78	TOS	Sta. (1+000)	300	Lt Br Cl(y) Si Till, Tr Gr & Cob
79	CL	Sta. (0+950)	270	Lt Br Cl(y) Si Till, some Sa, Tr Gr
80	CL	Sta. (0+900)	250	Lt Br Si(y) Sa & Gr, some Cl
81	TOS	Sta. (0+900)	260	Lt Br Cl(y) Si Till, some Sa & Gr
82	CL	Sta. (0+850)	230	Lt r BCl(y) Si Till, Tr Gr, Occ Cob

BH#	Location	Approx. Station	Topsoil / Organics Thickness (mm)		Predominant Underlying Material
83	CL	Sta. (0+800)	230		Lt Br Cl(y) Si Till, some Sa, Tr Gr
84	TOS	Sta. (0+800)	220		Lt Br Cl(y) Si Till, some Sa
85	CL	Sta. (0+750)	210		Lt Br Cl(y) Si Till, some Sa, Tr Cob
86	CL	Sta. (0+700)	300		Br Si(y) Cl / Cl(y) Si, Tr Sa
87	TOS	Sta. (0+700)	350		Br Si(y) Cl / Cl(y) Si, Tr Sa
88	CL	Sta. (0+650)	300		Gry / Br Si(y) Cl / Cl(y) Si
89	CL	Sta. (0+600)	290		Gry / Br Si(y) Cl / Cl(y) Si
90	TOS	Sta. (0+600)	300		Gry / Br Si(y) Cl / Cl(y) Si
91	CL	Sta. (0+550)	400		Gry / Br Si(y) Cl / Cl(y) Si
92	CL	Sta. (0+500)	260		Gry / Br Si(y) Cl / Cl(y) Si
93	TOS	Sta. (0+500)	260		Gry / Br Si(y) Cl / Cl(y) Si
94	CL	Sta. (0+450)	290		Gry Si(y) Cl / Cl(y) Si
95	CL	Sta. (0+400)	280		Lt Br Cl(y) Si / Si(y) Cl
96	TOS	Sta. (0+400)	300		Gry / Br Cl(y) Si / Si(y) Cl
97	CL	Sta. (0+350)	300		Cl & Si, some Sa
98	CL	Sta. (0+300)	250		Gry / Br Cl(y) Si / Si(y) Cl
99	TOS	Sta. (0+300)	250		Lt Br Cl(y) Si Till
100	CL	Sta. (0+200)	280		Gry Si(y) Cl Till, Tr Sa
101	TOS	Sta. (0+200)	310		Gry Si(y) Cl Till, some Sa
102	CL	Sta. (0+150)	240		Lt Br Cl(y) Si / Si(y) Cl
103	CL	Sta. (0+100)	210		Lt Br Cl(y) Si / Si(y) Cl, Tr Sa
104	TOS	Sta. (0+100)	200		Lt Br Si / Cl(y) Si, Tr Sa
105	CL	Sta. (0+050)	180		Lt Br Cl(y) Si / Si(y) Cl, Tr Sa & Gr
Minimum Maximum Average			180 mm 400 mm 265 mm		
Chinguacousy Road					
BH#	Location	Approx. Station	Total Thickness (mm)		Predominant Underlying Material
			HMA	Granular/Fill	
106	MDL	Sta. (2+800)	55	345	Si(y) Cl Till
107	MDL	Sta. (2+800)	55	245	Si(y) Cl Till
Minimum Maximum Average			55 mm	245 mm 345 mm 295 mm	Only applicable to boreholes drilled in the mid-driving lane

BH = Borehole; TOS=Toe of Slope; CL=Centreline; MDL=Mid-Driving Lane.

3.0 LABORATORY TESTING

3.1 Soil Testing

Laboratory tests were performed on selected samples from the boreholes. The laboratory tests were performed according to LS Testing Methods and the results are summarized in Tables 3.1 and presented in Appendix C.

Table 3.1: Summary of Soil Classification Test Results

BHs#	Stations, o/s of CL			% Passing				OPS.PROV 1010 & Frost Susceptibility (75-5µm)	Atterberg Limits			Unified Soil Classification	M/C (%)
				Gravel >4.75mm	Sand 75µm to 4.75mm	Fines < 75µm			w _L	w _P	w _U		
						Silt	Clay						
McLaughlin Road													
BH1	AS1	Sta (0+050) o/s 1.1 m E of CL	MDL	41	49	10		Granular B	-	-	-	Sa & Gr, Tr Si	3.2
BH3	AS2	Sta (0+150) o/s 2.0 m W of CL	MDL	35	60	5		Granular B	-	-	-	Gr(y) Sa, Tr Si	3.1
BH5	AS1	Sta (0+250) o/s 2.0 m E of CL	MDL	31	61	8		Granular B	-	-	-	Gr(y) Sa, Tr Si	5.6
BH6	AS4	Sta (0+250) o/s 5.2 m E of CL	SHR	6	26	44	24	LSFH	24	15	9	CL: Cl(y) Sa(y) Si, Tr Gr	14
BH7	AS2	Sta (0+350) o/s 2.1 m W of CL	MDL	40	52	8		Granular B	-	-	-	Sa & Gr, Tr Si	3.4
BH11	AS1	Sta (0+550) o/s 2.0 m W of CL	MDL	47	46	7		Granular A	-	-	-	Sa & Gr, Tr Si	2.9
BH15	AS1	Sta (0+750) o/s 1.8 m W of CL	MDL	39	54	7		Granular B	-	-	-	Sa & Gr, Tr Si	3.0
BH21	AS2	Sta (1+050) o/s 1.8 m E of CL	MDL	52	41	7		Granular B	-	-	-	Sa & Gr, Tr Si	3.0
BH24	AS4	Sta (1+150) o/s 4.1 m W of CL	SHR	5	28	39	28	LSFH	38	17	21	CL, Sa(y) Cl(y) Tr Gr	14.3
BH25	AS1	Sta (1+250) o/s 1.9 m E of CL	MDL	39	52	9		Granular B	-	-	-	Sa & Gr, Tr Si	3.1
BH29	AS1	Sta (1+450) o/s 1.8 m E of CL	MDL	41	51	8		Granular B	-	-	-	Sa & Gr, Tr Si	3.1
BH31	AS2	Sta (1+550) o/s 2.0 m W of CL	MDL	60	35	5		Granular B	-	-	-	Sa(y) Gr, Tr Si	3.5
Spine Road													
BH38	AS3	Sta (2+450)	TOS	2	24	49	25	MSFH	34	17	17	Cl: Sa(y) Cl(y) Si, Tr Gr	11.1
BH64	AS3	Sta (1+500)	CL	5	22	45	28	MSFH	32	16	16	Cl: Sa(y) Cl(y) Si, Tr Gr	11.9
BH97	AS3	Sta (0+350)	CL	0	11	45	44	MSFH	41	18	23	Cl: Cl & Si, some Sa	18

BH = Borehole MDL=Mid-Driving Lane; TOS=Toe of Slope; CL=Centreline.
 BHs are described as per OPSD 100.060

3.2 Environmental Chemical Analysis

3.2.1 Environmental Sample Collection and Analysis

The environmental component of the subsurface investigation included the following activities:

- Conducting the soil sampling activities in accordance with the Ministry of the Environment (MOE) document entitled “*Guide for Completing Phase Two Environmental Site Assessments under Ontario Regulation 153/04*” dated June 2011, the Ministry of the Environment and Energy (MOEE) document entitled “*Guidance on Sampling and Analytical Methods for Use at Contaminated Sites in Ontario*”, dated December 1996; and MOE document entitled “*Protocol for Analytical Methods Used in the Assessment of Properties under Part XV.1 of the Environmental Protection Act*” issued by the Laboratory Services Branch of the MOE and dated March 9, 2004, amended as of July 1, 2011 (Analytical Protocol);
- Submission of sixteen (16) soil samples for laboratory analysis of metals and inorganics, two (2) soil samples for analysis of petroleum hydrocarbons (PHCs) and volatile organic compounds (VOCs) and nine (9) soil samples for analysis of organochlorine (OC) pesticides to assist in determining appropriate soil disposal options, if required, during construction;
- Submission of three (3) soil samples for Ontario Regulation 347 (*O. Reg. 347*) as amended by Ontario Regulation 558/00 (*O. Reg. 558/00*) Toxicity Characteristic Leaching Procedure (TCLP) for one or more of VOCs, benzo(a)pyrene (B(a)P), metals and inorganics, OC pesticides and polychlorinated biphenyls (PCBs) to determine landfill acceptability of soil/granular fill originating from the Site; and
- Comparison of the laboratory analytical results to soil standards presented in the Ministry of the Environment and Climate Change (MOECC) document entitled “*Soil, Ground Water and Sediment Standards for Use Under Part XV.1 of the Environmental Protection Act*,” (the “MOECC SCS”) dated April 15, 2011 and *O. Reg. 347*, as amended by *O. Reg. 558/00*, Schedule 4 Leachate Quality Criteria provided in the MOECC document entitled “*Registration Guidance Manual For Generators of Liquid Industrial and Hazardous Waste*,” October 2000 (the “Schedule 4 Criteria”).

3.2.2 Site Condition Standards

All analytical results were compared to the appropriate standards identified in the MOECC SCS. Soil results were compared to the MOECC Table 1 SCS for Residential/ Parkland/Institutional/ Industrial/ Commercial/ Community Property Use (Table 1 SCS) and Table 3 SCS for Residential/Parkland/Institutional Property Use (Table 3 SCS).

3.2.3 Soil Sampling, Inspection & Preservation Procedures

Soil samples were obtained for laboratory analysis and field screening, where applicable, using a drill rig.

The drillers obtained the sample by auguring to the specified depth and retrieving soil from the augers. The sample was inspected for visual and/or olfactory evidence of environmental impacts. Disposable nitrile gloves were used and replaced between the handling of successive samples.

Soil samples deemed to be representative of the Site conditions were collected and placed in laboratory-supplied glass jars equipped with Teflon seals and submitted for metals & inorganics. The samples were selected on the basis of visual/olfactory evidence of impacts, field screening results, or from the vicinity of the apparent water

table. All samples were stored in coolers, on ice, immediately after collection and during transport to the laboratory.

Using nitrile gloves, the remaining sample was transferred from the split spoon into clean (i.e., unused) resealable bags. Prior to measurement of soil headspace vapours, the bags were allowed to reach ambient temperature. Soil vapours in collected soil samples were measured with a RKI Eagle 2 portable gas meter. The RKI Eagle 2 was calibrated at the commencement of the field sampling programs using isobutylene reference gas (100 parts per million [ppm]) and hexane reference gas (100 ppm). The duplicate soil sample fractions were screened for both combustible organic vapour (COV) and total organic vapour (TOV) concentrations using the sample headspace method to facilitate sample selections for laboratory analysis and to provide an assessment of the vertical contaminant distributions at each borehole location, if applicable.

Representative soil samples collected during the investigation were submitted to AGAT Laboratories (AGAT) of Mississauga, Ontario, for metals and inorganics. AGAT is accredited by the Standards Council of Canada (SCC) and the Canadian Association for Laboratory Accreditation (CALA) in accordance with ISO/IEC 17025:2005 – “*General Requirements for the Competence of Testing and Calibration Laboratories*” for the tested parameters set out in the Soil, Ground Water and Sediment Standards.

3.2.4 Environmental Test Results & Considerations

Amec Foster Wheeler completed an Environmental Soil Quality Testing Program (the Investigation) as part of the Geotechnical Investigation. The details of the drilling program, including borehole locations and drilling methodology are presented in the geotechnical investigation sections of this report. Sixteen (16) soil samples for laboratory analysis of metals and inorganics, two (2) soil samples for analysis of PHCs and VOCs and nine (9) soil samples for analysis of OC pesticides were submitted as a part of the geotechnical investigation. Soil samples were selected from depths between 0.0 and 0.46 metres below ground surface (mbgs) based on measured combustible soil vapours, presence of fill material and depth of construction works.

Aside from fill material (i.e., silty sand and gravel) in select boreholes, no other evidence (i.e., visual/olfactory) of environmental impacts were observed in any of the soil samples collected from this project area. The RKI Eagle 2 was used to measure soil vapour readings in all boreholes. The readings were non-detectable for COV and ranged from non-detectable to 5 ppm for TOV.

The soil samples collected as part of this assessment that exceeded the Tables 1 and 3 SCS are as follows:

- BH4 AS1 for sodium adsorption ratio (SAR);
- BH28 AS1 for SAR;
- BH30 AS1 for SAR; and
- BH34 AS1 for SAR.

The soil samples collected as part of this assessment that exceed the Table 1 SCS are as follows:

- BH8 AS1 for PHC F4.

The remaining samples were below the Table 1 SCS for the parameters analyzed.

It should be noted that SAR is commonly associated with road salt used for de-icing activities along roads and highways. Exceedances of SAR will be exempt as per Section 48 (3) of O.Reg.153/04: “If, having regard to any phase one and phase two environmental site assessments for a property, a qualified person determines that an applicable site condition standard is exceeded at the property solely because a substance has been used on a highway for the purpose of keeping the highway safe for traffic under conditions of snow or ice or both, as provided for under section 2 of Regulation 339 of the Revised Regulations of Ontario, 1990 (Classes of

Contaminants — Exemptions), the applicable site condition standard is deemed not to be exceeded for the purpose of Part XV.1 of the Act. O. Reg. 153/04, s. 48 (3)". Therefore, soils elevated concentrations of SAR within the road allowance appear to originate from de-icing activities that have occurred along the road and therefore are not considered to exceed the SCS under O.Reg 153/04.

The reported leachate concentrations were compared to the Schedule 4 Criteria. The reported concentrations of metals & inorganics, VOCs, B(a)P, OC pesticides and PCBs were below the Schedule 4 Leachate Quality Criteria; therefore, the soil would be classified as non-hazardous for disposal at an approved landfill.

If soil is required to be removed from the site it should be disposed at a licensed landfill, equivalent receiving facility or disposed of at a quarry for reclamation purposes.

The laboratory certificates of analysis for the bulk analysis as well as the *O. Reg. 347* TCLP analysis are included in Appendix D. The results of the laboratory analysis are summarized in Tables 3.2 to 3.6 as below:

- Table 3.2 - Borehole Soil Chemical Analysis - Metals & Inorganic Parameters;
- Table 3.3 - Borehole Soil Chemical Analysis - Petroleum Parameter;
- Table 3.4 - Borehole Soil Chemical Analysis - Volatile Organic Compounds;
- Table 3.5 - Borehole Soil Chemical Analysis - OC Pesticides; and
- Table 3.6 - Ontario Regulation 347 Volatile Organic Compounds, Benzo(a)Pyrene, Metals and Inorganics and OC Pesticides & PCB Parameters.

3.2.5 Quality Assurance / Quality Control

Laboratory Quality Control: The 2011 Analytical Protocol provides requirements for sample handling and storage requirements, reporting requirements, analytical methods and QA/QC procedures for analytical parameters.

As per the 2011 Analytical Protocol, all samples/sample extracts were analyzed within their applicable hold times using approved analytical methods. The report limits were met for all samples and tested parameters.

Table 3.2 - Borehole Soil Chemical Analysis Metals & Inorganic Parameters

Sample Location	Borehole 4 BH4, AS1	Borehole 12 BH12, AS1	Borehole 18 BH18, AS1	Borehole 24 BH24, AS1	Borehole 28 BH28, AS1	Borehole 30 BH30, AS1	Borehole 34 BH34, AS1	Borehole 36 BH36 AS1	Borehole 46 BH46 AS1
Sample ID									
Soil Type	Topsoil	Silty Sand and Gravel	Silty Sand	Topsoil	Silty Sand and Gravel	Silty Sand and Gravel	Silty Sand with Clay	Silty Sand with Clay	Topsoil
Depth (metres below ground level)	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2
Field Vapour Reading (COV/TOV)	0/2	0/1	0/2	0/0	0/0	0/1	0/0	0/0	0/1
Sampling Date	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/20/2017	10/20/2017
Laboratory ID	8852230	8852289	8852292	8852298	8852302	8852303	8852304	8845488	8845489
Certificate of Analysis No.	17T276361	17T276361	17T276361	17T276361	17T276361	17T276361	17T276361	17T275410	17T275410
	Unit	RDL	Table 1 ^A	Table 3 ^B					
Antimony	µg/g	0.8	1.3	7.5	<	<	<	<	<
Arsenic	µg/g	1	18	18	3	3	3	3	5
Barium	µg/g	2	220	390	40	30	30	31	77
Beryllium	µg/g	0.5	2.5	(5) 4	<	<	<	<	<
Boron	µg/g	5	36	120	<	<	<	5	<
Boron (Hot Water Soluble)	µg/g	0.10	NA	1.5	0.27	0.23	0.37	0.16	0.2
Cadmium	µg/g	0.5	1.2	1.2	<	<	<	<	<
Chromium	µg/g	2	70	160	17	22	41	19	22
Cobalt	µg/g	0.5	21	22	4.8	4.1	4.1	4.9	4.4
Copper	µg/g	1	92	(180) 40	27	26	32	32	31
Lead	µg/g	1	120	120	24	21	25	16	36
Molybdenum	µg/g	0.5	2	6.9	0.5	1.7	1.6	0.9	0.7
Nickel	µg/g	1	82	(130) 100	10	8	12	10	11
Selenium	µg/g	0.4	1.5	2.4	<	<	<	<	<
Silver	µg/g	0.2	0.5	(25) 20	<	<	<	<	<
Thallium	µg/g	0.4	1	1	<	<	<	<	<
Uranium	µg/g	0.5	2.5	23	<	<	<	<	<
Vanadium	µg/g	1	86	86	18	15	16	17	19
Zinc	µg/g	5	290	340	63	88	142	75	94
Chromium VI	µg/g	0.2	0.66	(10) 8	<	<	<	<	<
Cyanide	µg/g	0.040	0.051	0.051	<	<	<	<	<
Mercury	µg/g	0.10	0.27	(1.8) 0.27	<	<	<	<	<
Electrical Conductivity	mS/cm	0.005	0.57	0.7	0.535	0.125	0.190	0.168	0.169
Sodium Adsorption Ratio	NA	NA	2.4	5	7.88	0.173	0.193	0.402	5.14
pH, 2:1 CaCl ₂ Extraction	pH Units	NA	NA	See Note*	7.58	7.44	7.33	7.62	8.02

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Residential / Parkland / Institutional Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "" As per Ontario Regulation 153/04, in order to apply the generic Site Condition Standards, pH for surface soil (<1.5 metres) should be between 5 and 9 and for subsurface soil (>1.5 metres), pH should be between 5 and 11. "µg/g" means micrograms per gram. "mS/cm" means milli-Siemens per centimetre. "NA" means not applicable/available.

Sample Location Sample ID Soil Type Depth (metres below ground level) Field Vapour Reading (COV/TOV) Sampling Date Laboratory ID Certificate of Analysis No.	Borehole 54 BH 54, AS1 Silty Clay to Silty Sand 0.0 - 0.3 0/0 10/18/2017 8833660 17T273733	Borehole 62 BH 62, AS1 Topsoil 0.0 - 0.3 0/0 10/18/2017 8833663 17T273733	Borehole 68 BH 68, AS1 Clayey Silt 0.0 - 0.3 0/1 10/18/2017 8833664 17T273733	Borehole 77 BH 77, AS1 Topsoil 0.0 - 0.3 0/0 10/18/2017 8833665 17T273733	Borehole 86 BH86 AS1 Topsoil 0.0 - 0.3 0/1 10/20/2017 8845506 17T275401	Borehole 96 BH96 AS1 Topsoil 0.0 - 0.3 0/0 10/20/2017 8845507 17T275401	Borehole 103 BH103 AS1 Topsoil 0.0 - 0.2 0/0 10/20/2017 8845495 17T275401				
	Unit	RDL	Table 1 ^A	Table 3 ^B							
Antimony	µg/g	0.8	1.3	(50) 40	<	<	<	<	<	<	<
Arsenic	µg/g	1	18	18	5	5	4	4	4	4	5
Barium	µg/g	2	220	670	58	103	67	71	51	62	92
Beryllium	µg/g	0.5	2.5	(10) 8	0.7	0.8	0.7	0.7	0.6	0.6	0.7
Boron	µg/g	5	36	120	<	<	<	<	<	<	<
Boron (Hot Water Soluble)	µg/g	0.10	NA	2	0.25	0.32	0.42	0.37	0.28	0.52	0.77
Cadmium	µg/g	0.5	1.2	1.9	<	<	<	<	<	<	<
Chromium	µg/g	2	70	160	20	29	20	20	17	19	23
Cobalt	µg/g	0.5	21	(100) 80	9.7	14.4	8.4	9.1	8.2	8.7	12.3
Copper	µg/g	1	92	(300) 230	21	23	17	16	17	18	19
Lead	µg/g	1	120	120	13	11	13	12	11	16	15
Molybdenum	µg/g	0.5	2	40	<	<	<	<	<	<	0.6
Nickel	µg/g	1	82	(340) 270	18	31	17	17	16	16	18
Selenium	µg/g	0.4	1.5	5.5	<	<	<	<	<	0.4	0.5
Silver	µg/g	0.2	0.5	(50) 40	<	<	<	<	<	<	<
Thallium	µg/g	0.4	1	3.3	<	<	<	<	<	<	<
Uranium	µg/g	0.5	2.5	33	0.6	0.7	0.9	0.7	<	0.6	0.7
Vanadium	µg/g	1	86	86	32	39	30	28	26	27	33
Zinc	µg/g	5	290	340	60	71	59	65	52	74	83
Chromium VI	µg/g	0.2	0.66	(10) 8	<	<	<	<	<	<	<
Cyanide	µg/g	0.040	0.051	0.051	<	<	<	<	<	<	<
Mercury	µg/g	0.10	0.27	(20) 3.9	<	<	<	<	<	<	<
Electrical Conductivity	mS/cm	0.005	0.57	1.4	0.139	0.312	0.116	0.096	0.068	0.200	0.182
Sodium Adsorption Ratio	NA	NA	2.4	12	0.118	0.838	0.163	0.154	0.114	0.208	0.316
pH, 2:1 CaCl ₂ Extraction	pH Units	NA	NA	See Note ^A	6.69	7.30	6.68	5.64	5.43	7.12	6.49

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Residential / Parkland / Institutional Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "" As per Ontario Regulation 153/04, in order to apply the generic Site Condition Standards, pH for surface soil (<1.5 metres) should be between 5 and 9 and for subsurface soil (>1.5 metres), pH should be between 5 and 11. "µg/g" means micrograms per gram. "mS/cm" means milli-Siemens per centimetre. "NA" means not applicable/available.

Table 3.3 - Borehole Soil Chemical Analysis Petroleum Parameters

Sample Location					Borehole 8	Borehole 22
Sample ID					BH8, AS1	BH22, AS1
Soil Type					Silty Sand and Gravel	Sand and Gravel
Depth (metres below ground level)					0.0 - 0.2	0.2 - 0.5
Field Vapour Reading (COV/TOV)					0/5	0/0
Sampling Date					10/23/2017	10/23/2017
Laboratory ID					8852256	8852295
Certificate of Analysis No.					17T276361	17T276361
	Unit	RDL	Table 1 ^A	Table 3 ^B		
Benzene	µg/g	0.02	0.02	(0.17) 0.21	<	<
Toluene	µg/g	0.02	0.2	(6) 2.3	<	<
Ethylbenzene	µg/g	0.05	0.05	(15) 2	<	<
Xylene Mixture	µg/g	0.05	0.05	(25) 3.1	<	<
F1 (C6 to C10) minus BTEX	µg/g	5	25	(65) 55	<	<
F2 (C10 to C16)	µg/g	10	10	(150) 98	<	<
F3 (C16 to C34)	µg/g	50	240	(1,300) 300	210	89
F4 (C34 to C50)	µg/g	50	120	(5,600) 2,800	200	71
Gravimetric Heavy Hydrocarbons	µg/g	50	120	(5,600) 2,800	NA	NA

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Residential / Parkland / Institutional Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "µg/g" means micrograms per gram. C10 notation means 10 (or corresponding number) carbon chain. "NA" means not applicable/available.

Table 3.4 - Borehole Soil Chemical Analysis Volatile Organic Compounds

Sample Location					Borehole 8	Borehole 22
Sample ID					BH8, AS1	BH22, AS1
Soil Type					Silty Sand and Gravel	Sand and Gravel
Depth (metres below ground level)					0.0 - 0.2	0.2 - 0.5
Field Vapour Reading (COV/TOV)					0/5	0/0
Sampling Date					10/23/2017	10/23/2017
Laboratory ID					8852256	8852295
Certificate of Analysis No.					17T276361	17T276361
	Unit	RDL	Table 1 ^A	Table 3 ^B		
Dichlorodifluoromethane	µg/g	0.05	0.05	(25) 16	<	<
Vinyl Chloride	µg/g	0.02	0.02	(0.022) 0.02	<	<
Bromomethane	µg/g	0.05	0.05	0.05	<	<
Trichlorofluoromethane	µg/g	0.05	0.25	(5.8) 4	<	<
Acetone	µg/g	0.50	0.5	(28) 16	<	<
1,1-Dichloroethylene	µg/g	0.05	0.05	0.05	<	<
Methylene Chloride	µg/g	0.05	0.05	(0.96) 0.1	<	<
Trans- 1,2-Dichloroethylene	µg/g	0.05	0.05	(0.75) 0.084	<	<
Methyl tert-butyl Ether	µg/g	0.05	0.05	(1.4) 0.75	<	<
1,1-Dichloroethane	µg/g	0.02	0.05	(11) 3.5	<	<
Methyl Ethyl Ketone	µg/g	0.50	0.5	(44) 16	<	<
Cis- 1,2-Dichloroethylene	µg/g	0.02	0.05	(30) 3.4	<	<
Chloroform	µg/g	0.04	0.05	(0.18) 0.05	<	<
1,2-Dichloroethane	µg/g	0.03	0.05	0.05	<	<
1,1,1-Trichloroethane	µg/g	0.05	0.05	(3.4) 0.38	<	<
Carbon Tetrachloride	µg/g	0.05	0.05	(0.12) 0.05	<	<
1,2-Dichloropropane	µg/g	0.03	0.05	(0.085) 0.05	<	<
Trichloroethylene	µg/g	0.03	0.05	(0.52) 0.061	<	<
Bromodichloromethane	µg/g	0.05	0.05	13	<	<
Methyl Isobutyl Ketone	µg/g	0.50	0.5	(4.3) 1.7	<	<
1,1,2-Trichloroethane	µg/g	0.04	0.05	(0.05)	<	<
Dibromochloromethane	µg/g	0.05	0.05	9.4	<	<
Ethylene Dibromide	µg/g	0.04	0.05	0.05	<	<
Tetrachloroethylene	µg/g	0.05	0.05	(2.3) 0.28	<	<
1,1,1,2-Tetrachloroethane	µg/g	0.04	0.05	(0.05) 0.058	<	<
Chlorobenzene	µg/g	0.05	0.05	(2.7) 2.4	<	<
Bromoform	µg/g	0.05	0.05	(0.26) 0.27	<	<
Styrene	µg/g	0.05	0.05	(2.2) 0.7	<	<
1,1,2,2-Tetrachloroethane	µg/g	0.05	0.05	0.05	<	<
1,3-Dichlorobenzene	µg/g	0.05	0.05	(6) 4.8	<	<
1,4-Dichlorobenzene	µg/g	0.05	0.05	(0.097) 0.083	<	<
1,2-Dichlorobenzene	µg/g	0.05	0.05	(4.3) 3.4	<	<
1,3-Dichloropropene	µg/g	0.04	0.05	(0.083) 0.05	<	<
n-Hexane	µg/g	0.05	0.05	(34) 2.8	<	<

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Industrial / Commercial / Community Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "µg/g" means micrograms per gram.

Table 3.5 - Borehole Soil Chemical Analysis OC Pesticides

Sample Location	Borehole 36	Borehole 46	Borehole 54	Borehole 62	Borehole 68	Borehole 77	Borehole 86	Borehole 96	Borehole 103
Sample ID	BH36 AS1	BH46 AS1	BH 54, AS1	BH62, AS1	BH 68, AS1	BH 77, AS1	BH86 AS1	BH96 AS1	BH103 AS1
Soil Type	Silty Sand with Clay	Topsoil	Silty Clay to Silty Sand	Topsoil	Clayey Silt	Topsoil	Topsoil	Topsoil	Topsoil
Depth (metres below ground level)	0.0 - 0.2	0.0 - 0.2	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.2
Field Vapour Reading (COV/TOV)	0/0	0/1	0/0	0/0	0/1	0/0	0/1	0/0	0/0
Sampling Date	10/20/2017	10/20/2017	10/18/2017	10/18/2017	10/18/2017	10/18/2017	10/20/2017	10/20/2017	10/20/2017
Laboratory ID	8845488	8845489	8833660	8833663	8833664	8833665	8845506	88445507	8845495
Certificate of Analysis No.	17T275410	17T275410	1712/3/33	1712/3/33	1712/3/33	1712/3/33	1712/5401	1712/5401	1712/6401
	Unit	RDL	Table 1 ^A	Table 3 ^B					
Hexachloroethane	µg/g	0.01	0.01	(0.071) 0.089	<	<	<	<	<
Gamma-Hexachlorocyclohexane	µg/g	0.005	0.01	(0.063) 0.056	<	<	<	<	<
Heptachlor	µg/g	0.005	0.05	0.15	<	<	<	<	<
Aldrin	µg/g	0.005	0.05	0.05	<	<	<	<	<
Heptachlor Epoxide	µg/g	0.005	0.05	0.05	<	<	<	<	<
Endosulfan	µg/g	0.005	0.04	0.04	<	<	<	<	<
Chlordane	µg/g	0.007	0.05	0.05	<	<	<	<	<
DDE	µg/g	0.007	0.05	(0.33) 0.26	<	<	<	<	<
DDD	µg/g	0.007	0.05	3.3	<	<	<	<	<
DDT	µg/g	0.007	1.4	1.4	<	<	<	<	<
Dieldrin	µg/g	0.005	0.05	0.05	<	<	<	<	<
Endrin	µg/g	0.005	0.04	0.04	<	<	<	<	<
Methoxychlor	µg/g	0.005	0.05	0.13	<	<	<	<	<
Hexachlorobenzene	µg/g	0.005	0.01	0.52	<	<	<	<	<
Hexachlorobutadiene	µg/g	0.01	0.01	(0.014) 0.012	<	<	<	<	<

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Industrial / Commercial / Community Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "µg/g" means micrograms per gram.

Table 3.6 - Ontario Regulation 347 Volatile Organic Compounds, Benzo(a)Pyrene, Metals & Inorganics, and OC Pesticides & PCB Parameters

Sample Location Sample ID	Borehole 6 BH6, AS2 + AS3	Borehole 54 BH54, AS2+AS3	Borehole 95 BH95, AS2+AS3			
Sampling Date	10/23/2017	10/18/2017	10/20/2017			
Laboratory ID	8852232	8834648	8847372			
Certificate of Analysis No.	17T276361	17T273735	17T275400			
	Units	RDL	Schedule 4 ^A			
Volatile Organic Compounds						
Vinyl Chloride	mg/L	0.030	0.2	<	<	<
1,1-Dichloroethene	mg/L	0.020	1.4	<	<	<
Dichloromethane	mg/L	0.030	5.0	<	<	<
Methyl Ethyl Ketone	mg/L	0.090	200	<	<	<
Chloroform	mg/L	0.020	10.0	<	<	<
1,2-Dichloroethane	mg/L	0.020	0.5	<	<	<
Carbon Tetrachloride	mg/L	0.020	0.5	<	<	<
Benzene	mg/L	0.020	0.5	<	<	<
Trichloroethene	mg/L	0.020	5.0	<	<	<
Tetrachloroethene	mg/L	0.050	3.0	<	<	<
Chlorobenzene	mg/L	0.010	8.0	<	<	<
1,2-Dichlorobenzene	mg/L	0.010	20.0	<	<	<
1,4-Dichlorobenzene	mg/L	0.010	0.5	<	<	<
Benzo(a)Pyrene						
Benzo(a)Pyrene	mg/L	0.001	0.001	<	<	<
Metals & Inorganics						
Arsenic Leachate	mg/L	0.010	2.5	<	<	<
Barium Leachate	mg/L	0.100	100	1.01	0.493	0.35
Boron Leachate	mg/L	0.050	500	0.052	0.074	0.064
Cadmium Leachate	mg/L	0.010	0.5	<	<	<
Chromium Leachate	mg/L	0.010	5.0	<	<	<
Lead Leachate	mg/L	0.010	5.0	0.017	<	<
Mercury Leachate	mg/L	0.01	0.1	<	<	<
Selenium Leachate	mg/L	0.010	1.0	<	<	<
Silver Leachate	mg/L	0.010	5.0	<	<	<
Uranium Leachate	mg/L	0.050	10.0	<	<	<
Fluoride Leachate	mg/L	0.05	150	0.16	0.24	0.23
Cyanide Leachate	mg/L	0.05	20.0	<	<	<
(Nitrate + Nitrite) as N Leachate	mg/L	0.70	1,000	<	<	<
OC Pesticides & PCBs						
Heptachlor + Heptachlor Epoxide	mg/L	0.0003	0.3	N/A	<	<
Aldrin + Dieldrin	mg/L	0.0007	0.07	N/A	<	<
DDT + Metabolites	mg/L	0.003	3.0	N/A	<	<
Methoxychlor	mg/L	0.09	90.0	N/A	<	<
Chlordane (Total)	mg/L	0.0007	0.7	N/A	<	<
Aldrin	mg/L	0.0002	N/A	N/A	<	<
alpha - chlordane	mg/L	0.0001	N/A	N/A	<	<
gamma-Chlordane	mg/L	0.0002	N/A	N/A	<	<
Oxychlordane	mg/L	0.0004	N/A	N/A	<	<
pp'-DDE	mg/L	0.0005	N/A	N/A	<	<
pp'-DDD	mg/L	0.0015	N/A	N/A	<	<
op'-DDT	mg/L	0.0015	3.0	N/A	<	<
pp'-DDT	mg/L	0.0005	N/A	N/A	<	<
Dieldrin	mg/L	0.0005	N/A	N/A	<	<
Heptachlor	mg/L	0.0001	N/A	N/A	<	<
Heptachlor Epoxide	mg/L	0.0002	N/A	N/A	<	<
Lindane	mg/L	0.0004	0.4	N/A	<	<
PCB's	mg/L	0.0002	0.3	N/A	<	<
Endrin	mg/L	0.0004	0.02	N/A	<	<
Toxaphene	mg/L	0.0005	0.5	N/A	<	<

Notes: (A) Ontario Ministry of the Environment (MOE) "Registration Guidance Manual for Generators of Liquid Industrial and Hazardous Waste" (October 2000) Schedule 4 Leachate Quality Criteria, as amended by Ontario Regulation 558/00. Schedule 4 exceedances if any, indicated by **BOLD**. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "mg/L" means milligrams per litre.

4.0 PAVEMENT DESIGN

4.1 Pavement Adequacy

Two (2) methods were used to assess the existing pavement structure adequacy. In-situ structure number (“SN”) and in-situ Granular Base Equivalency (“GBE”) were estimated from the borehole data using the equivalency factors for various material types, as shown in Table 4.1.

Table 4.1 - Typical Structural Layer Coefficient

Material Type	Typical AASHTO-Ontario Structural Layer Coefficient (SLC), ai (mm) ⁽¹⁾		Granular base Equivalency Factors ⁽²⁾
	Drainage	Structural	
Rehabilitation			
Existing HL			1.25
Existing Gran Base	Acceptable 1.0	0.14 to 0.28	0.75
Existing Gran Sub-base	Questionable 0.9	0.10 to 0.14	0.5
Existing Gran Base/Sub-base	Inadequate 0.8 to 0.5	0.05 to 0.09	0.625
For Resurfacing			
Old HMA	1.0	0.28	-
Old Granular / drainage	0.9	0.12	-
Pulverization	1.0	0.10 to 0.14	1.0
CIR	1.0	0.28 to 0.38	1.6 – 1.8
RAP/Gran A blended stabilized with EAM	1.0	0.20 to 0.25	1.0

Notes:

- (1) MTO Report MI-183 - MTO Report MI-183 "Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions" - Table 4-5.
- (2) MTO Pavement Design Rehabilitation Manual 1990 – Table 3.5.

Table 4.2 displays the total average pavement structural thickness of the existing asphaltic concrete pavement, granular base and sub-base, as well as the average existing structure number ‘GBE’ and ‘SN’ before rehabilitation.

Table 4.2 - Summary of Existing Pavement Structure

Number of Boreholes	Thickness (mm)			GBE	SN
	Tps / Organics	HMA	Base/Sub-Base	(mm)	
McLaughlin Road					
# of BHs = 17 @MDL	-	Range (40 - 70) mm Average 57 mm	Range (340 – 785) mm Average 615 mm	Range (288-572) mm Average 454 mm	Range (48-80) mm Average 65 mm
# of BHs = 17 for Widening	Range (150 - 200) mm Average 170 mm	-	Range (200 – 850) mm Average 500 mm	-	-
Chinguacousy Road					
# of BHs = 2 @MDL	-	55 mm	Range (245 – 345) mm Average 295 mm	Range (222-284) mm Average 253 mm	Range (39-46) mm Average 43 mm
Spine Road (New Alignment)					
# of BHs = 71 @ CL & TOS	Range (180 - 400) mm Average 260 mm	-	-	-	-

BH = Borehole; MDL=Mid-Driving Lane; CL=Centreline; TOS=Toe of Slope.

4.2 Existing and Forecasted Traffic Data

McLaughlin Road is 2-lane rural road, and is proposed to be widened to 4 lanes. Spine Road is a new alignment where it is planned to be 4 lanes west of Hwy 10 to railway crossing and 2 lanes to Chinguacousy Road. The traffic data represented as Average Annual Daily Traffic (AADT) and percentage of commercial vehicles (%) was provided by Amec Foster Wheeler Transportation Group, and is summarized in Table 4.3. These traffic data was used to calculate the projected traffic for an anticipated construction year in 2019. The traffic loading represented in equivalent single axle loads (ESALs) was then calculated cumulatively over 20 years (to 2039), as described in the Ministry of Transportation Report "Procedures For Estimating Traffic Loads For Pavement Design, 1995".

Table 4.3 – Traffic Data

Road Section	AADT In Two Direction			% Trucks	Growth Rate (%)	Design ESALs 20 Yrs
	2016	2019 ⁽¹⁾	2031 ⁽²⁾			
Spine Road	-	9,234	32,760	2.0%	⁽³⁾	2,914,408 ~3X10 ⁶ ⁽⁵⁾
McLaughlin Rd - Mayfield to Collector Rd B	3,420	-	12,340	3.2%		
McLaughlin Rd - Collector Rd B to Spine Rd ⁽⁴⁾	3,420	4,694	16,650	3.2%	11.13%	2,370,410 ~3X10 ⁶ ⁽⁵⁾
McLaughlin Rd - Spine to Collector Rd A	3,420	-	9,560	3.2%		
McLaughlin Rd - Collector Rd A to Old School Rd	3,420	-	9,560	3.2%		

Notes:

- (1) 2019 is the anticipated construction year.
- (2) 2031 is the horizon year.
- (3) Growth rate assumed similar to McLaughlin Rd - Collector Rd B to Spine.
- (4) The higher traffic as noted above was used for the pavement design of McLaughlin Road.
- (5) Maximum ESAL Selected to Design Pavement Structure. Traffic Category 'C' for ESALs 3 to 10 Million.

4.3 Flexible Structural Pavement Design for Widening/Reconstruction

After reviewing the field data and laboratory test results, the minimum pavement structural design for widening of McLaughlin Road and constructing Spine Road is presented in Table 4.4 and was determined in accordance with the 1993 American Association of State Highway and Transportation Officials ('AASHTO') Guide for the Design of Pavement Structures using the Darwin Software Program.

The AASHTO Pavement Design is considered to be a function of estimated future traffic in both directions (ESALs), reliability (R), which is a function of road classification, overall standard deviation (S_o), resilient modulus (M_r), as well as initial and terminal serviceability (P_o , P_t). From these parameters, the structure number (SN) is calculated. The SN is defined in the AASHTO Guide as a number, which provides a measure of the pavement strength and thickness needed to avoid overstressing the subgrade.

The following design parameters were chosen to calculate the required structure number for the design of the flexible pavement using the AASHTO method, as described in the Ministry of Transportation Materials Information Report MI-183 "Adaptation and Verification of AASHTO Pavement Design Parameters for Ontario Conditions".

	McLaughlin Rd	Spine Rd
ESALs (20 years design)	3X10 ⁶	3X10 ⁶
Initial serviceability, P _i	4.5	4.5
Terminal serviceability, P _t	2.5	2.5
Mean subgrade resilient modulus, Mr	30 MPa	20 MPa
Reliability level, R	90%	90%
Overall standard of deviation, S _o	0.49	0.49

Table 4.4 - Recommended Minimum Structural Pavement Design

Material Description	AASHTO'93 Pavement Design for 20 years	
	McLaughlin Road	Spine Road
Hot Mix Asphalt Concrete Surface Course HL3 or HL 1 or SP 12.5 Binder Course HDDB or HL 8 or SP 19	HMA = 150 mm 50 mm / PGAC 58-28 50+50 mm/ PGAC 58-28 Traffic Category 'C'	HMA = 150 mm 50 mm / PGAC 58-28 50+50 mm/ PGAC 58-28 Traffic Category 'C'
Granular Base 'A'	150 mm	150 mm
Granular Subbase 'B' Type II	300 mm	400 mm
Design Structure Number (DSN) mm	DSN = 123 mm	DSN = 140 mm
Selected Structure Number (SSN) mm	SSN = 126 mm	SSN = 140 mm
Total Pavement Thickness (mm)	600 mm	700 mm

Notes:

Pavement design shall be over approved subgrade.

Granular A and Granular B Type II: Compaction as per OPSS Form 1010 (100% SPMDD).

For widening sufficient granular to match the excavation level of the adjacent driving lane to promote positive lateral drainage.

4.3.1 Widening of McLaughlin Road

Pavement recommendations for widening of McLaughlin Road are presented in Table 4.4, including hot mix type, lift thickness, and PGAC type making up the recommended asphalt thickness, as well as the traffic category, in accordance with OPSS 1151. The granular thicknesses of the widening given in the table is a minimum thickness and should match the adjacent existing pavement granular thickness to promote positive lateral drainage. Also, the thicknesses can be increased depending on grading requirements.

Full depth excavation, as required and commencing from the existing edge of pavement, will be required to accommodate the proposed design thickness.

The excavated granular materials from the shoulder can be re-used as fill material for the widening/embankment, provided it is not contaminated. New Granular B subbase can then be added and compacted, followed by new Granular A base material.

Both base and subbase can vary in thickness to match the adjacent existing pavement granular in order to promote positive lateral drainage. The Granular A base course should be compacted, and overlain with 2 lifts of HL 8 or SP19.0 mm binder course and 1 lift of HL 3 or SP12.5 surface course, as per Table 4.4. Both base and subbase can vary in thickness to match the adjacent existing pavement granular in order to promote positive lateral drainage. Installation of subdrain is recommended, if lateral drainage of the existing subgrade is not possible.

4.3.2 New Alignment of Spine Road

The 71 boreholes advanced on the centerline of the new alignment and proposed toe of the slope revealed the depth of topsoil and organics in the range of 180 mm to 400 mm. Full depth excavation will be required to accommodate the proposed design thickness given in Table 4.4.

4.3.3 Tie-In between Spine Road and Chinguacousy Road

For resurfacing, partial depth removal to a depth of 55 mm and resurface with 90 mm with padding in areas requiring cross-fall and elevation corrections. This will extend the service life from 10 to 14 years.

- 40 mm surface course
- 50 mm of binder course

4.4 Rehabilitation Strategies

Given that McLaughlin Road will be widened from 2 to 4 lanes, two (2) selected rehabilitation strategies were based on Amec Foster Wheeler's geotechnical investigation and analysis, including a visual pavement condition assessment, subgrade condition, laboratory test results and calculated ESALs. Consideration was also given to user delay, cost and/or disruption of traffic and anticipated construction year of 2019. Implementation of rehabilitation strategy will only be possible if/where the future profile approximately matches the existing profile. Feasibility will be determined through the geometric and grading design process. Table 4.1 presents details of Rehabilitation strategies.

4.5.1 Partial Depth Reconstruction and Resurface

This option involves removal of total asphalt (70 mm) and further excavating to a total depth of 250 mm of granular materials, proof-rolling, completing base repair where needed, re-grading and compaction, addition of 100 mm of new granular A and compaction, and resurfacing with 150 mm of hot mix. This option will improve drainage and the structural capacity of the pavement and will have lower maintenance cost over the pavement service life than the existing pavement. In addition, it will not change the existing vertical profiles and will yield a Structure Number of 123 mm. Partial depth reconstruction is an option if raising the grade is not feasible.

4.5.2 In-Place Pulverization, Remixing and Resurfacing

This option will involve pulverizing the remaining asphalt to a total depth of 120 mm. The resulting mixture of asphalt concrete materials and granular is then graded to cross fall and compacted and used as a base. The advantages of this option include the elimination of surface defects and reflection cracking and the reuse of the existing material efficiently. Typically, the GBE for Bituminous crushed recovered material is in the order

of 1.0. In-place pulverization should be graded and compacted, and resurfaced with 120 mm of HMA. This will raise the vertical profile by 120 mm and will yield SN of 128 mm. Pulverization is cost-effective if raising the grade is feasible.

Table 4.5 – Rehabilitation Strategies

Rehabilitation Alternative	Activity
<p><u>Option 1:</u> Partial depth reconstruction and resurface. Excavate to a depth of 270 mm. Add 100 mm of Gran A followed by 140 mm of hot mix (50 mm of HL 1 or HL 3 or SP 12.5 and 50+50 mm of HL 8 or HDBC or SP 19 mm)</p> <p>(No increase in grade).</p>	<p>Gran A = 100 mm HMA = 150 mm (50+50+50)</p> <p>SN = 123 mm</p>
<p><u>Option 2:</u> In-Place Pulverization, Remixing, and Resurface with 120 mm of HMA (50 mm of HL 1 or HL 3 or SP 12.5 and 70 mm of HL 8 or HDBC or SP 19 mm)</p> <p>(120 mm increase in grade).</p>	<p>HMA = 120 mm (50+70)</p> <p>SN = 128 mm</p>

Detouring: No long term detouring is anticipated. Therefore, no special treatment will be required.

5.0 RECOMMENDATIONS AND CONSTRUCTION FEATURES FOR PAVEMENT

5.1 Widening of McLaughlin Road

It is anticipated that portion of McLaughlin Road will be widened, where alignment is changed and/or existing width is insufficient, where full re-construction is not recommended. Pavement recommendations for widening are provided in both Table 4.4, including hot mix type, lift thickness and PGAC type. For widening, full depth excavation is recommended, commencing from the existing edge of pavement. The design granular sub-base depth should be increased to match the existing subgrade to provide positive lateral drainage, if necessary. Where lateral drainage of the existing subgrade cannot be accommodated, installation of subdrain has to be considered.

5.2 New Alignment of Spine Road

Full depth excavation including topsoil, organics, soft or deleterious material will be required to accommodate the proposed design thickness given in Table 4.4.

5.3 Hot Mixes and PGAC Type

The following Marshall hot mixes should be used on McLaughlin and Spine Road:

- HL 2 leveling mix should be used to correct cross-fall and/or provide crown shifts (if required); and
- HL 3 (HS) or HL 1 or SP 12.5 surface course mix and HL 8 or HDBC or SP 19 binder course should be used to provide the roadway with high durability.

Material Specification should be as per OPSS 1150 Material Specification for Hot Mix Asphalt. For aggregates, the material specification should be as per OPSS.MUNI 1010.

Performance Graded Asphalt Cement (“PGAC”) 58-28 should be used for surface course and binder course. This PGAC should satisfy the requirements of MP1 of SHRP Specifications for Superpave.

Recycled Materials: The use of reclaimed asphalt pavement (RAP) is permitted in Marshall Mixes and Traffic Category ‘C’.

RAP containing steel slag aggregates should not be allowed.

Transition Treatments at Limits of Paving: At the limits of the project, a butt joint with the existing pavement is recommended. The butt joint between successive lifts of hot mix should be staggered at a distance of not less than 5 m, in accordance with OPSS 313. It should be ensured that no joint location corresponds with a joint location in any other layer.

The transition treatment from earth cut to earth fill should be in accordance with OPSD 205.010.

Tack Coat: It is recommended that all milled surfaces, and binder course surfaces will be tack coated prior to top course asphalt, if exposed to extended traffic. Construction Specification shall be as per OPSS Prov. 308.

5.4 Stripping and Sub-Excavation

No additional sub-excavation, other than removal of organics and topsoil, is anticipated within the widening limits of McLaughlin Road. The boreholes advanced for McLaughlin Road, revealed revealed the topsoil depth ranged from 150 mm to 200 mm.

Deeper stripping depths may be required, depending on the actual site conditions between borehole locations. Any unsuitable soft spots or saturated material encountered during stripping should also be removed.

5.5 Subgrade / Road Base Preparation and Compaction

The pavement structural design recommended for roads is applicable, provided the subgrade is prepared under dry weather conditions, proof-rolled with a heavy rubber-tired vehicle (such as a grader or loaded dump truck) in the presence of the geotechnical consultant. Any loose, soft or unstable areas, if detected during proof-rolling, must be sub-excavated, replaced with approved granular materials and compacted. Any additional engineered fill, if required, should be placed in thin layers not exceeding 200 mm and compacted to a minimum of 98 % of Standard Proctor Maximum Dry Density (SPMDD). Granular materials should be placed in thin layers not exceeding approximately 200 mm, within ± 2 % of its optimum moisture content, and thoroughly compacted to a minimum of 100 % of SPMDD.

The subgrade should be provided with adequate drainage. If wet weather conditions prevail at the time of construction, adjustments to this design may be required, i.e. if the subgrade becomes excessively wet or rutted during construction activities, additional sub-base material may be required. The need for additional

sub-base material is best determined during construction. All granular base and sub-base materials must be compacted to at least 100% of SPMDD.

5.6 Drainage

Prior to completing the rehabilitation, it is recommended that adequate drainage be provided both laterally and longitudinally along the length of the project.

To meet the design requirements for the pavement life, the road subgrade and granular courses should be well drained at all times. This can be accomplished by ensuring proper grading of the subgrade and positive lateral drainage of the granular base daylighting at the ditch. Alternatively, full-length perforated subdrain pipes of 150 mm diameter should be installed along both sides of the road, below the roadbed level, to ensure effective drainage, in accordance with OPSD 216.021. The sub-drain pipes should be wrapped in suitable non-woven geotextile surrounded by a minimum drainage zone of 19 mm size clear stone of minimum 150 mm thickness. A minimum slope of 2 % should be maintained across the paved sections (finished road surface) to ensure proper surface drainage. New pavement should slope towards the gutter/ditch.

5.7 Frost Depth

A minimum depth of 1.2 m should be used for frost protection as per OPSD 3090.101.

5.8 In-Situ Compaction for Hot Mix

In all areas, asphaltic concrete should be compacted as per OPSS 310, Table 10 (April 2011). It should be noted that the granular base and sub-base materials should be compacted to 100 % SPMDD.

Field Quality Assurance: Plate samples of loose hot mix should be obtained for each paving day, and extraction/gradation and full Marshall compliance testing should be carried out on these samples. The finished surface shall be true to required profile and cross-section within 6 mm from required elevations and thickness. The surface shall show no depressions or bumps exceeding 3 mm under a 3.0 m long straight edge, placed parallel to the road centreline.

6.0 CLOSURE

The sub-soil information contained in this report should be used solely for the purpose of the geotechnical investigation of this project.

The attached Report Limitations is an integral part of this report.

This report was prepared by Thomas Horvat, E.I.T. (Pavement/Geotechnical EIT), and Kate Slaman, B.Sc. (Environmental Scientist), and reviewed by Jonathan Wakani, P.Geo. (Senior Geoscientist), Hoda Seddik, M.A.Sc., P.Eng. (Senior Associate Pavement Engineer).

Sincerely,

**Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited**

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REPORT LIMITATIONS

The conclusions and recommendations given in this report are based on information determined at the test hole locations. The information contained herein in no way reflects on the environmental aspects of the project, unless otherwise stated. Subsurface and groundwater conditions between and beyond the test holes may differ from those encountered at the test hole locations, and conditions may become apparent during construction, which could not be detected or anticipated at the time of the site investigation. It is recommended practice that the Geotechnical Engineer be retained during the construction to confirm that the subsurface conditions across the site do not deviate materially from those encountered in the test holes.

The design recommendations given in this report are applicable only to the project described in the text, and then only if constructed substantially in accordance with the details stated in this report. Since all details of the design may not be known, Amec Foster Wheeler Environment & Infrastructure recommends that we be retained during the final design stage to verify that the design is consistent with our recommendations, and that assumptions made in our analysis are valid.

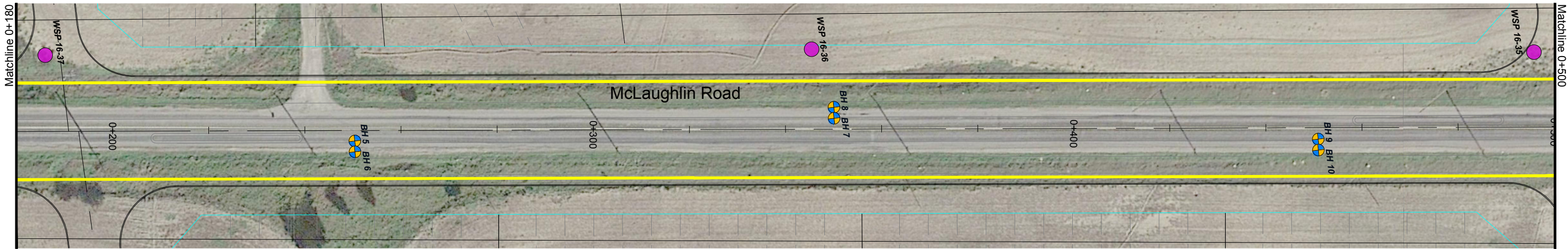
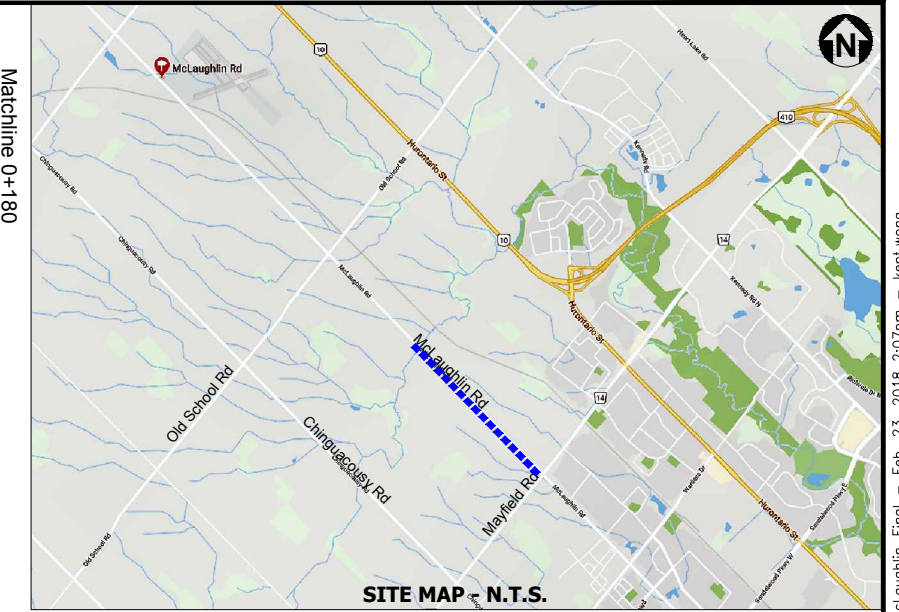
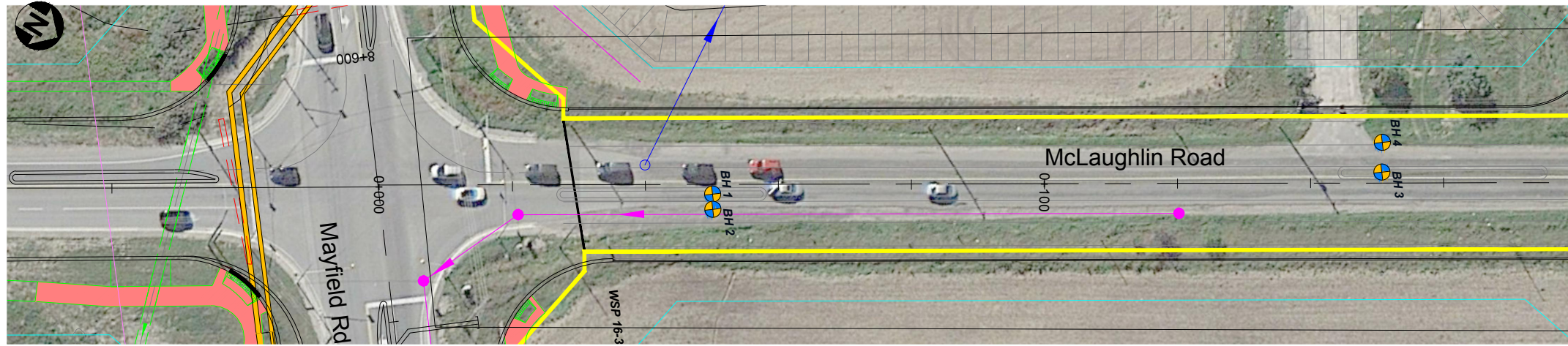
The comments made in this report relating to potential construction problems and possible methods of construction are intended only for the guidance of the designer. The number of test holes may not be sufficient to determine all the factors that may affect construction methods and costs. For example, the thickness of surficial topsoil or fill layers may vary markedly and unpredictably. The contractors bidding on this project or undertaking the construction should, therefore, make their own interpretation of the factual information presented and draw their own conclusions as to how the subsurface conditions may affect their work. This work has been undertaken in accordance with normally accepted geotechnical engineering practices. No other warranty is expressed or implied.

The benchmark and elevations mentioned in this report were obtained strictly for use by this office in the geotechnical design of the project. They should not be used by any other party for any other purpose. Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of such third parties. Amec Foster Wheeler Environment & Infrastructure accepts no responsibility for damages, if any, suffered by any third party as a result of decisions made or actions based on this report.

TM-GEO-03-02

Figures
Site Location Plan
Borehole Location Plans





LEGEND

- BOREHOLE LOCATION
- BOREHOLE LOCATION (WSP 2016)

APPROXIMATE SCALE

CLIENT LOGO

TOWN OF CALEDON

CLIENT

THE CORPORATION OF THE TOWN OF CALEDON

Units 3 & 4, 50 Vogell Road, Richmond Hill, Ontario, L4B 3K6

DWN BY: KW

CHK'D BY: HS

DATUM: NAD83

PROJECTION: UTM ZONE 17T

SCALE: AS SHOWN

TITLE

BOREHOLE LOCATION PLAN
McLaughlin Road

PROJECT

GEOTECHNICAL INVESTIGATION
McLaughlin Road, Chinguacousy Road and Spine Road
City of Brampton, Ontario

REV. NO.: A

DATE: FEBRUARY 2018



PROJECT NO: TPB166090.6000

FIGURE No. 1A

Z:\Projects\2017\TPB_Burlington\TPB166090.6000 - McLaughlin & Spine Rd Brampton (Caledon)\Drawings\Borehole Location Plan.dwg - Aug.2017_Proposed Borehole Location Plan.dwg - McLaughlin_Final - Feb. 23, 2018 2:07pm - kent.wong



LEGEND

-  BOREHOLE LOCATION
-  BOREHOLE LOCATION (WSP 2016)



APPROXIMATE SCALE

CLIENT LOGO



CLIENT

THE CORPORATION OF THE TOWN OF CALEDON

amec foster wheeler

Units 3 & 4, 50 Vogell Road, Richmond Hill, Ontario, L4B 3K6



DWN BY:
KW

CHK'D BY:
HS

DATUM:
NAD83

PROJECTION:
UTM ZONE 17T

SCALE:
AS SHOWN

TITLE

BOREHOLE LOCATION PLAN
McLaughlin Road

PROJECT

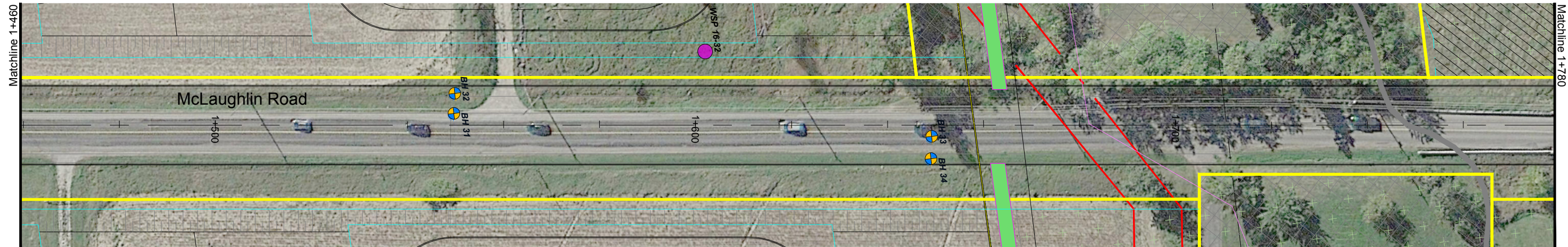
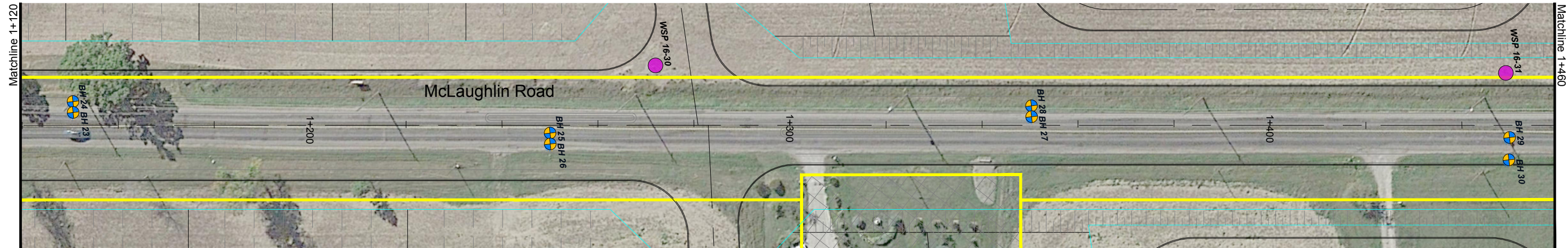
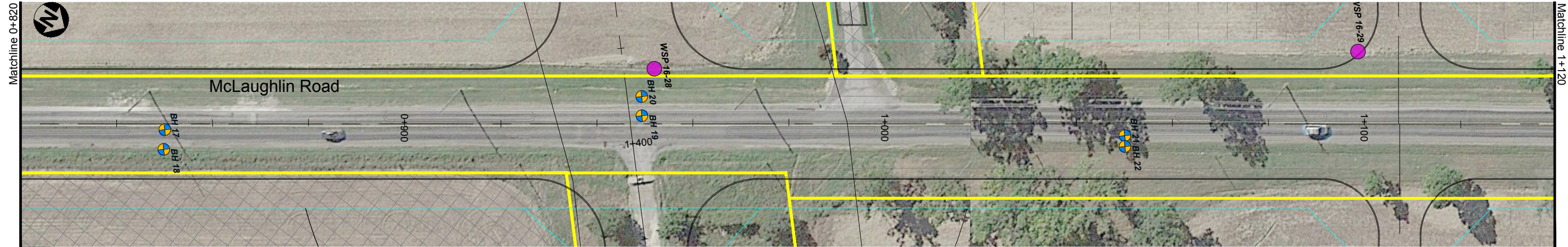
GEOTECHNICAL INVESTIGATION
McLaughlin Road, Chinguacousy Road and Spine Road
City of Brampton, Ontario

REV. NO.:
A



DATE:
FEBRAURY 2018

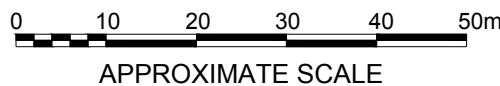
PROJECT NO:
TPB166090.6000

FIGURE No.
1C



LEGEND

-  BOREHOLE LOCATION
-  BOREHOLE LOCATION (WSP 2016)



CLIENT LOGO



CLIENT

THE CORPORATION OF THE TOWN OF CALEDON



DWN BY:

KW

CHK'D BY:

HS

DATUM:

NAD83

PROJECTION:

UTM ZONE 17T

SCALE:

AS SHOWN

TITLE

BOREHOLE LOCATION PLAN
McLaughlin Road

PROJECT

GEOTECHNICAL INVESTIGATION
McLaughlin Road, Chinguacousy Road and Spine Road
City of Brampton, Ontario

REV. NO.:

A

DATE:

FEBRAURY 2018

PROJECT NO.:

TPB166090.6000

FIGURE No.

1B

Matchline 1+020



Matchline 0+320

Matchline 0+020



LEGEND

- BOREHOLE LOCATION
- BOREHOLE LOCATION (WSP 2016)

0 10 20 30 40 50m
APPROXIMATE SCALE

CLIENT LOGO

TOWN OF CALEDON

CLIENT

THE CORPORATION OF THE TOWN OF CALEDON

amec foster wheeler
Units 3 & 4, 50 Vogell Road, Richmond Hill, Ontario, L4B 3K6

DWN BY: KW
CHK'D BY: HS
DATUM: NAD83
PROJECTION: UTM ZONE 17T
SCALE: AS SHOWN

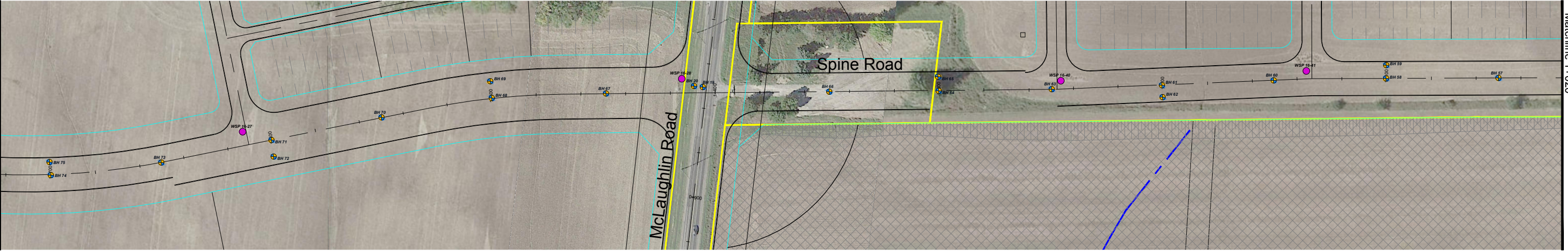
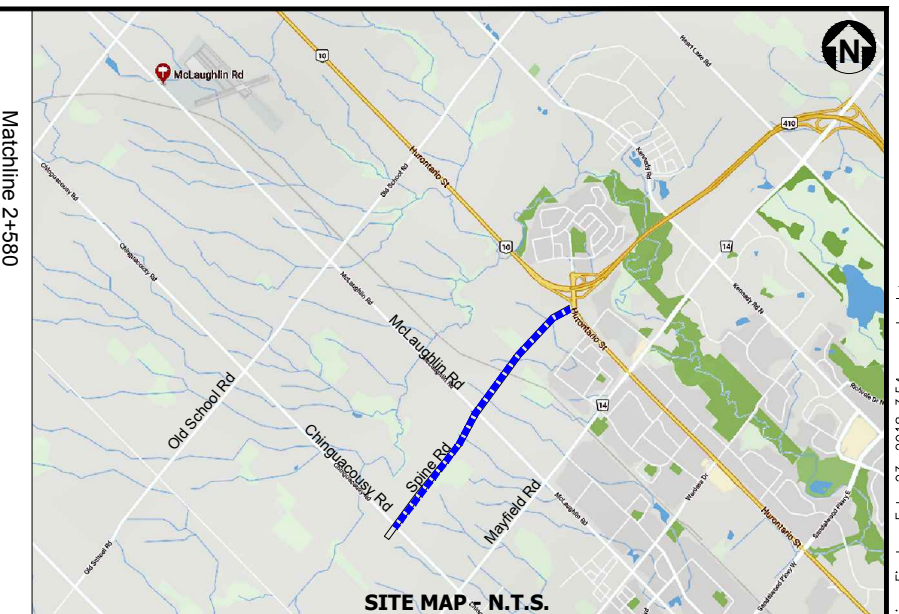
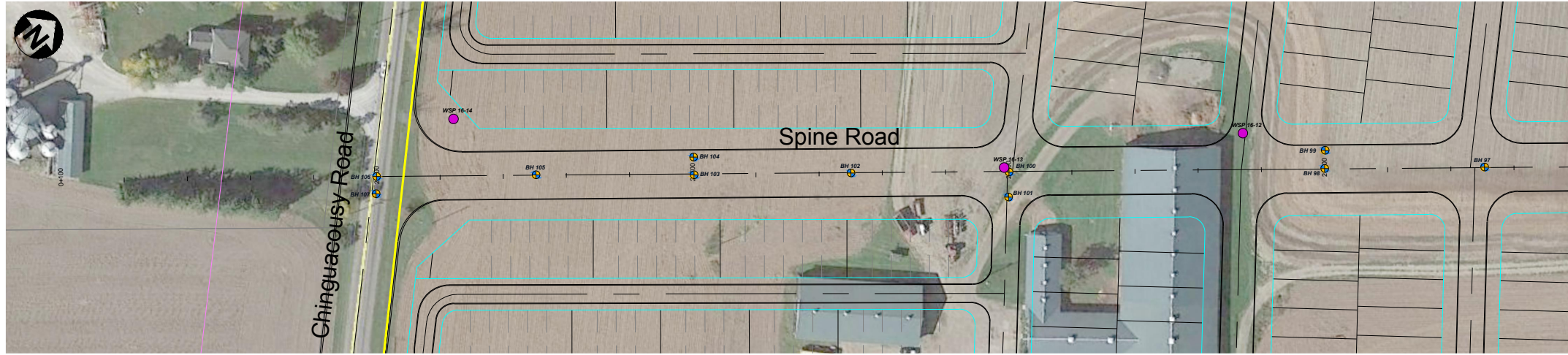
TITLE

**BOREHOLE LOCATION PLAN
Spine Road**

PROJECT

**GEOTECHNICAL INVESTIGATION
McLaughlin Road, Chinguacousy Road and Spine Road
City of Brampton, Ontario**

REV. NO.: A
DATE: FEBRAURY 2018
PROJECT NO: TPB166090.6000
FIGURE No. 2B



LEGEND

- BOREHOLE LOCATION
- BOREHOLE LOCATION (WSP 2016)

APPROXIMATE SCALE

CLIENT LOGO

TOWN OF CALEDON

CLIENT

THE CORPORATION OF THE TOWN OF CALEDON

Units 3 & 4, 50 Vogell Road, Richmond Hill, Ontario, L4B 3K6

DWN BY: KW

CHK'D BY: HS

DATUM: NAD83

PROJECTION: UTM ZONE 17T

SCALE: AS SHOWN

TITLE

BOREHOLE LOCATION PLAN
Spine Road

PROJECT

GEOTECHNICAL INVESTIGATION
McLaughlin Road, Chinguacousy Road and Spine Road
City of Brampton, Ontario

REV. NO.: A

DATE: FEBRAURY 2018

PROJECT NO: TPB166090.6000

FIGURE No. 2A

Z:\Projects\2017\IPB Burlington\IPB166090.6000 - McLaughlin & Spine Rd Brompton (Caledon)\Drawings\vrer\IPB166090.6000 - Aug2017_Proposed Borehole Location Plan.dwg - Spine_Final - Feb. 23, 2018 3:54pm - kent.wong

Appendix A

Pavement Condition Survey




APPENDIX - A Pavement Condition Photos



PROJECT NO. TPB166090.6000 - Widening of McLaughlin Road
PROJECT LOCATION McLaughlin Road From Mayfield Road to 1,700 m North of Mayfield Road
Caledon, Ontario

ENCLOSURE 1

	PHOTOGRAPH 1
	McLaughlin Road
	From Mayfield Road to 1700m North of Mayfield Road
<p>Fair Condition</p>	


	PHOTOGRAPH 2
	McLaughlin Road
	From Mayfield Road to 1700m North of Mayfield Road
<p>Fair Condition</p>	


APPENDIX - A Pavement Condition Photos



PROJECT NO. TPB166090.6000 - Widening of McLaughlin Road
PROJECT LOCATION McLaughlin Road From Mayfield Road to 1,700 m North of Mayfield Road
Caledon, Ontario

ENCLOSURE 2

	PHOTOGRAPH 3
	McLaughlin Road
	From Mayfield Road to 1700m North of Mayfield Road Fair to Poor Condition


	PHOTOGRAPH 4
	McLaughlin Road
	From Mayfield Road to 1700m North of Mayfield Road Fair to Poor Condition


APPENDIX - A Pavement Condition Photos



PROJECT NO. TPB166090.6000 - Widening of McLaughlin Road
PROJECT LOCATION McLaughlin Road From Mayfield Road to 1,700 m North of Mayfield Road
Caledon, Ontario

ENCLOSURE 3

	PHOTOGRAPH	5
	McLaughlin Road	
	From Mayfield Road to 1700m North of Mayfield Road	
<p>Fair to Poor Condition</p>		


	PHOTOGRAPH	6
	McLaughlin Road	
	From Mayfield Road to 1700m North of Mayfield Road	
<p>Fair to Poor Condition</p>		


APPENDIX - A Pavement Condition Photos



PROJECT NO. TPB166090.6000 - Widening of McLaughlin Road
PROJECT LOCATION McLaughlin Road From Mayfield Road to 1,700 m North of Mayfield Road
Caledon, Ontario

ENCLOSURE 4

	PHOTOGRAPH 7
	McLaughlin Road From Mayfield Road to 1700m North of Mayfield Road
	Fair to Poor Condition

	PHOTOGRAPH 8
	McLaughlin Road From Mayfield Road to 1700m North of Mayfield Road
	Fair to Poor Condition

APPENDIX - A Pavement Condition Photos



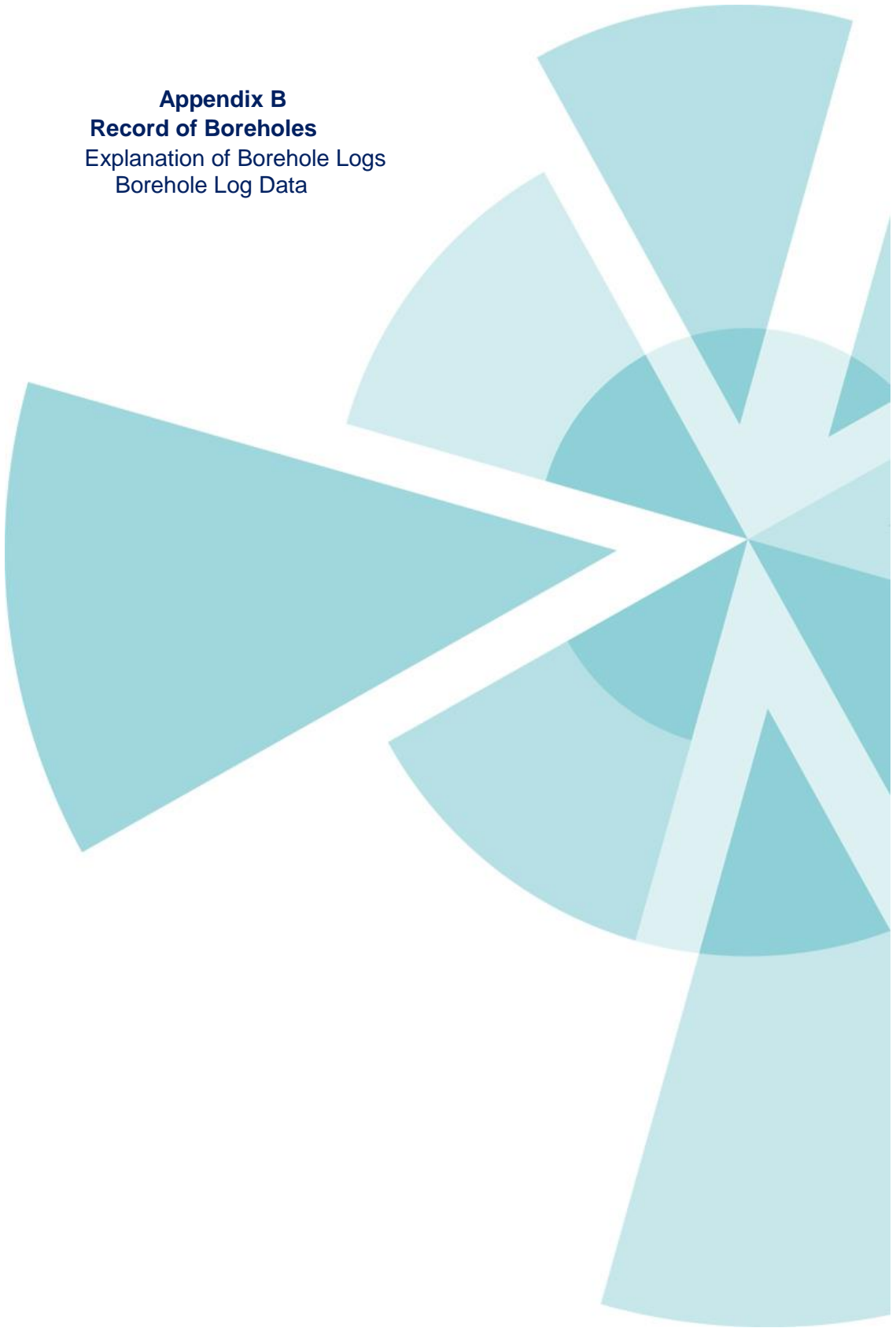
PROJECT NO. TPB166090.6000 - Widening of McLaughlin Road
PROJECT LOCATION McLaughlin Road From Mayfield Road to 1,700 m North of Mayfield Road
Caledon, Ontario

ENCLOSURE 5

	PHOTOGRAPH	9
	McLaughlin Road	
	From Mayfield Road to 1700m North of Mayfield Road	
<p>Fair to Poor Condition</p>		

	PHOTOGRAPH	10
	McLaughlin Road	
	From Mayfield Road to 1700m North of Mayfield Road	
<p>Fair to Poor Condition</p>		

Appendix B
Record of Boreholes
Explanation of Borehole Logs
Borehole Log Data



Acceptable	grey	Quant	quantity
Agg	heavy	Reinf	reinforced
Amor	highly	RF	rock fill
Asph	hot mix	RSS	remoulded shear strength
BH	high plasticity	Sa (y)	sand (y)
Bl	plasticity index	Sat	saturated
Bld (y)	loose	SH	shale
Blids	liquid	Sh Rk	shot rock
Blk	loam	Si (y)	silt (y)
Br	light	Sl (y)	slight (y)
BR	material	SP	slight plasticity
BU	maximum	SSM	select subgrade material
CF	maximum dry density	St	sensitivity
Cl (y)	medium	Stn (y)	stone (y)
Co	moderate	Stks	streaks
Cob	mottled	Surf	surface
Comp	medium plasticity	Temp	temperature
Conc	marl	TH	test hole
Contam	mulch	TP	test pit
Cord	maximum wet density	Tps	topsoil
Cr	no further progress	Tr	trace
D	no further progress (boulders)	Unreinf	unreinforced
Decomp	numerous	USS	undisturbed shear strength
Dk	overburden	Varv	varved
DR	occasional	VF	very fine
E	orange	w	field moisture content
F	organic	W	with
FB	organic matter	W _L	liquid limit
FH	pavement	W _d (y)	wood (y)
Fib	pedological	Weath	weathered
Fr Wat	penetration macadam	Wopt	optimum moisture content
Gr (y)	possible	Wp	plastic limit
Gran	prime and surface treated	WT	water table
Grn	polystyrene	Yel	yellow
Gry			
H			
Hi			
HM			
HP			
Ip			
L			
Liq			
Lo			
Lt			
Matl			
Max			
MDD			
Med			
Mod			
Mott			
MP			
Mrl			
Mul			
MWD			
NFP			
NFP (bids)			
Num			
Ob			
Occ			
Ora			
Org			
Org M			
Pavt			
Pedo			
Pen Mac			
Poss			
PST			
Psty			

SUSCEPTIBILITY TO FROST HEAVING

HSFH – High
MSFH – Medium
LSFH – Low

ONTARIO PROVINCIAL STANDARD DRAWING

Nov 2006 Rev 1



ABBREVIATIONS
GEOTECHNICAL

OPSD 100.060

BOREHOLE LOG DATA

McLaughlin Road

BH# 1 NBL

Sta (0+050) o/s 1.1 m E of CL

MDL

NAD'83 Coordinates: 17 T 4841901.809 593770.563

0	-	70	Asph		
70	-	400	Sa & Gr, Tr Si (w = 3.2%)	moist	(Fill)

Sieve	% Pass
13.2 mm	84.4
9.5 mm	72.6
4.75 mm	58.5
1.18 mm	40.5
300 µm	19.1
75 µm	9.8
Granular B	

400	-	600	Gry(y) Sa, Tr Cob	moist	(Fill)
600	-	900	Lt Br Si(y) Cl, some Sa	moist	(Fill)
900	-	1.5 m	Lt Br Si(y) Cl Till, some Sa, Tr Gr	moist	(Native)

BH# 2 NBL

Sta (0+050) o/s 5.5 m E of CL

MSH

NAD'83 Coordinates: 17 T 4841903.436 593772.139

0	-	300	Sa & Gr	moist	(Fill)
300	-	660	Lt Br Si(y) Cl, some Sa	moist	(Fill)
660	-	1.0 m	Dk Gry Si(y) Cl W Org	moist	(Fill)
1.0 m	-	1.5 m	Lt Br Si(y) Cl Till	moist	(Native)

BH# 3 SBL

Sta (0+150) o/s 2.0 m W of CL

MDL

NAD'83 Coordinates: 17 T 4841970.500 593696.947

0	-	60	Asph		
60	-	350	Sa & Gr	moist	(Fill)
350	-	600	Gr(y) Sa, Tr Si (w = 3.1%)	moist	(Fill)

Sieve	% Pass
13.2 mm	80.2
9.5 mm	74.5
4.75 mm	64.9
1.18 mm	50.3
300 µm	14.9
75 µm	5.0
Granular B	

600	-	1.0 m	Dk Gry Si(y) Cl, some Sa & Gr, Tr Asph & Org	moist	(Fill)
1.0 m	-	1.5 m	Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)

BH# 4 SBL

Sta (0+150) o/s 5.3 m W of CL

TOS

NAD'83 Coordinates: 17 T 4841967.372 593693.760

0	-	150	Tps	moist	(Fill) Hex=0, IBL=2
150	-	300	Si(y) Sa & Gr	moist	(Fill) Hex=0, IBL=1
300	-	700	Br Cl(y) Si, some Sa	moist	(Fill) Hex=0, IBL=0
700	-	1.5 m	Lt Br Si(y) Cl Till	moist	(Native) Hex=0, IBL=0

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 5 NBL

Sta (0+250) o/s 2.0 m E of CL

MDL

NAD'83 Coordinates: 17 T 4842043.398 593628.895

0	-	60	Asph																		
60	-	390	Gr(y) Sa, Tr Si (w = 5.6%)	moist	(Fill)																
<table border="1" style="width: 100%;"> <thead> <tr> <th>Sieve</th> <th>% Pass</th> </tr> </thead> <tbody> <tr> <td>13.2 mm</td> <td>81.3</td> </tr> <tr> <td>9.5 mm</td> <td>76.6</td> </tr> <tr> <td>4.75 mm</td> <td>68.5</td> </tr> <tr> <td>1.18 mm</td> <td>53.8</td> </tr> <tr> <td>300 µm</td> <td>19.2</td> </tr> <tr> <td>75 µm</td> <td>7.7</td> </tr> <tr> <td colspan="2" style="text-align: center;">Granular B</td> </tr> </tbody> </table>						Sieve	% Pass	13.2 mm	81.3	9.5 mm	76.6	4.75 mm	68.5	1.18 mm	53.8	300 µm	19.2	75 µm	7.7	Granular B	
Sieve	% Pass																				
13.2 mm	81.3																				
9.5 mm	76.6																				
4.75 mm	68.5																				
1.18 mm	53.8																				
300 µm	19.2																				
75 µm	7.7																				
Granular B																					
390	-	650	Sa & Gr, some Cob	moist	(Fill)																
650	-	1.0 m	Br Si(y) Sa, some Cl	moist	(Fill)																
1.0 m	-	1.5 m	Lt Br Cl(y) Si Till	moist	(Native)																

BH# 6 NBL

Sta (0+250) o/s 5.2 m E of CL

SHR

NAD'83 Coordinates: 17 T 4842045.025 593630.471

0	-	200	Tps - Si(y) Sa & Gr W Org	moist	(Fill) Hex=0, IBL=1																		
200	-	650	Si(y) Sa & Gr, Tr Cob	moist	(Fill) Hex=0, IBL=5																		
650	-	1.0 m	Dk Gry Si(y) Cl W Org	moist	(Fill) Hex=0, IBL=5																		
1.0 m	-	1.5 m	Si W Sa & Cl Tr Gr (w = 14%)	moist	(Native) Hex=0, IBL=5																		
<table border="1" style="width: 100%;"> <thead> <tr> <th>Sieve</th> <th>% Pass</th> </tr> </thead> <tbody> <tr> <td>4.75 mm</td> <td>93.8</td> </tr> <tr> <td>2.00 mm</td> <td>91.0</td> </tr> <tr> <td>425 µm</td> <td>83.8</td> </tr> <tr> <td>75 µm</td> <td>68.2</td> </tr> <tr> <td>5 µm</td> <td>34.3</td> </tr> <tr> <td>2 µm</td> <td>24.3</td> </tr> <tr> <td colspan="2" style="text-align: center;">LSFH</td> </tr> <tr> <td colspan="2" style="text-align: center;">Soil Classification: CL W_L/W_p/I_p= 24/15/9</td> </tr> </tbody> </table>						Sieve	% Pass	4.75 mm	93.8	2.00 mm	91.0	425 µm	83.8	75 µm	68.2	5 µm	34.3	2 µm	24.3	LSFH		Soil Classification: CL W_L/W_p/I_p= 24/15/9	
Sieve	% Pass																						
4.75 mm	93.8																						
2.00 mm	91.0																						
425 µm	83.8																						
75 µm	68.2																						
5 µm	34.3																						
2 µm	24.3																						
LSFH																							
Soil Classification: CL W_L/W_p/I_p= 24/15/9																							

BH# 7 SBL

Sta (0+350) o/s 2.1 m W of CL

MDL

NAD'83 Coordinates: 17 T 4842110.456 593554.950

0	-	40	Asph																		
40	-	410	Sa & Gr	moist	(Fill)																
410	-	550	Gr(y) Sa Tr Si (w = 3.4%)	moist	(Fill)																
<table border="1" style="width: 100%;"> <thead> <tr> <th>Sieve</th> <th>% Pass</th> </tr> </thead> <tbody> <tr> <td>13.2 mm</td> <td>80.3</td> </tr> <tr> <td>9.5 mm</td> <td>71.7</td> </tr> <tr> <td>4.75 mm</td> <td>59.6</td> </tr> <tr> <td>1.18 mm</td> <td>42.5</td> </tr> <tr> <td>300 µm</td> <td>16.6</td> </tr> <tr> <td>75 µm</td> <td>8.4</td> </tr> <tr> <td colspan="2" style="text-align: center;">Granular B</td> </tr> </tbody> </table>						Sieve	% Pass	13.2 mm	80.3	9.5 mm	71.7	4.75 mm	59.6	1.18 mm	42.5	300 µm	16.6	75 µm	8.4	Granular B	
Sieve	% Pass																				
13.2 mm	80.3																				
9.5 mm	71.7																				
4.75 mm	59.6																				
1.18 mm	42.5																				
300 µm	16.6																				
75 µm	8.4																				
Granular B																					
550	-	1.0 m	Dk Bry Cl(y) Si, Tr Gr	moist	(Fill)																
1.0 m	-	1.5 m	Gry Si(y) Cl	moist	(Fill)																

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 8 SBL

Sta (0+350) o/s 4.8 m W of CL

SHR

NAD'83 Coordinates: 17 T 4842108.829 593553.374

0	-	200	Tps W Si(y) Sa & Gr	moist	(Fill)
200	-	480	Si(y) Sa & Gr	moist	(Fill) Hex=0, IBL=5
480	-	1.0 m	Dk Gry Si(y) Cl W Org	moist	(Fill) Hex=0, IBL=2
1.0 m	-	1.4 m	Gry Si(y) Cl Tr Sa & Org	moist	(Fill) Hex=0, IBL=0
1.4 m	-	1.5 m	Gry Si(y) Cl Till	moist	(Native) Hex=0, IBL=0

BH# 9 NBL

Sta (0+450) o/s 2.0 m E of CL

MDL

NAD'83 Coordinates: 17 T 4842184.654 593486.690

0	-	50	Asph		
50	-	300	Sa & Gr	moist	(Fill)
300	-	600	Sa, some Gr & Cob	moist	(Fill)
600	-	900	Si(y) Sa & Gr	moist	(Fill)
900	-	1.3 m	Dk Gry Si(y) Cl W Org	moist	(Fill)
1.3 m	-	1.5 m	Lt Br Cl(y) Si Till	moist	(Native)

BH# 10 NBL

Sta (0+450) o/s 4.1 m E of CL

SHR

NAD'83 Coordinates: 17 T 4842186.281 593488.266

0	-	300	Sa & Gr	moist	(Fill)
300	-	500	Gr(y) Sa, Tr Cob	moist	(Fill)
500	-	700	Si(y) Sa & Gr	moist	(Fill)
700	-	1.2	Dk Gry Si(y) Cl, some Sa W Org	moist	(Fill)
1.2	-	1.5 m	Lt Br Cl(y) Si Till	moist	(Native)

BH# 11 SBL

Sta (0+550) o/s 2.0 m W of CL

MDL

NAD'83 Coordinates: 17 T 4842253.841 593414.736

0	-	40	Asph		
40	-	400	Sa & Gr Tr Si (w = 2.9%)	moist	(Fill)

Sieve	% Pass
13.2 mm	89.5
9.5 mm	71.6
4.75 mm	53.4
1.18 mm	35.0
300 µm	14.8
75 µm	6.5

400	-	680	Sa, some Gr Tr Cob	moist	(Fill)
680	-	1.2 m	Dk Gry Si(y) Cl W Org	moist	(Fill)
1.2 m	-	1.5 m	Gry Si(y) Cl Tr Occ Gr	moist	(Native)

BH# 12 SBL

Sta (0+550) o/s 4.5 m W of CL

SHR

NAD'83 Coordinates: 17 T 4842252.214 593413.160

0	-	150	Tps. Si(y) Sa & Gr, some Rootlets	moist	(Fill) Hex=0, IBL=1
150	-	480	Sa & Gr, Tr Cob	moist	(Fill) Hex=0, IBL=1
480	-	1.0 m	Dk Gry Si(y) Cl W Org	moist	(Fill) Hex=0, IBL=0
1.0 m	-	1.5 m	Dk Gry Si(y) Cl, Tr Org	moist	(Fill) Hex=0, IBL=0

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 13 NBL		Sta (0+650) o/s 1.8 m E of CL																		
MDL		NAD'83 Coordinates: 17 T 4842325.154 593344.510																		
0	-	40	Asph																	
40	-	350	Sa & Gr	moist (Fill)																
350	-	650	Gr(y) Sa, Tr Cob	moist (Fill)																
650	-	1.0 m	Lt Gry Si(y) Cl, some Sa	moist (Fill)																
1.0 m	-	1.5 m	Br Cl(y) Si Till	moist (Native)																
BH# 14 NBL		Sta (0+650) o/s 4.3 m E of CL																		
TOS		NAD'83 Coordinates: 17 T 4842327.806 593347.237																		
0	-	300	Si Sa & Gr	moist (Fill)																
300	-	660	Gr(y) Sa, Tr Cob	moist (Fill)																
660	-	1.2 m	Br Cl(y) Si, some Org, Tr Gr	moist (Fill)																
1.2 m	-	1.5 m	Lt Br Cl(y) Si, Tr Gr	moist (Native)																
BH# 15 SBL		Sta (0+750) o/s 1.8 m W of CL																		
MDL		NAD'83 Coordinates: 17 T 4842391.690 593270.951																		
0	-	50	Asph																	
50	-	350	Gr(y) Sa, Tr Si (w = 3.0%)	moist (Fill)																
		<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Sieve</th> <th style="text-align: left; border-bottom: 1px solid black;">% Pass</th> </tr> </thead> <tbody> <tr><td>13.2 mm</td><td>88.8</td></tr> <tr><td>9.5 mm</td><td>79.6</td></tr> <tr><td>4.75 mm</td><td>61.2</td></tr> <tr><td>1.18 mm</td><td>38.9</td></tr> <tr><td>300 µm</td><td>16.1</td></tr> <tr><td>75 µm</td><td>7.2</td></tr> <tr><td colspan="2" style="text-align: center;">Granular B</td></tr> </tbody> </table>			Sieve	% Pass	13.2 mm	88.8	9.5 mm	79.6	4.75 mm	61.2	1.18 mm	38.9	300 µm	16.1	75 µm	7.2	Granular B	
Sieve	% Pass																			
13.2 mm	88.8																			
9.5 mm	79.6																			
4.75 mm	61.2																			
1.18 mm	38.9																			
300 µm	16.1																			
75 µm	7.2																			
Granular B																				
350	-	650	Gr(y) Sa, some Cob	moist (Fill)																
650	-	1.0 m	Lt Gry Si(y) Cl, some Sa	moist (Fill)																
1.0 m	-	1.5 m	Br Cl(y) Si Till	moist (Fill)																
BH# 16 SBL		Sta (0+750) o/s 4.5 m W of CL																		
TOS		NAD'83 Coordinates: 17 T 4842389.038 593268.225																		
0	-	200	Tps, Si(y) Sa & Gr, some Org	moist (Fill)																
200	-	450	Sa, some Gr, Tr Cob	moist (Fill)																
450	-	1.0 m	Dk Gry Si(y) Cl W Org	moist (Fill)																
1.0 m	-	1.5 m	Gry Si(y) Sa, some Cl	moist (Fill)																
BH# 17 NBL		Sta (0+850) o/s 2.0 m E of CL																		
MDL		NAD'83 Coordinates: 17 T 4842465.341 593202.852																		
0	-	55	Asph																	
55	-	400	Sa & Gr	moist (Fill)																
400	-	750	Sa, some Gr, Tr Cob & Blds	moist (Fill)																
750	-	1.3 m	Dk Gry Si(y) Cl W Org, some Sa, Tr Gr	wet (Fill)																
1.3 m	-	1.5 m	Br Cl(y) Si Till	moist (Native)																

BOREHOLE LOG DATA

BH# 18 NBL		Sta (0+850) o/s 4.3 m E of CL																			
TOS		NAD'83 Coordinates: 17 T 4842468.093 593205.884																			
0	-	200	Tps, Si(y) Sa W Org	moist	(Fill) Hex=0, IBL=2																
200	-	580	Sa & Gr	moist	(Fill) Hex=0, IBL=1																
580	-	1.3 m	Dk Gry Si(y) Cl, some Org	moist	(Fill) Hex=0, IBL=0																
1.3 m	-	1.5 m	Gry Si(y) Cl Till	moist	(Native) Hex=0, IBL=2																
BH# 19 SBL		Sta (0+950) o/s 1.8 m W of CL																			
MDL		NAD'83 Coordinates: 17 T 4842533.517 593130.347																			
0	-	65	Asph																		
65	-	400	Sa & Gr	moist	(Fill)																
400	-	850	Gr(y) Sa, some Cob	moist	(Fill)																
850	-	1.2 m	Si(y) Sa & Gr, some Cob, Tr Blds	wet	(Fill)																
1.2 m	-	1.5 m	Si(y) Sa & Gr, some Cob	wet	(Fill)																
BH# 20 SBL		Sta (0+950) o/s 4.2 m W of CL																			
TOS		NAD'83 Coordinates: 17 T 4842530.667 593127.579																			
0	-	150	Tps, Si(y) Sa & Gr W Org	moist	(Fill)																
150	-	450	Sa & Gr	moist	(Fill)																
450	-	850	Sa & Gr, some Cob	wet	(Fill)																
850	-	1.2 m	Sa & Gr, some Cob, Tr Blds	wet	(Fill)																
1.2 m	-	1.5 m	Sa, Tr Gr, some Cob	moist	(Fill)																
BH# 21 NBL		Sta (1+050) o/s 1.8 m E of CL																			
MDL		NAD'83 Coordinates: 17 T 4842607.512 593061.999																			
0	-	60	Asph																		
60	-	450	Sa & Gr	moist	(Fill)																
450	-	750	Sa & Gr, Tr Si (w = 3.0%)	moist	(Fill)																
			<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Sieve</th> <th style="text-align: left; border-bottom: 1px solid black;">% Pass</th> </tr> </thead> <tbody> <tr><td>13.2 mm</td><td>67.2</td></tr> <tr><td>9.5 mm</td><td>58.7</td></tr> <tr><td>4.75 mm</td><td>48.1</td></tr> <tr><td>1.18 mm</td><td>33.8</td></tr> <tr><td>300 µm</td><td>14.7</td></tr> <tr><td>75 µm</td><td>6.5</td></tr> <tr><td></td><td>Granular B</td></tr> </tbody> </table>		Sieve	% Pass	13.2 mm	67.2	9.5 mm	58.7	4.75 mm	48.1	1.18 mm	33.8	300 µm	14.7	75 µm	6.5		Granular B	
Sieve	% Pass																				
13.2 mm	67.2																				
9.5 mm	58.7																				
4.75 mm	48.1																				
1.18 mm	33.8																				
300 µm	14.7																				
75 µm	6.5																				
	Granular B																				
750	-	1.2 m	Dk Gry Si(y) Cl, some Org	moist	(Fill)																
1.2 m	-	1.5 m	Br Si(y) Cl Till	moist	(Native)																
BH# 22 NBL		Sta (1+050) o/s 4.2 m E of CL																			
SHR		NAD'83 Coordinates: 17 T 4842609.139 593063.575																			
0	-	150	Tps - Si(y) Sa & Gr Tr Org																		
150	-	460	Sa & Gr	moist	(Fill) Hex=0, IBL=0																
460	-	950	Gr(y) Sa, Tr Cob, some Org	moist	(Fill) Hex=0, IBL=0																
950	-	1.2 m	Dk Gry Si(y) Cl W Org	moist	(Fill) Hex=0, IBL=0																
1.2 m	-	1.5 m	Br Si(y) Cl Till	moist	(Native) Hex=0, IBL=0																

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 23 SBL

Sta (1+150) o/s 1.9 m W of CL

MDL

NAD'83 Coordinates: 17 T 4842674.954 592987.157

0	-	60	Asph		
60	-	400	Sa & Gr	moist	(Fill)
400	-	750	Sa, some Gr, Tr Cob	moist	(Fill)
750	-	1.2 m	Dk Gry Si(y) Cl, some Org, Tr Gr	moist	(Fill)
1.2 m	-	1.5 m	Br Si(y) Cl Till	moist	(Native)

BH# 24 SBL

Sta (1+150) o/s 4.1 m W of CL

SHR

NAD'83 Coordinates: 17 T 4842673.327 592985.581

0	-	150	Tps	moist	(Fill) Hex=0, IBL=0
150	-	460	Si(y) Sa & Gr	moist	(Fill) Hex=0, IBL=0
460	-	1.0 m	Dk Gry Si(y) Cl, some Sa & Gr W Org	moist	(Fill) Hex=0, IBL=0
1.0 m	-	1.5 m	Si W Cl & Sa, Tr Gr (w = 14.3%)	moist	(Fill) Hex=0, IBL=0

Sieve	% Pass
4.75 mm	95.3
2.00 mm	91.3
425 µm	90.5
75 µm	66.6
5 µm	39.3
2 µm	28.3
LSFH	
Soil Classification: CL W_L/W_P/I_P= 38/17/21	

BH# 25 NBL

Sta (1+250) o/s 1.9 m E of CL

MDL

NAD'83 Coordinates: 17 T 4842748.182 592919.784

0	-	60	Asph		
60	-	410	Gr(y) Sa, Tr Si (w = 3.1%)	moist	(Fill)

Sieve	% Pass
13.2 mm	89.5
9.5 mm	76.0
4.75 mm	60.7
1.18 mm	40.2
300 µm	18.3
75 µm	9.3
Granular B	

410	-	710	Gr(y) Sa, Tr Cob	moist	(Fill)
710	-	1.2 m	Dk Gry Si(y) Sa, some Cl W Org	moist	(Fill)
1.2 m	-	1.5 m	Br Si(y) Cl Till, Tr Sa, OCC Gr	moist	(Native)

BH# 26 NBL

Sta (1+250) o/s 4.3 m E of CL

SHR

NAD'83 Coordinates: 17 T 4842749.809 592921.360

0	-	160	Tps	moist	(Fill)
160	-	430	Si(y) Sa & Gr	moist	(Fill)
430	-	550	Si(y) Sa & Gr	wet	(Fill)
550	-	1.2 m	Dk Gry Si(y) Cl, some Sa, W Org	moist	(Fill)
1.2 m	-	1.5 m	Br Cl(y) Si Till, some Sa & Gr	moist	(Fill)

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 27 SBL

Sta (1+350) o/s 2.1 m W of CL

MDL

NAD'83 Coordinates: 17 T 4842816.656 592846.312

0	-	60	Asph		
60	-	420	Sa & Gr	moist	(Fill)
420	-	750	Gr(y) Sa, Tr Cob	moist	(Fill)
750	-	1.25	Dk Gry Si(y) Cl, some Org, Tr Sa & Gr	moist	(Fill)
1.25	-	1.5 m	Br Si(y) Cl Till, Tr Sa, OCC Gr	moist	(Native)

BH# 28 SBL

Sta (1+350) o/s 4.1 m W of CL

SHR

NAD'83 Coordinates: 17 T 4842815.029 592844.736

0	-	150	Tps Si(y) Sa & Gr W Rootlets	moist	(Fill) Hex=0, IBL=0
150	-	450	Sa & Gr	moist	(Fill) Hex=0, IBL=0
450	-	800	Dk Gry Si(y) Sa W Gr, some Cl, Tr Org	moist	(Fill) Hex=0, IBL=0
800	-	1.5 m	Gry Si(y) Cl, some Sa & Gr, Tr Org	moist	(Fill) Hex=0, IBL=0

BH# 29 NBL

Sta (1+450) o/s 1.8 m E of CL

MDL

NAD'83 Coordinates: 17 T 4842890.054 592778.807

0	-	65	Asph		
65	-	450	Sa & Gr, Tr Si (w = 3.1%)	moist	(Fill)

Sieve	% Pass
13.2 mm	86.6
9.5 mm	77.1
4.75 mm	58.5
1.18 mm	40.2
300 µm	17.4
75 µm	7.9
Granular B	

450	-	700	Gr(y) Sa, Tr Cob	moist	(Fill)
700	-	900	Br & Gry Si(y) Sa, some Cl, Tr Org	moist	(Fill)
900	-	1.5 m	Br & Gry Cl(y) Si Till	moist	(Native)

BH# 30 NBL

Sta (1+450) o/s 4.2 m E of CL

TOS

NAD'83 Coordinates: 17 T 4842893.239 592782.185

0	-	150	Tps, Si(y) Sa W Gr & Org	moist	(Fill) Hex=0, IBL=1
150	-	500	Sa & Gr	moist	(Fill) Hex=0, IBL=0
500	-	1.0 m	Gr(y) Sa, Tr Cob	moist	(Fill) Hex=0, IBL=0
1.0 m	-	1.5 m	Br Si(y) Cl to Cl(y) Si Till, some Sa	moist	(Native) Hex=0, IBL=0

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 31 SBL

Sta (1+550) o/s 2.0 m W of CL

MDL

NAD'83 Coordinates: 17 T 4842956.990 592704.635

0	-	60	Asph		
60	-	430	Sa & Gr	moist	(Fill)
430	-	750	Sa(y) Gr, Tr Si (w = 3.5%)	moist	(Fill)

Sieve	% Pass
13.2 mm	58.9
9.5 mm	49.7
4.75 mm	40.0
1.18 mm	28.1
300 µm	11.5
75 µm	4.8
Granular B	

750	-	1.0 m	Dk Gry Si(y) Cl w Org	moist	(Fill)
1.0 m	-	1.5 m	Dk Gry Cl(y) Si, Tr Org	moist	(Fill)

BH# 32 SBL

Sta (1+550) o/s 4.2 m W of CL

TOS

NAD'83 Coordinates: 17 T 4842954.158 592701.535

0	-	300	Sa & Gr	moist	(Fill)
300	-	650	Gr(y) Sa, Tr Cob	moist	(Fill)
650	-	1.3 m	Dk Gry Si(y) Cl, some Org	moist	(Fill)
1.3 m	-	1.5 m	Gry Si(y) Cl Till	moist	(Native)

BH# 33 NBL

Sta (1+650) o/s 2.0 m E of CL

MDL

NAD'83 Coordinates: 17 T 4843030.687 592637.465

0	-	65	Asph		
65	-	410	Sa & Gr	moist	(Fill)
410	-	760	Gr(y) Sa, Tr Cob	moist	(Fill)
760	-	1.0 m	Dk Gry Si(y) Cl W Org	moist	(Fill)
1.0 m	-	1.5 m	Br Si(y) Cl to Cl(y) Si, some Sa & Gr	moist	(Fill)

BH# 34 NBL

Sta (1+650) o/s 4.3 m E of CL

TOS

NAD'83 Coordinates: 17 T 4843033.872 592640.842

0	-	200	Tps , Si(y) Sa, some Cl W Org	moist	(Fill) Hex=0, IBL=0
200	-	450	Sa & Gr	moist	(Fill) Hex=0, IBL=5
450	-	900	Si(y) Sa & Gr, Tr Cob	moist	(Fill) Hex=0, IBL=0
900	-	1.3 m	Dk Gry Si(y) Cl, some Sa & Gr, Tr Org	moist	(Fill) Hex=0, IBL=0
1.3 m	-	1.5 m	Br Si(y) Cl Till, some Sa, Tr Gr	wet	(Fill) Hex=0, IBL=1

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

Spine Road

BH# 35		Sta (2+550)																					
CL		NAD'83 Coordinates: 17 T 4843326 593853																					
0	-	200	Tps	moist	(Fill)																		
200	-	400	Si(y) Sa, Tr Gr, some Cl	moist	(Fill)																		
400	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)																		
BH# 36		Sta (2+500)																					
CL		NAD'83 Coordinates: 17 T 4843296 593832																					
0	-	210	Tps, Dk Br Si(y) Sa W Org some Cl	moist	(Fill) Hex=0, IBL=0																		
210	-	440	Br Si(y) Sa, some Cl, Tr Gr	moist	(Fill) Hex=0, IBL=1																		
440	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native) Hex=0, IBL=0																		
BH# 37		Sta (2+500)																					
CL		NAD'83 Coordinates: 17 T 4843375 593843																					
0	-	200	Tps	moist	(Fill)																		
200	-	380	Lt Br Si(y) Sa, some Cl	moist	(Fill)																		
380	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)																		
BH# 38		Sta (2+450)																					
TOS		NAD'83 Coordinates: 17 T 4843342 593811																					
0	-	180	Tps, Dk Br Si(y) Sa W Org some Cl (w = 21.7%)	moist	(Fill)																		
180	-	350	Lt Br Si(y) Sa, Tr Gr, some Cl (w = 17.6%)	moist	(Fill)																		
350	-	1.5 m	Si W Cl & Sa, Tr Gr (w = 11.1%)	moist	(Native)																		
		<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Sieve</th> <th style="text-align: left; border-bottom: 1px solid black;">% Pass</th> </tr> </thead> <tbody> <tr><td>4.75 mm</td><td>97.8</td></tr> <tr><td>2.00 mm</td><td>96.7</td></tr> <tr><td>425 µm</td><td>89.7</td></tr> <tr><td>75 µm</td><td>74.3</td></tr> <tr><td>5 µm</td><td>33.6</td></tr> <tr><td>2 µm</td><td>24.9</td></tr> <tr><td colspan="2" style="text-align: center;">MSFH</td></tr> <tr><td colspan="2" style="text-align: center;">Soil Classification: CI W_L/W_P/I_P= 34/17/17</td></tr> </tbody> </table>		Sieve	% Pass	4.75 mm	97.8	2.00 mm	96.7	425 µm	89.7	75 µm	74.3	5 µm	33.6	2 µm	24.9	MSFH		Soil Classification: CI W_L/W_P/I_P= 34/17/17			
Sieve	% Pass																						
4.75 mm	97.8																						
2.00 mm	96.7																						
425 µm	89.7																						
75 µm	74.3																						
5 µm	33.6																						
2 µm	24.9																						
MSFH																							
Soil Classification: CI W_L/W_P/I_P= 34/17/17																							
BH# 39		Sta (2+400)																					
CL		NAD'83 Coordinates: 17 T 4843304 593773																					
0	-	205	Tps	moist	(Fill)																		
205	-	380	Lt Br Si(y) Sa, Tr Gr & Cob	moist	(Fill)																		
380	-	1.5 m	Lt Br Cl(y) Si Till, some Sa & Gr	moist	(Native)																		
BH# 40		Sta (2+400)																					
TOS		NAD'83 Coordinates: 17 T 4843304 593773																					
0	-	200	Tps	moist	(Fill)																		
200	-	390	Lt Br Cl(y) Si, some Sa, Tr Gr	moist	(Fill)																		
390	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)																		

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 41			Sta (2+350)		
CL			NAD'83 Coordinates: 17 T 4843268 593742		
0	-	200	Tps	moist	(Fill)
200	-	410	Lt Br Cl(y) Si, some Sa	moist	(Fill)
410	-	1.5 m	Lt Br Si(y) Cl to Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)
BH# 42			Sta (2+300)		
CL			NAD'83 Coordinates: 17 T 4843232 593704		
0	-	210	Tps	moist	(Fill)
210	-	400	Lt Br Si(y) Sa, some Cl, Tr Gr	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si Till, some Sa & Gr	moist	(Native)
BH# 43			Sta (2+300)		
TOS			NAD'83 Coordinates: 17 T 4843232 593704		
0	-	210	Tps, Dk Br Si(y) Cl, some Sa W Org	moist	(Fill)
210	-	390	Lt Br Cl(y) Si, some Sa, Tr Gr & Cob	moist	(Fill)
390	-	1.5 m	Lt Br Cl(y) Si Till, some Sa	moist	(Native)
BH# 44			Sta (2+250)		
CL			NAD'83 Coordinates: 17 T 4843197 593674		
0	-	250	Tps, Dk Gry Si(y) Sa W Org, some Cob & Gr	moist	(Fill)
250	-	400	Lt Br Cl(y) Si, some Sa	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si Till	moist	(Native)
BH# 45			Sta (2+200)		
CL			NAD'83 Coordinates: 17 T 4843161 593634		
0	-	200	Tps, Dk Br Cl(y) Si W Org, Tr Gr	moist	(Fill)
200	-	400	Lt Br Cl(y) Si, Tr Gr, Tr Org	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si Till	moist	(Native)
BH# 46			Sta (2+200)		
TOS			NAD'83 Coordinates: 17 T 4843161 593634		
0	-	195	Tps	moist	(Fill) Hex=0, IBL=1
195	-	380	Si(y) Sa, Tr Gr	moist	(Fill) Hex=0, IBL=0
380	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native) Hex=0, IBL=0
BH# 47			Sta (2+150)		
CL			NAD'83 Coordinates: 17 T 4843121 593601		
0	-	210	Tps, Dk Br Si(y) Cl W Org, Tr Gr	moist	(Fill)
210	-	380	Si(y) Sa, Tr Gr	moist	(Fill)
380	-	1.5 m	Lt Br Cl(y) Si Till, some Sa	moist	(Native)
BH# 48			Sta (2+100)		
CL			NAD'83 Coordinates: 17 T 4843089 593564		
0	-	245	Tps, Dk Br Si(y) Cl W Org	moist	(Fill)
245	-	390	Lt Br Si(y) Sa, some Cl	moist	(Fill)
390	-	1.5 m	Lt Br Cl(y) Si Till	moist	(Native)

BOREHOLE LOG DATA

BH# 49			Sta (2+100)		
TOS			NAD'83 Coordinates: 17 T 4843089 593564		
0	-	220	Tps Dk Br Cl(y) Si W Org	moist	(Fill)
220	-	400	Lt Br Si(y) Sa, some Cl	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si till, some Sa, Tr Gr	moist	(Native)
BH# 50			Sta (2+050)		
CL			NAD'83 Coordinates: 17 T 4843049 593536		
0	-	205	Tps Dk Br Cl(y) Si W Org	moist	(Fill)
205	-	390	Lt Br Cl(y) Si, some Sa	moist	(Fill)
390	-	1.5 m	Lt Br Cl(y) Si / Si(y) Cl Till, some Sa, Tr Gr	moist	(Native)
BH# 51			Sta (2+000)		
CL			NAD'83 Coordinates: 17 T 4843010 593502		
0	-	200	Tps Dk Br Si(y) Sa W Org, some Cl	moist	(Fill)
200	-	380	Lt Br Cl(y) Si, some Sa	moist	(Fill)
380	-	1.5 m	Lt Br Cl(y) Si Till, some Sa	moist	(Native)
BH# 52			Sta (2+000)		
TOS			NAD'83 Coordinates: 17 T 4843010 593502		
0	-	230	Tps Dk Br Si(y) Sa W Cl & Org (w = 19.0%)	moist	(Fill)
230	-	400	Lt Br Cl(y) Si, some Sa (w = 16.1%)	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr (w = 14.0%)	moist	(Native)
BH# 53			Sta (1+950)		
CL			NAD'83 Coordinates: 17 T 4842971 593472		
0	-	220	Tps Dk Br Si(y) Cl, some Sa W Org	moist	(Fill)
220	-	340	Si(y) Sa, Tr Gr	moist	(Fill)
340	-	1.5 m	Lt Br Cl(y) Si Till, Tr Gr & Sa	moist	(Native)
BH# 54			Sta (1+850)		
CL			NAD'83 Coordinates: 17 T 4842892 593414		
0	-	290	Tps Dk Br Si(y) Cl to Si(y) Sa W Org	moist	(Fill) Hex=0, IBL=0
290	-	450	Lt Br Si(y) Sa, Tr Gr	moist	(Fill) Hex=0, IBL=0
450	-	1.5 m	Lt Br Si(y) Sa to Cl(y) Si Tr Gr	moist	(Native) Hex=0, IBL=0
BH# 55			Sta (1+800)		
CL			NAD'83 Coordinates: 17 T 593381 4842848		
0	-	300	Tps Dk Br Cl(y) Si W Org	moist	(Fill)
300	-	410	Lt Br Si(y) Sa, Tr Gr	moist	(Fill)
410	-	1.5 m	Lt Br Si(y) Sa to Cl(y) Si Tr Gr	moist	(Native)
BH# 56			Sta (1+800)		
TOS			NAD'83 Coordinates: 17 T 593387 4842844		
0	-	300	Tps	moist	(Fill)
300	-	410	Lt Br Si(y) Sa, Tr Gr	moist	(Fill)
410	-	1.5 m	Lt Br Si(y) Sa to Cl(y) Si, Tr Gr	moist	(Fill)

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 57			Sta (1+750)		
CL			NAD'83 Coordinates: 17 T 593358 4842816		
0	-	300	Tps Dk Br Cl(y) Si W Org	moist	(Fill)
300	-	440	Lt Br Si(y) Sa, some Cl	moist	(Native)
440	-	1.5 m	Lt Br Si(y) Cl(y) Si Till some Sa Tr Occ Gr	moist	(Fill)
BH# 58			Sta (1+700)		
CL			NAD'83 Coordinates: 17 T 4842774 593317		
0	-	300	Tps	moist	(Fill)
300	-	1.0 m	Br Si(y) Sa, some Cl, Tr Org	moist	(Fill)
1.0 m	-	1.5 m	Br Si(y) Cl to Cl(y) Si Till	moist	(Native)
BH# 59			Sta (1+700)		
TOS			NAD'83 Coordinates: 17 T 4842774 593317		
0	-	310	Si(y) Cl to Si(y) Sa W Org	moist	(Fill)
310	-	450	Br Si(y) Sa	moist	(Native)
450	-	1.5 m	Br Cl(y) Si to Si(y) Cl Till, Tr Gr	moist to wet	(Native)
BH# 60			Sta (1+650)		
CL			NAD'83 Coordinates: 17 T 4842733 593290		
0	-	320	Tps	moist	(Fill)
320	-	460	Br Si(y) Sa	moist	(Native)
460	-	1.5 m	Br Cl(y) Si to Si(y) Sa, Tr Gr	moist to wet	(Native)
BH# 61			Sta (1+600)		
CL			NAD'83 Coordinates: 17 T 4842694 593258		
0	-	320	Tps	moist	(Fill)
320	-	460	Br Si(y) Sa	moist	(Native)
460	-	1.5 m	Br Cl(y) Si to Si(y) Sa, Tr Gr	moist to wet	(Native)
BH# 62			Sta (1+600)		
TOS			NAD'83 Coordinates: 17 T 4842694 593258		
0	-	310	Tps	moist	(Fill)
310	-	480	Br Si(y) Sa	moist	(Native) Hex=0, IBL=2
480	-	1.5 m	Br Cl(y) Si to Si(y) Sa, Tr Gr	moist to wet	(Native) Hex=0, IBL=2
BH# 63			Sta (1+550)		
CL			NAD'83 Coordinates: 17 T 4842652 593231		
0	-	300	Dk Br Si(y) Sa / Sa(y) Si W Org, Tr Cl	moist	(Fill)
300	-	460	Cl(y) Si, some Sa, Tr Gr	moist	(Native)
460	-	1.5 m	Cl(y) Si, some Sa, Tr Gr	moist	(Native)

BOREHOLE LOG DATA

BH# 64

CL

0	-	290	NAD'83 Coordinates: 17 T 4842614 593198						
290	-	400	Tps Dk Br Si(y) Sa, some Cl W Org (w = 26.0%)		moist			(Fill)	
			Br Si(y) Sa, some Cl, Tr Gr (w = 11.6%)		moist			(Fill)	
400	-	1.5 m	Si W Cl & Sa, Tr Gr (w = 11.9%)		moist			(Native)	

Sieve	% Pass
4.75 mm	94.8
2.00 mm	91.7
425 µm	85.1
75 µm	73.1
5 µm	38.3
2 µm	27.5
MSFH	
Soil Classification: CI W_L/W_P/I_P= 32/16/16	

BH# 65

TOS

0	-	280	NAD'83 Coordinates: 17 T 4842614 593198						
280	-	850	Tps Dk Br Si(y) Sa, some Cl W Org		moist			(Fill)	
			Br Si(y) Sa, some Cl, Tr Gr		moist			(Fill)	
850	-	1.5 m	Br Cl(y) Si, some Sa, Tr Gr		moist			(Native)	

BH# 66

CL

0	-	260	NAD'83 Coordinates: 17 T 4842574 593164						
260	-	660	Tps Si(y) Sa & Gr, some Org		moist			(Fill)	
			F Sa, Tr Gr		moist			(Fill)	
660	-	1.5 m	Si(y) Sa W Pockets of F Sa to Si(y) Cl W Sa		moist			(Native)	

BH# 67

CL

0	-	300	NAD'83 Coordinates: 17 T 4842498 593106						
300	-	430	Tps Dk Br Si(y) Cl W Org		moist			(Fill)	
			Lt Br Si(y) Sa, Tr Gr		moist			(Fill)	
430	-	1.5 m	Lt Br Si(y) Sa to Cl(y) Si Till, some Sa, Tr Gr		moist			(Native)	

BH# 68

CL

0	-	300	NAD'83 Coordinates: 17 T 4842454 593077						
300	-	400	Tps Dk Br Cl(y) Si W Org		moist			(Fill)	
			Lt Br Si(y) Sa, Tr Gr		moist			(Fill) Hex=0, IBL=1	
400	-	1.5 m	Lt Br Cl(y) Si Till to Si(y) Sa, Tr Gr		moist			(Native) Hex=0, IBL=0	

BH# 69

TOS

0	-	310	NAD'83 Coordinates: 17 T 4842454 593077						
310	-	420	Tps Dk Br Cl(y) Si W Org, Tr Gr		moist			(Fill)	
			Lt Br Si(y) Sa & Gr		moist			(Fill)	
420	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr		moist			(Native)	

BH# 70

CL

0	-	300	NAD'83 Coordinates: 17 T 4842406 593057						
300	-	400	Tps		moist			(Fill)	
			Si(y) Sa, Tr Gr		moist			(Fill)	
400	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr & Cob		moist			(Native)	

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 71		Sta (1+200)			
CL		NAD'83 Coordinates: 17 T 4842366 593031			
0	-	290	Tps	moist	(Fill)
290	-	340	Si(y) Sa, Tr Gr	moist	(Native)
340	-	1.5 m	Lt Br Cl(y) Si Till, Tr Gr & Cobb	moist	(Native)
BH# 72		Sta (1+200)			
TOS		NAD'83 Coordinates: 17 T 4842366 593031			
0	-	300	Tps	moist	(Fill)
300	-	450	Si(y) Sa, Tr Gr	moist	(Native)
450	-	1.5 m	Lt Br Cl(y) Si Till, Tr Gr	moist	(Native)
BH# 73		Sta (1+150)			
CL		NAD'83 Coordinates: 17 T 4842314 593015			
0	-	300	Tps	moist	(Fill)
300	-	400	Si(y) Sa, Tr Gr	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)
BH# 74		Sta (1+100)			
CL		NAD'83 Coordinates: 17 T 4842279 592981			
0	-	280	Tps	moist	(Fill)
280	-	410	Lt Br Si(y) Sa to Cl(y) Si, Tr Gr	moist	(Fill)
410	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)
BH# 75		Sta (1+100)			
TOS		NAD'83 Coordinates: 17 T 4842279 592981			
0	-	300	Tps	moist	(Fill)
300	-	500	Lt Br Si(y) Sa, Tr Gr	moist	(Fill)
500	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)
BH# 76		Sta (1+050)			
CL		NAD'83 Coordinates: 17 T 4842235 592948			
0	-	290	Tps Dk Br Si(y) Sa W Org, some Cl	moist	(Fill)
290	-	420	Lt Br Si(y) Sa, some Cl, Tr Gr	moist	(Fill)
420	-	1.5 m	Lt Br Cl(y) Si Till, some Sa & Gr	moist	(Native)
BH# 77		Sta (1+000)			
CL		NAD'83 Coordinates: 17 T 4842203 592916			
0	-	300	Tps	moist	(Fill) Hex=0, IBL=0
300	-	400	Lt Br Si(y) Sa, some Cl	moist	(Fill) Hex=0, IBL=0
400	-	1.5 m	Lt Br Si(y) Sa to Cl(y) Si Till	moist	(Native) Hex=0, IBL=0
BH# 78		Sta (1+000)			
TOS		NAD'83 Coordinates: 17 T 4842203 592916			
0	-	300	Tps	moist	(Fill)
300	-	410	Lt Br Si(y) Sa, some Cl	moist	(Fill)
410	-	1.5 m	Lt Br Cl(y) Si Till, Tr Gr & Cob	moist	(Native)

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 79			Sta (0+950)		
CL			NAD'83 Coordinates: 17 T 4842160 592884		
0	-	270	Tps Dk Br Cl(y) Si W Org	moist	(Fill)
270	-	400	Lt Br Si(y) Sa, Tr Gr	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)
BH# 80			Sta (0+900)		
CL			NAD'83 Coordinates: 17 T 4842128 592850		
0	-	250	Tps	moist	(Fill)
250	-	340	Lt Br Si(y) Sa	moist	(Fill)
340	-	1.5 m	Lt Br Si(y) Sa & Gr, some Cl	moist	(Native)
BH# 81			Sta (0+900)		
TOS			NAD'83 Coordinates: 17 T 4842128 592850		
0	-	260	Tps	moist	(Fill)
260	-	400	Lt Br Si(y) Sa, Tr Gr	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si Till, some Sa & Gr	moist	(Native)
BH# 82			Sta (0+850)		
CL			NAD'83 Coordinates: 17 T 4842086 592821		
0	-	230	Tps	moist	(Fill)
230	-	380	Si(y) Sa Tr Gr	moist	(Fill)
380	-	1.5 m	Lt Br Cl(y) Si Till, Tr Gr, OCC Cob	moist	(Native)
BH# 83			Sta (0+800)		
CL			NAD'83 Coordinates: 17 T 4842053 592784		
0	-	230	Tps (w = 24.2%)	moist	(Fill)
230	-	530	Lt Br Si(y) Sa & Gr, some Cl	moist	(Fill)
530	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Gr	moist	(Native)
BH# 84			Sta (0+800)		
TOS			NAD'83 Coordinates: 17 T 4842053 592784		
0	-	220	Tps	moist	(Fill)
220	-	360	Lt Br Si(y) Sa, Tr Gr (w = 15.1%)	moist	(Native)
360	-	1.5 m	Lt Br Cl(y) Si Till, some Sa (w = 16.3%)	moist	(Native)
BH# 85			Sta (0+750)		
CL			NAD'83 Coordinates: 17 T 4842011 592755		
0	-	210	Tps	moist	(Fill)
210	-	320	Lt Br Si(y) Sa, Tr Gr	moist	(Fill)
320	-	1.5 m	Lt Br Cl(y) Si Till, some Sa, Tr Cob	moist	(Native)
BH# 86			Sta (0+700)		
CL			NAD'83 Coordinates: 17 T 4841978 592718		
0	-	300	Tps	moist	(Fill) Hex=0, IBL=1
300	-	450	Br Si(y) Sa / Sa(y) Si	moist	(Fill) Hex=0, IBL=0
450	-	1.5 m	Br Si(y) Cl / Cl(y) Si, Tr Sa	moist	(Native) Hex=0, IBL=0
0	-	350	Tps	moist	(Fill)
350	-	500	Br Si(y) Sa / Sa(y) Si	moist	(Fill)
500	-	1.5 m	Br Si(y) Cl / Cl(y) Si, Tr Sa	moist	(Native)

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 87		Sta (0+700)			
TOS		NAD'83 Coordinates: 17 T 4841978 592718			
0	-	350	Tps		
350	-	500	Br Si(y) Sa / Sa(y) Si	moist	(Fill)
500	-	1.5 m	Br Si(y) Cl / Cl(y) Si, Tr Sa	moist	(Native)
BH# 88		Sta (0+650)			
CL		NAD'83 Coordinates: 17 T 4841936 592688			
0	-	300	Tps	moist	(Fill)
300	-	500	Br Si(y) Sa / Sa(y) Si, Tr Cl	moist	(Fill)
500	-	1.5 m	Gry / Br Si(y) Cl / Cl(y) Si	moist	(Native)
BH# 89		Sta (0+600)			
CL		NAD'83 Coordinates: 17 T 4841902 592653			
0	-	290	Tps	moist	(Fill)
290	-	460	Br Si(y) Sa / Sa(y) Si, Tr Cl	moist	(Fill)
460	-	1.5 m	Gry / Br Si(y) Cl / Cl(y) Si	moist	(Native)
BH# 90		Sta (0+600)			
TOS		NAD'83 Coordinates: 17 T 4841902 592653			
0	-	300	Tps	moist	(Fill)
300	-	490	Br Si(y) Sa / Sa(y) Si, Tr Cl	moist	(Fill)
490	-	1.5 m	Gry / Br Si(y) Cl / Cl(y) Si	moist	(Native)
BH# 91		Sta (0+550)			
CL		NAD'83 Coordinates: 17 T 4841859 592628			
0	-	400	Tps	moist	(Fill)
400	-	450	Br Si(y) Sa / Sa(y) Si, Tr Cl	moist	(Fill)
450	-	1.5 m	Gry / Br Si(y) Cl / Cl(y) Si	moist	(Native)
BH# 92		Sta (0+500)			
CL		NAD'83 Coordinates: 17 T 4841825 592589			
0	-	260	Tps	moist	(Fill)
260	-	400	Br Si(y) Sa / Sa(y) Si, Tr Cl	moist	(Fill)
400	-	1.5 m	Gry / Br Si(y) Cl / Cl(y) Si	moist	(Native)
BH# 93		Sta (0+500)			
TOS		NAD'83 Coordinates: 17 T 4841825 592589			
0	-	260	Tps	moist	(Fill)
260	-	460	Br Si(y) Sa / Sa(y) Si, Tr Cl	moist	(Fill)
460	-	1.5 m	Gry / Br Si(y) Cl / Cl(y) Si	moist	(Native)
BH# 94		Sta (0+450)			
CL		NAD'83 Coordinates: 17 T 4841786 592572			
0	-	290	Tps	moist	(Fill)
290	-	400	Gry Sa(y) Si / Si(y) Sa, Tr Gr & Cl	moist	(Fill)
400	-	1.5 m	Gry Cl(y) Si / Si(y) Cl	moist	(Native)

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 95	Sta (0+400)																					
CL		NAD'83 Coordinates: 17 T 4841746 592528																				
0	-	280	Tps	moist (Fill)																		
280	-	500	Lt Br Si(y) Sa / Sa(y) Si, Tr Cl	moist (Fill)																		
500	-	1.5 m	Lt Br Cl(y) Si / Si(y) Cl	moist (Native)																		
BH# 96	Sta (0+400)																					
TOS		NAD'83 Coordinates: 17 T 4841746 592528																				
0	-	300	Tps	moist (Fill) Hex=0, IBL=0																		
300	-	420	Lt Br Si(y) Sa / Sa(y) Si	moist (Fill) Hex=0, IBL=0																		
420	-	1.5 m	Gry / Br Cl(y) Si / Si(y) Cl	moist (Native) Hex=0, IBL=0																		
BH# 97	Sta (0+350)																					
CL		NAD'83 Coordinates: 17 T 4841697 592498																				
0	-	300	Tps (w = 23.6%)	moist (Fill)																		
300	-	420	Lt Br Si(y) Sa / Sa(y) Si (w = 12.1%)	moist (Fill)																		
420	-	1.5 m	Cl & Si, some Sa (w = 18.0%)	moist (Native)																		
		<table border="0" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th style="text-align: left; border-bottom: 1px solid black;">Sieve</th> <th style="text-align: left; border-bottom: 1px solid black;">% Pass</th> </tr> </thead> <tbody> <tr><td>4.75 mm</td><td>100.0</td></tr> <tr><td>2.00 mm</td><td>99.8</td></tr> <tr><td>425 µm</td><td>96.9</td></tr> <tr><td>75 µm</td><td>89.1</td></tr> <tr><td>5 µm</td><td>59.1</td></tr> <tr><td>2 µm</td><td>44.1</td></tr> <tr><td colspan="2" style="text-align: center; color: red;">MSFH</td></tr> <tr><td colspan="2" style="text-align: center;">Soil Classification: CI W_L/W_P/I_P= 41/18/23</td></tr> </tbody> </table>			Sieve	% Pass	4.75 mm	100.0	2.00 mm	99.8	425 µm	96.9	75 µm	89.1	5 µm	59.1	2 µm	44.1	MSFH		Soil Classification: CI W_L/W_P/I_P= 41/18/23	
Sieve	% Pass																					
4.75 mm	100.0																					
2.00 mm	99.8																					
425 µm	96.9																					
75 µm	89.1																					
5 µm	59.1																					
2 µm	44.1																					
MSFH																						
Soil Classification: CI W_L/W_P/I_P= 41/18/23																						
BH# 98	Sta (0+300)																					
CL		NAD'83 Coordinates: 17 T 4841667 592467																				
0	-	250	Tps	moist (Fill)																		
250	-	400	Lt Br Si(y) Sa / Sa(y) Si	moist (Fill)																		
400	-	1.5 m	Gry / Br Cl(y) Si / Si(y) Cl	moist (Native)																		
BH# 99	Sta (0+300)																					
TOS		NAD'83 Coordinates: 17 T 4841667 592467																				
0	-	250	Tps	moist (Fill)																		
250	-	460	Br Si(y) Sa, some Cl	moist (Fill)																		
460	-	1.5 m	Lt Br Cl(y) Si Till	moist (Native)																		
BH# 100	Sta (0+200)																					
CL		NAD'83 Coordinates: 17 T 4841588 592405																				
0	-	280	Tps	moist (Fill)																		
280	-	450	Br / Gry Si(y) Cl, Tr Org & Sa	moist (Fill)																		
450	-	1.5 m	Gry Si(y) Cl Till, Tr Sa	moist (Native)																		

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

BH# 101		Sta (0+200)			
TOS		NAD'83 Coordinates: 17 T 4841588 592405			
0	-	310	Tps	moist	(Fill)
310	-	400	Br / Gry Si(y) Sa, some Cl	moist	(Fill)
400	-	1.5 m	Gry Si(y) Cl Till, some Sa	moist	(Native)
BH# 102		Sta (0+150)			
CL		NAD'83 Coordinates: 17 T 4841537 592380			
0	-	240	Tps	moist	(Fill)
240	-	400	Lt Br Si(y) Sa / Sa(y) Si	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si / Si(y) Cl	moist	(Native)
BH# 103		Sta (0+100)			
CL		NAD'83 Coordinates: 17 T 4841509 592344			
0	-	210	Tps	moist	(Fill) Hex=0, IBL=0
210	-	450	Lt Br Si(y) Sa / Sa(y) Si	moist	(Fill) Hex=0, IBL=0
450	-	1.5 m	Lt Br Cl(y) Si / Si(y) Cl, Tr Sa	moist	(Native) Hex=0, IBL=0
BH# 104		Sta (0+100)			
TOS		NAD'83 Coordinates: 17 T 4841509 592344			
0	-	200	Tps	moist	(Fill)
200	-	400	Lt Br Si(y) Sa / Sa(y) Si	moist	(Fill)
400	-	1.5 m	Lt Br Si / Cl(y) Si, Tr Sa	moist	(Native)
BH# 105		Sta (0+050)			
CL		NAD'83 Coordinates: 17 T 4841462 592312			
0	-	180	Tps (w = 25.4%)	moist	(Fill)
180	-	400	Lt Br Si(y) Sa / Sa(y) Si (w = 14.9%)	moist	(Fill)
400	-	1.5 m	Lt Br Cl(y) Si / Si(y) Cl, Tr Sa & Gr (w = 16.1%)	moist	(Native)

And > 40%.
 Adjective (Si(y), Sa(y) 30-40%
 With 20-30%
 Some 10-20%
 Trace 1-10%

BOREHOLE LOG DATA

Chinguacousy Road

BH# 106 SBL

MDL

Depth (m)	Interval (m)	Soil Description	Moisture	Notes
0	- 55	Asph		
55	- 200	Sa & Gr	moist	(Fill)
200	- 400	Gr(y) Sa	moist	(Fill)
400	- 600	Gry Si(y) Sa & Gr	moist	(Fill)
600	- 900	Dk Gry Si(y) Cl W Org	moist	(Fill)
900	- 1.5 m	Br Si(y) Cl Till	moist	(Native)

Sta (2+800) o/s 2.1 m W of CL

NAD'83 Coordinates: 17 T4841422.088 592285.828

BH# 107 NBL

MDL

Depth (m)	Interval (m)	Soil Description	Moisture	Notes
0	- 55	Asph		
55	- 300	Gr(y) Sa / Sa(y) Gr, some Si	moist	(Fill)
300	- 600	Sa, some Gr & Si	moist	(Fill)
600	- 1.0 m	Dk Gry Si(y) Cl W Org	moist	(Fill)
600	- 1.5 m	Br Si(y) Cl Till	moist	(Native)

Sta (2+800) o/s 2.0 m E of CL

NAD'83 Coordinates: 17 T4841418.018 592289.947

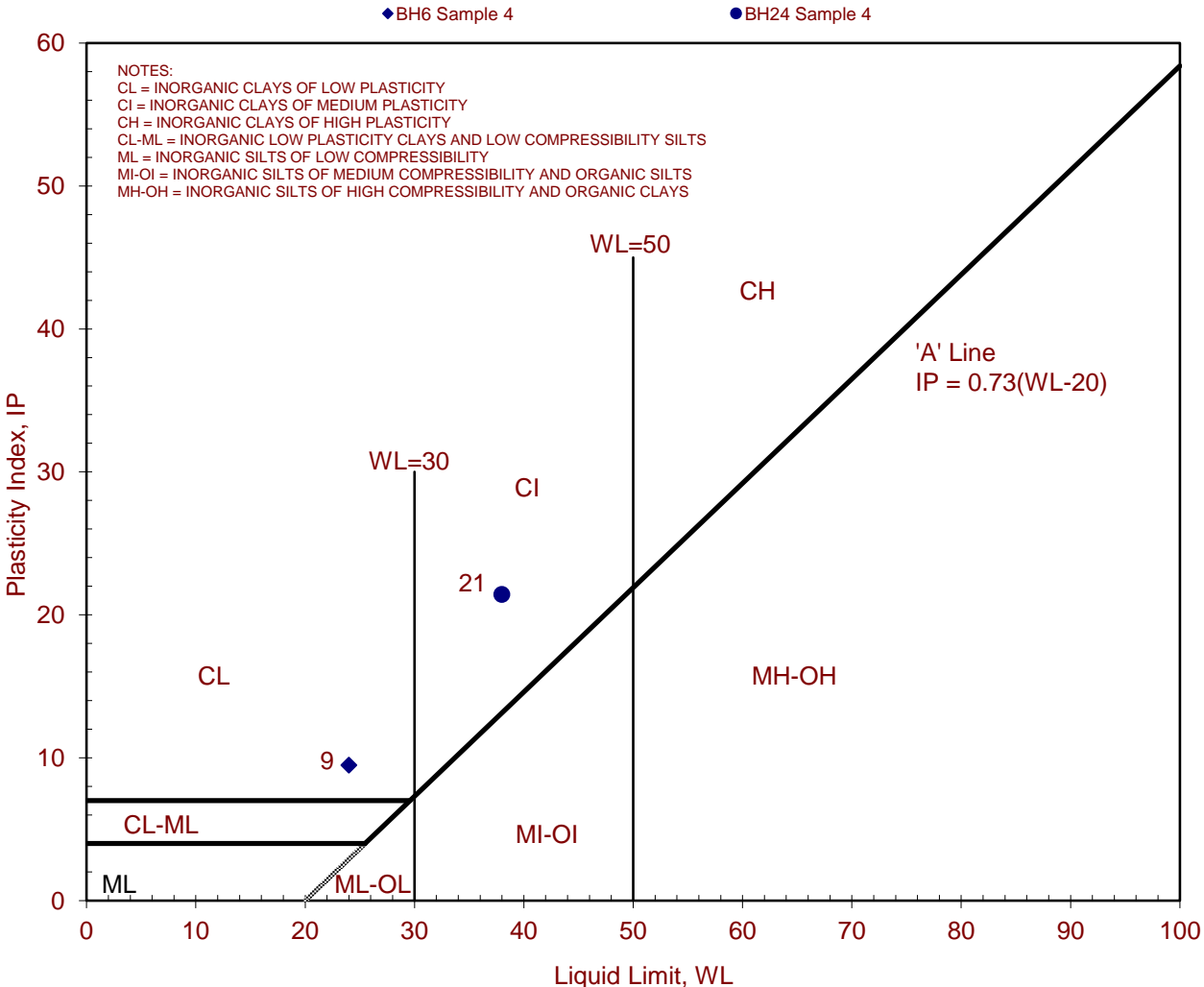
Appendix C
Laboratory Test Results



ATTERBERG LIMITS D 4318

Project Title: EA Widening McLaughlin - Mayfield **Project No.:** TPB166090.6000
Project Client: Town Of Caledon **Date Tested:** 03-Nov-2017
Project Location: McLaughlin Road, Widening from 2 to 4 lanes ~ 1.7 km, Caledon, ON. **Sampled By:** -
Tested By: CZ

		TEST RESULTS			
Borehole No.	BH6	BH24			
Sample No.	Sample 4	Sample 4			
Liquid Limit	24	38			
Plastic Limit	15	17			
Plasticity Index	9	21			
Soil Classification	CL	CI			
Natural Moisture Content %	14	14			



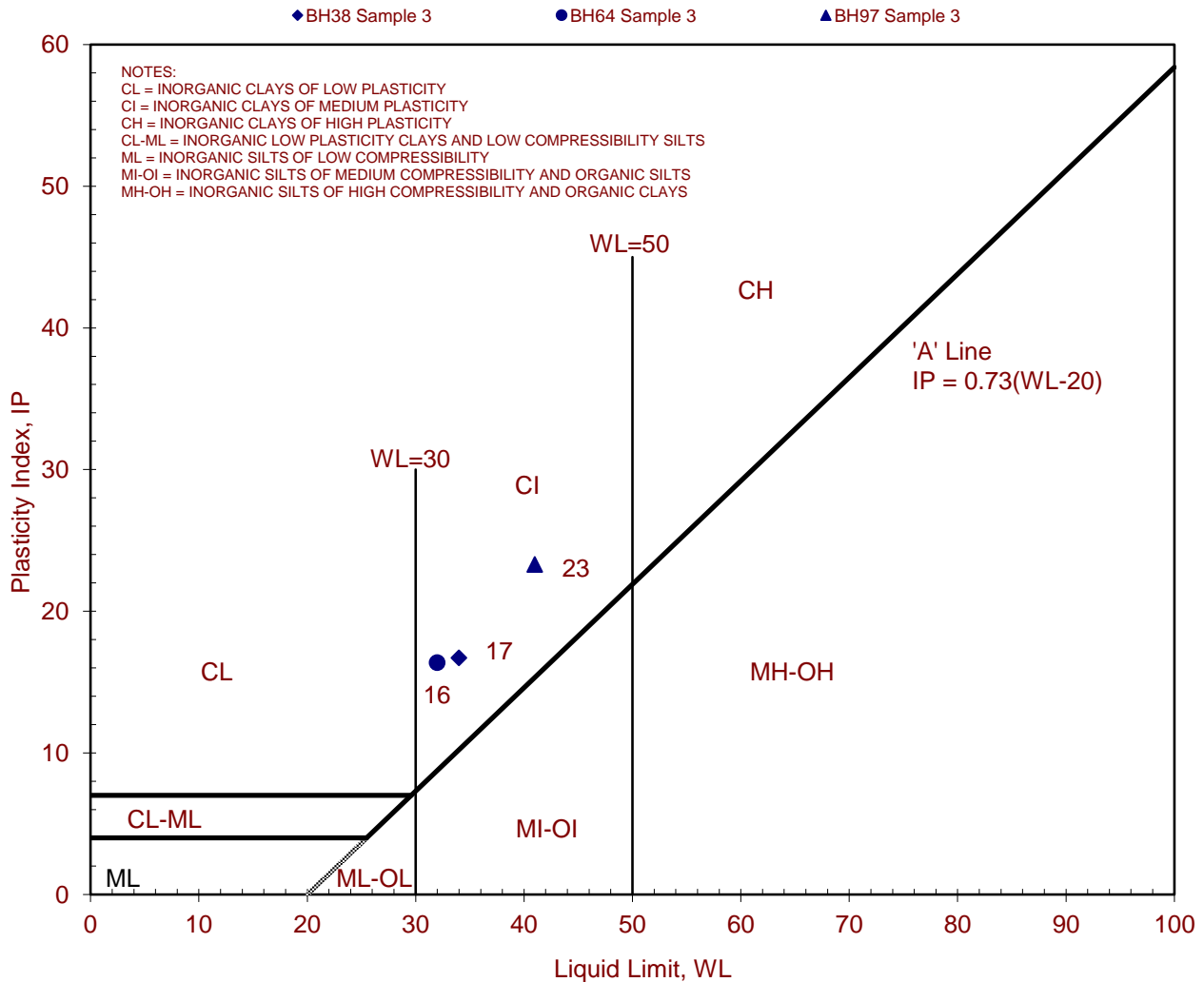
Laboratory Sheet No.: Att-01

Signed By: SB

**ATTERBERG LIMITS
D 4318**

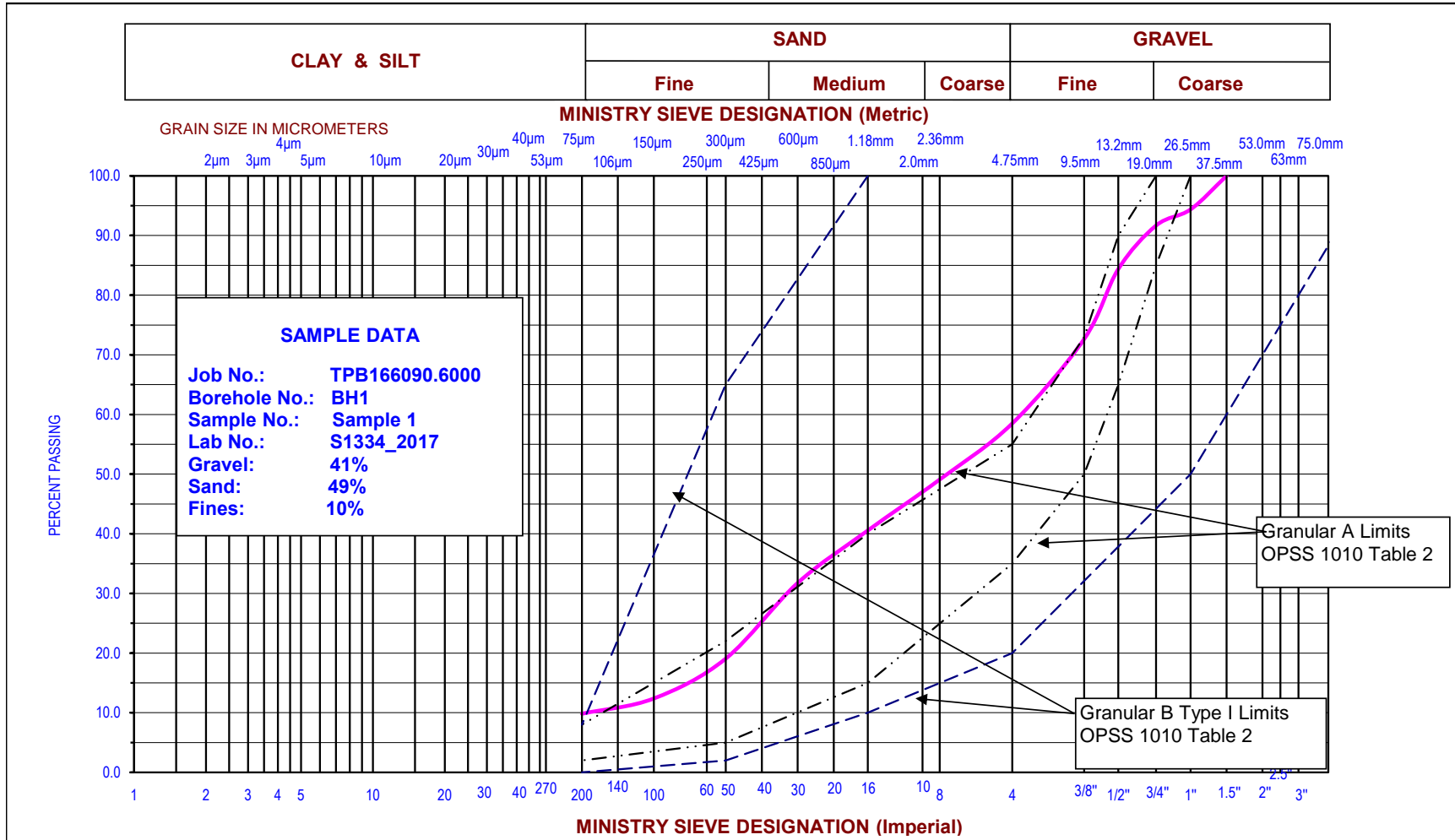
Project Title: EA Widening McLaughlin - Mayfield **Project No.:** TPB166090.6000
Project Client: Town Of Caledon **Date Tested:** 03-Nov-2017
Project Location: 1200 m West of Hwy 10 to Railway Crossing and 1600 m from West of Railway Crossing to Chinguacousy Road, Caledon, ON. **Sampled By:** -
Tested By: CZ

TEST RESULTS			
Borehole No.	BH38	BH64	BH97
Sample No.	Sample 3	Sample 3	Sample 3
Liquid Limit	34	32	41
Plastic Limit	17	16	18
Plasticity Index	17	16	23
Soil Classification	CI	CI	CI
Natural Moisture Content %	11	12	18



Laboratory Sheet No.: Att-01&02

Signed By: SB



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	GRAVEL AND SAND	Project:- EA Widening McLaughlin - Mayfield	
	trace silt	Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,	
		Lab No. :- S1334_2017	Date :- 02 Nov 2017



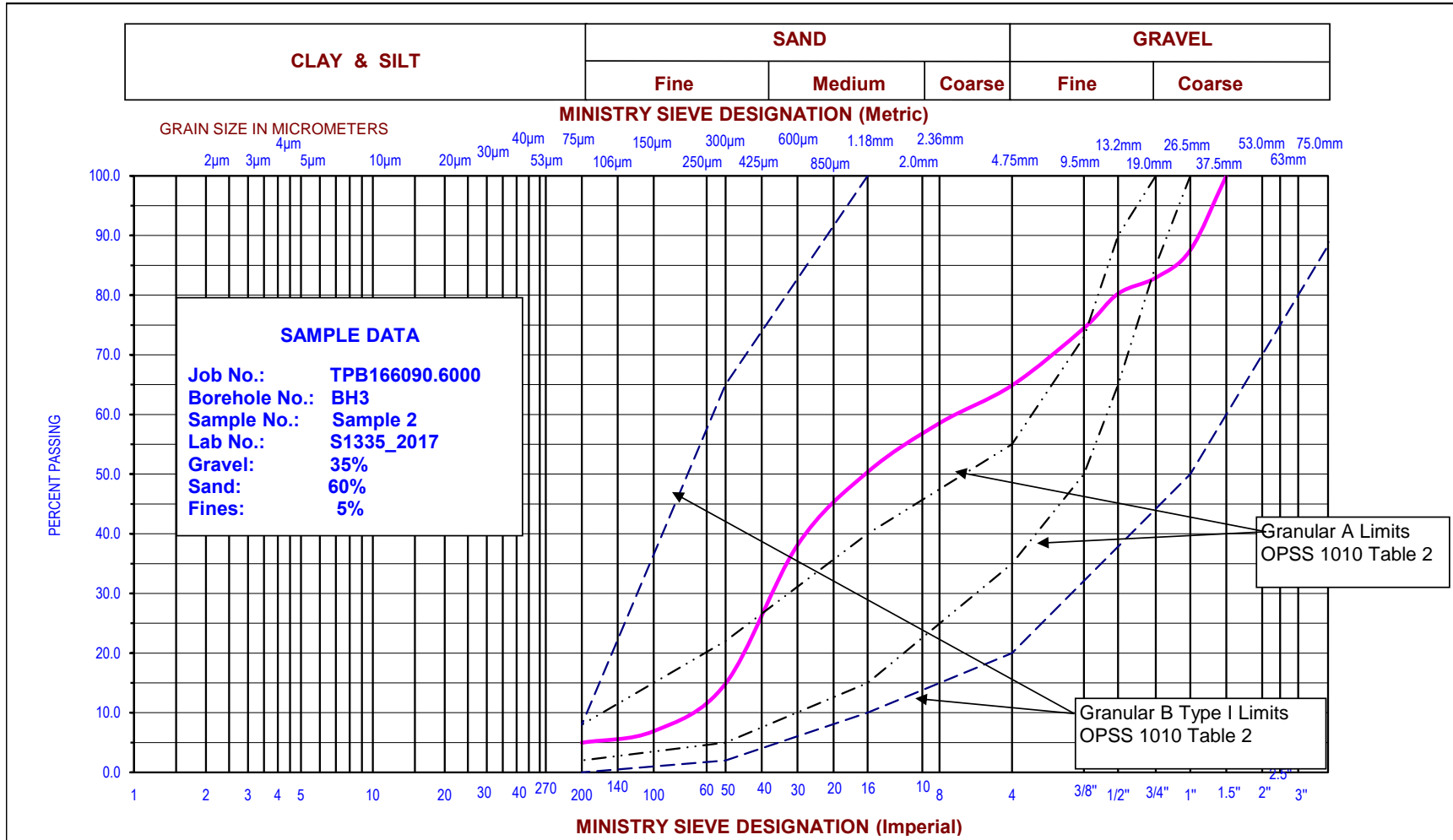
Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH1
Sample ID # :- Sample 1
Lab No. :- S1334_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
37.50	0.00	100.0
26.5	37.39	94.4
19	55.35	91.7
13.20	103.85	84.4
9.5	181.79	72.6
4.75	275.80	58.5
2.36		49.1
1.180		40.5
0.600		31.7
0.300		19.1
0.150		12.4
0.075		9.8

Total Wt (g)		664.54
FINES		
294.65 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	47.35	83.9%
1.18	90.42	69.3%
0.600	134.73	54.3%
0.300	198.60	32.6%
0.15	232.25	21.2%
0.075	245.14	16.8%
Pan	245.36	



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	GRAVELLY SAND	Project:- EA Widening McLaughlin - Mayfield	
	trace silt	Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,	
		Lab No. :- S1335_2017	Date :- 02 Nov 2017



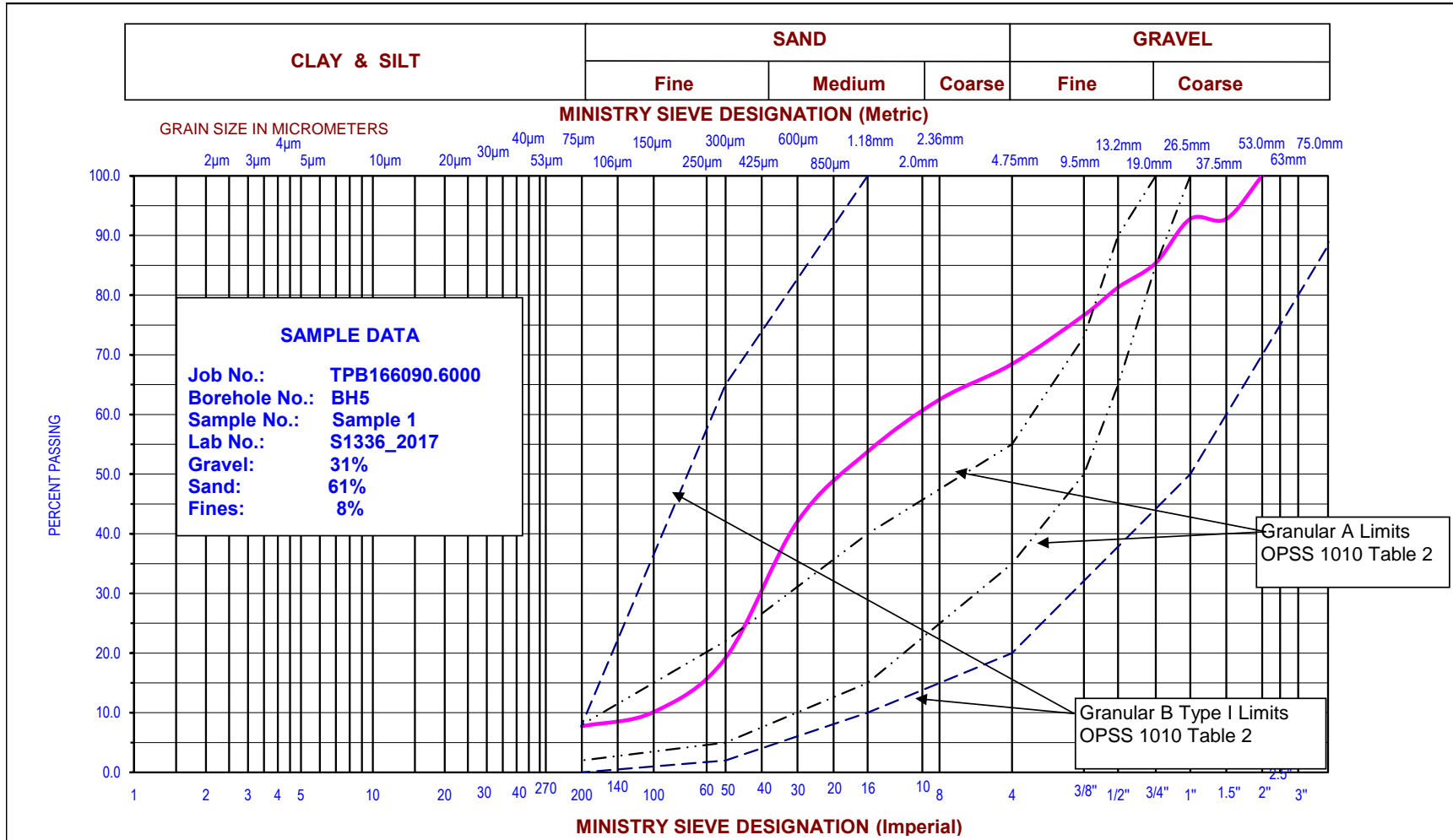
Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH3
Sample ID # :- Sample 2
Lab No. :- S1335_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
37.50	0.00	100.0
26.5	132.53	87.6
19	181.75	82.9
13.20	210.30	80.2
9.5	271.73	74.5
4.75	373.86	64.9
2.36		58.5
1.180		50.3
0.600		38.1
0.300		14.9
0.150		6.9
0.075		5.0

Total Wt (g)		1064.52
FINES		
295.36 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	28.84	90.2%
1.18	66.16	77.6%
0.600	121.94	58.7%
0.300	227.55	23.0%
0.15	263.90	10.7%
0.075	272.74	7.7%
Pan	272.88	



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GRAIN SIZE DISTRIBUTION

GRAVELLY SAND

trace silt

Client :- Town Of Caledon

Project:- EA Widening McLaughlin - Mayfield

Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,

Lab No. :- S1336_2017

Date :- 02 Nov 2017



Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH5
Sample ID # :- Sample 1
Lab No. :- S1336_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

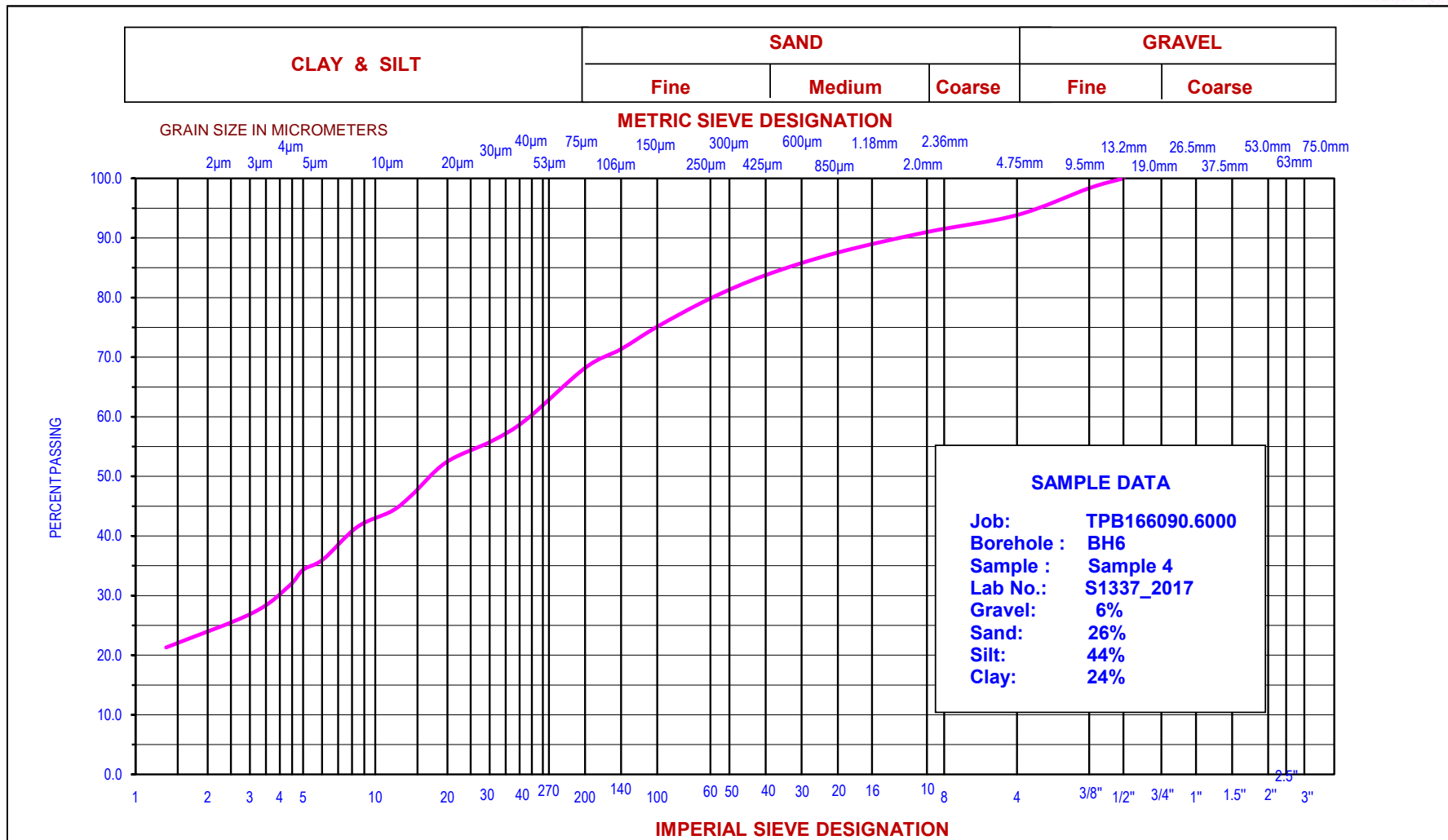
Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
53	0.00	100.0
37.50	77.19	92.8
26.5	77.19	92.8
19	156.27	85.4
13.20	200.23	81.3
9.5	250.08	76.6
4.75	337.67	68.5
2.36		62.5
1.180		53.8
0.600		42.0
0.300		19.2
0.150		10.1
0.075		7.7

Total Wt (g)		1070.58
FINES		
270.90 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	23.60	91.3%
1.18	58.19	78.5%
0.600	104.56	61.4%
0.300	194.90	28.1%
0.15	230.82	14.8%
0.075	240.31	11.3%
Pan	240.52	



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	SILT with sand & clay, trace gravel	Project:- EA Widening McLaughlin - Mayfield	
		Location:- McLaughlin Road Widening, from 2 to 4 lanes, ~ 1.7 km, Caledon, ON.	
		Lab No. :- S1337_2017	Date :- 02 Nov 2017

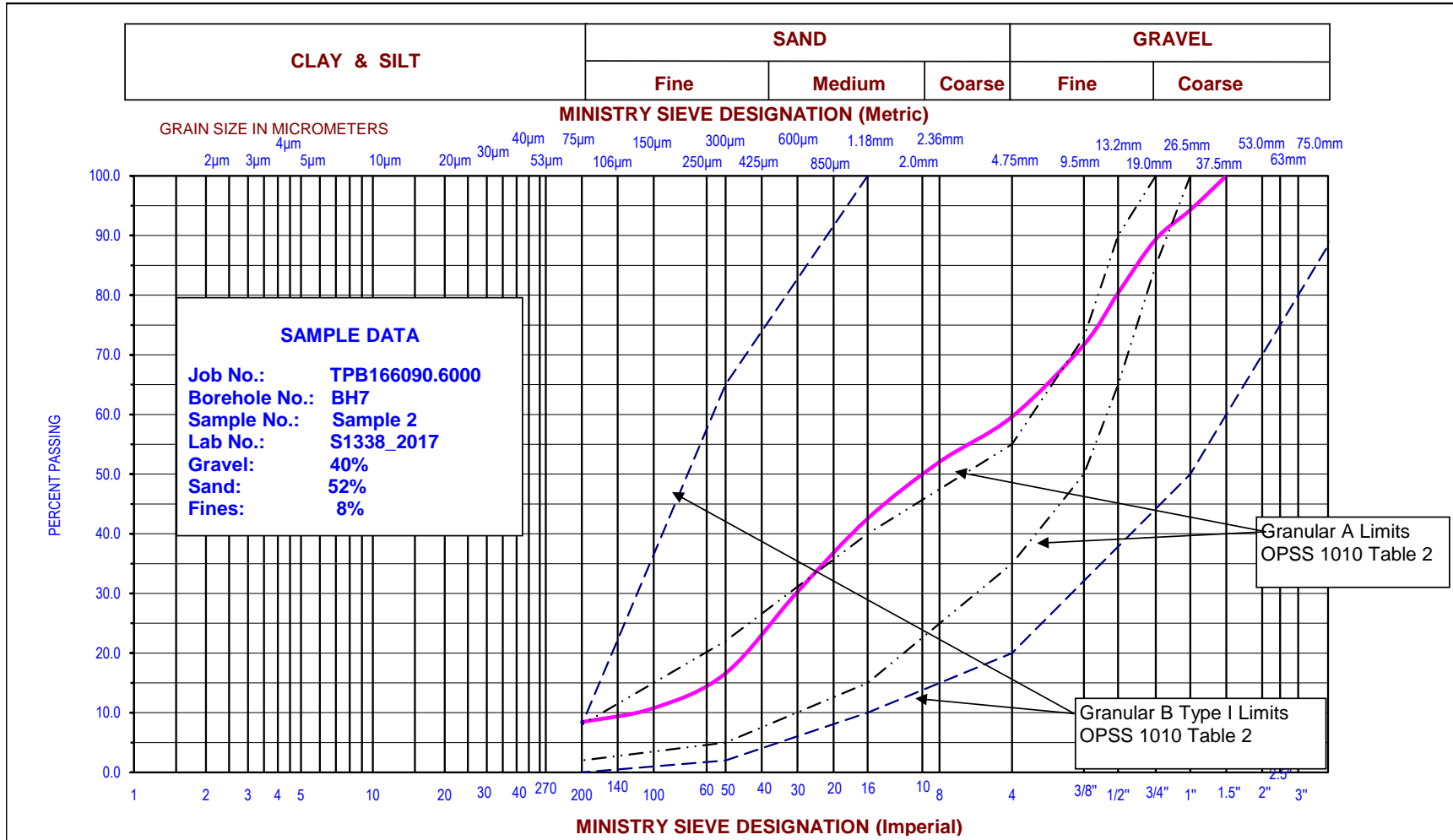
Grain Size Analysis

Project:- EA Widening McLaughlin - Mayfield
Location:- McLaughlin Road, Widening from 2 to 4 lanes ~ 1.7 km, Caledon, ON.
Client :- Town Of Caledon
Job# :- TPB166090.6000
Borehole # :- BH6
Lab No. :- S1337_2017

Date :- 2-Nov-17
Tested By :- WA/DB/CZ
Sample # :- Sample 4
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
13.2	0.00	100.0
9.5	3.70	98.4
4.75	13.86	93.8
2.00	20.27	91.0
0.85		87.6
0.425		83.8
0.25		79.9
0.150		75.1
0.106		71.4
0.0750		68.2
0.0427		59.6
0.0307		55.9
0.0197		52.3
0.0143		46.9
0.0118		44.2
0.0084		41.5
0.0061		36.1
0.0050		34.3
0.0044		31.6
0.0031		27.1
0.0013		21.3

Total Wt. (g)		227.09
Wt used for Hydrometer (g)		
49.85		
Pass 2mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
0.850	1.88	96.2%
0.425	3.96	92.1%
0.250	6.10	87.8%
0.150	8.70	82.5%
0.106	10.76	78.4%
0.075	12.49	74.9%
Pan	12.65	



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	GRAVEL AND SAND	Project:- EA Widening McLaughlin - Mayfield	
	trace silt	Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,	
		Lab No. :- S1338_2017	Date :- 02 Nov 2017



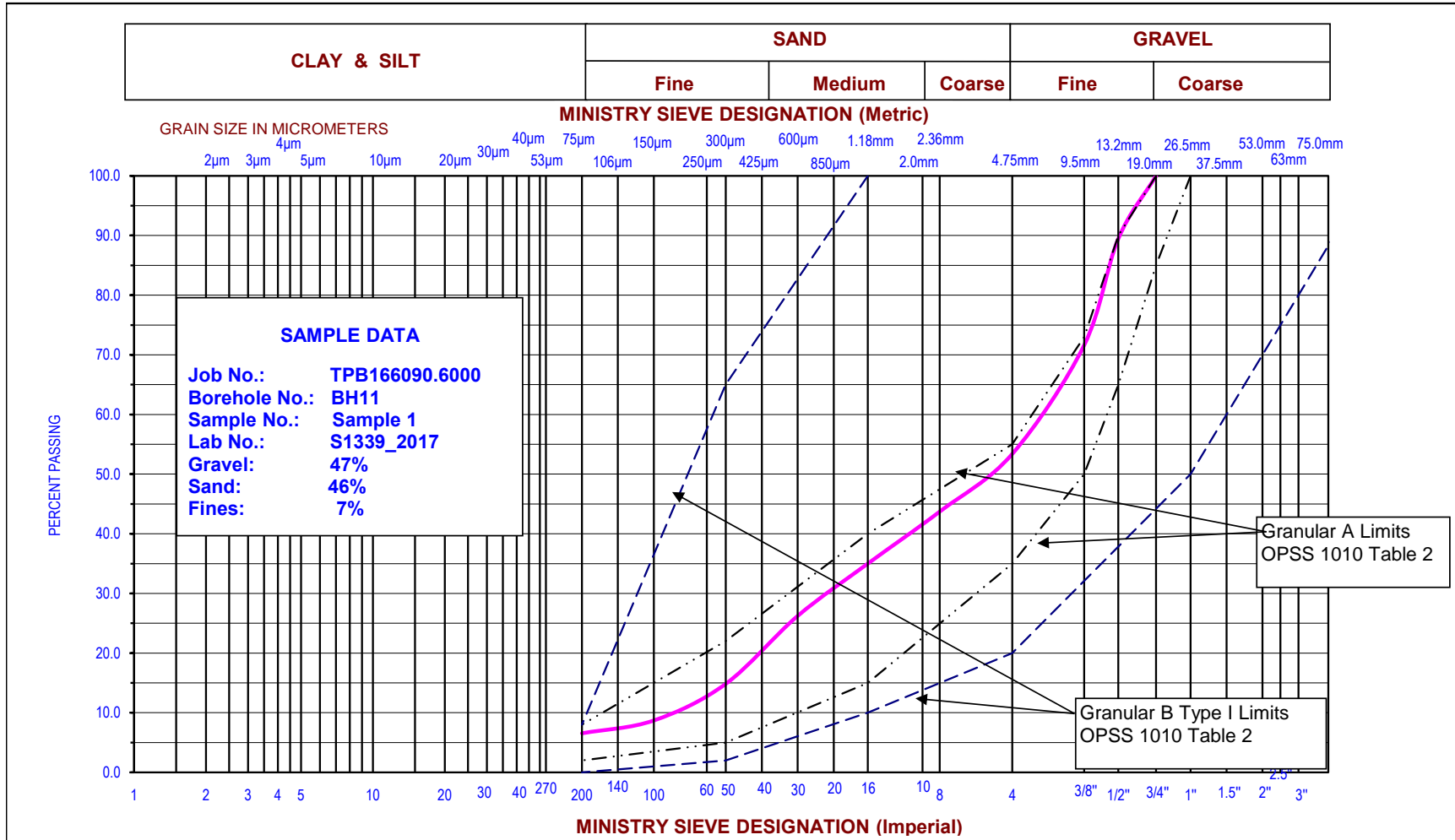
Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH7
Sample ID # :- Sample 2
Lab No. :- S1338_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
37.50	0.00	100.0
26.5	62.57	94.3
19	116.28	89.4
13.20	215.06	80.3
9.5	309.50	71.7
4.75	441.71	59.6
2.36		52.0
1.180		42.5
0.600		30.3
0.300		16.6
0.150		10.8
0.075		8.4

Total Wt (g)		1093.91
FINES		
274.18 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	34.85	87.3%
1.18	78.56	71.3%
0.600	135.01	50.8%
0.300	197.83	27.8%
0.15	224.63	18.1%
0.075	235.47	14.1%
Pan	235.76	



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GRAIN SIZE DISTRIBUTION

SAND AND GRAVEL

trace silt

Client :- Town Of Caledon

Project:- EA Widening McLaughlin - Mayfield

Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,

Lab No. :- S1339_2017

Date :- 02 Nov 2017



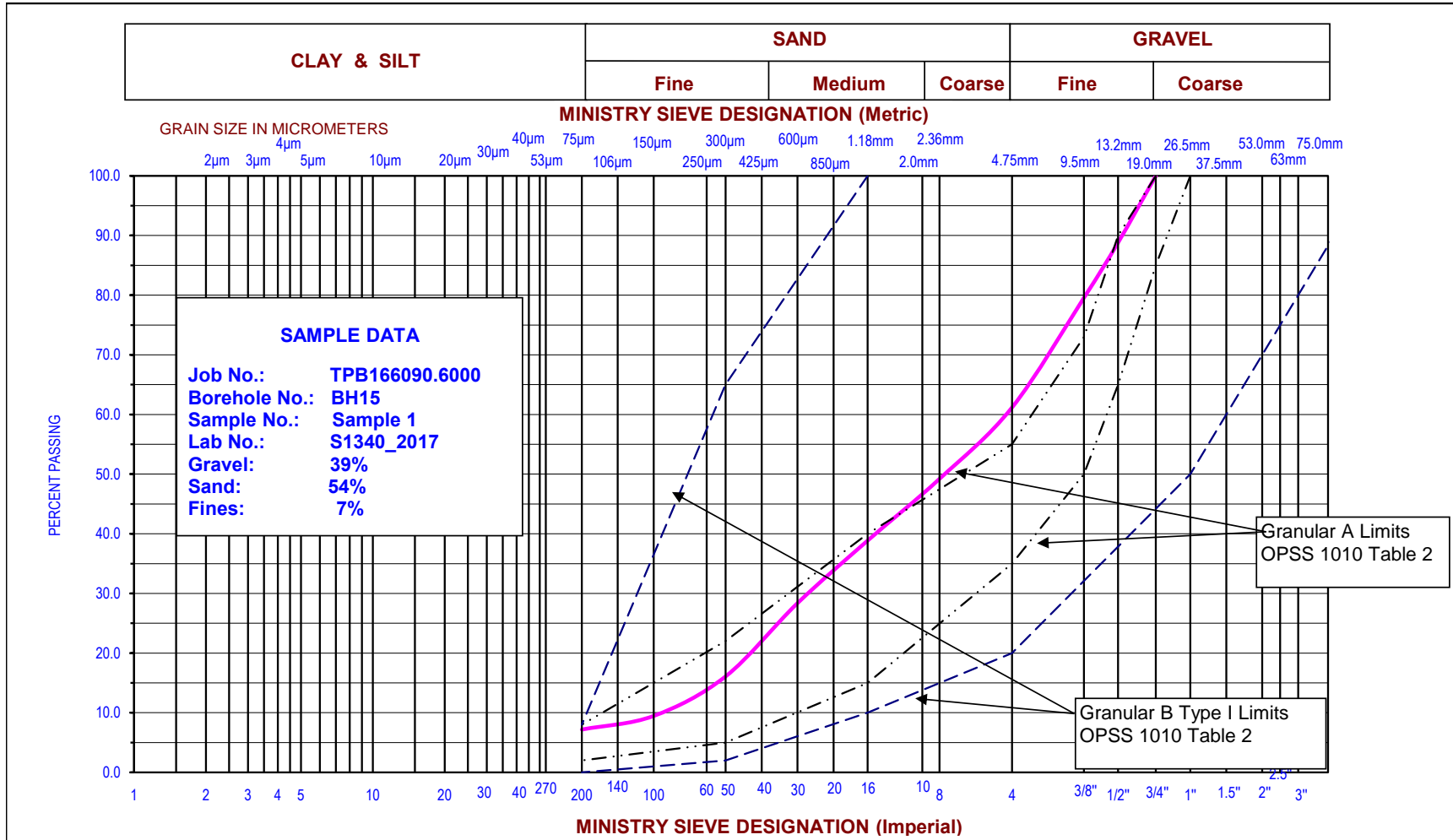
Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH11
Sample ID # :- Sample 1
Lab No. :- S1339_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
19	0.00	100.0
13.20	92.59	89.5
9.5	249.27	71.6
4.75	409.33	53.4
2.36		43.7
1.180		35.0
0.600		26.2
0.300		14.8
0.150		8.7
0.075		6.5

Total Wt (g)		878.11
FINES		
285.68 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	51.75	81.9%
1.18	98.43	65.5%
0.600	145.37	49.1%
0.300	206.28	27.8%
0.15	239.12	16.3%
0.075	250.65	12.3%
Pan	250.87	



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GRAIN SIZE DISTRIBUTION

GRAVELLY SAND

trace silt

Client :- Town Of Caledon

Project:- EA Widening McLaughlin - Mayfield

Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,

Lab No. :- S1340_2017

Date :- 02 Nov 2017



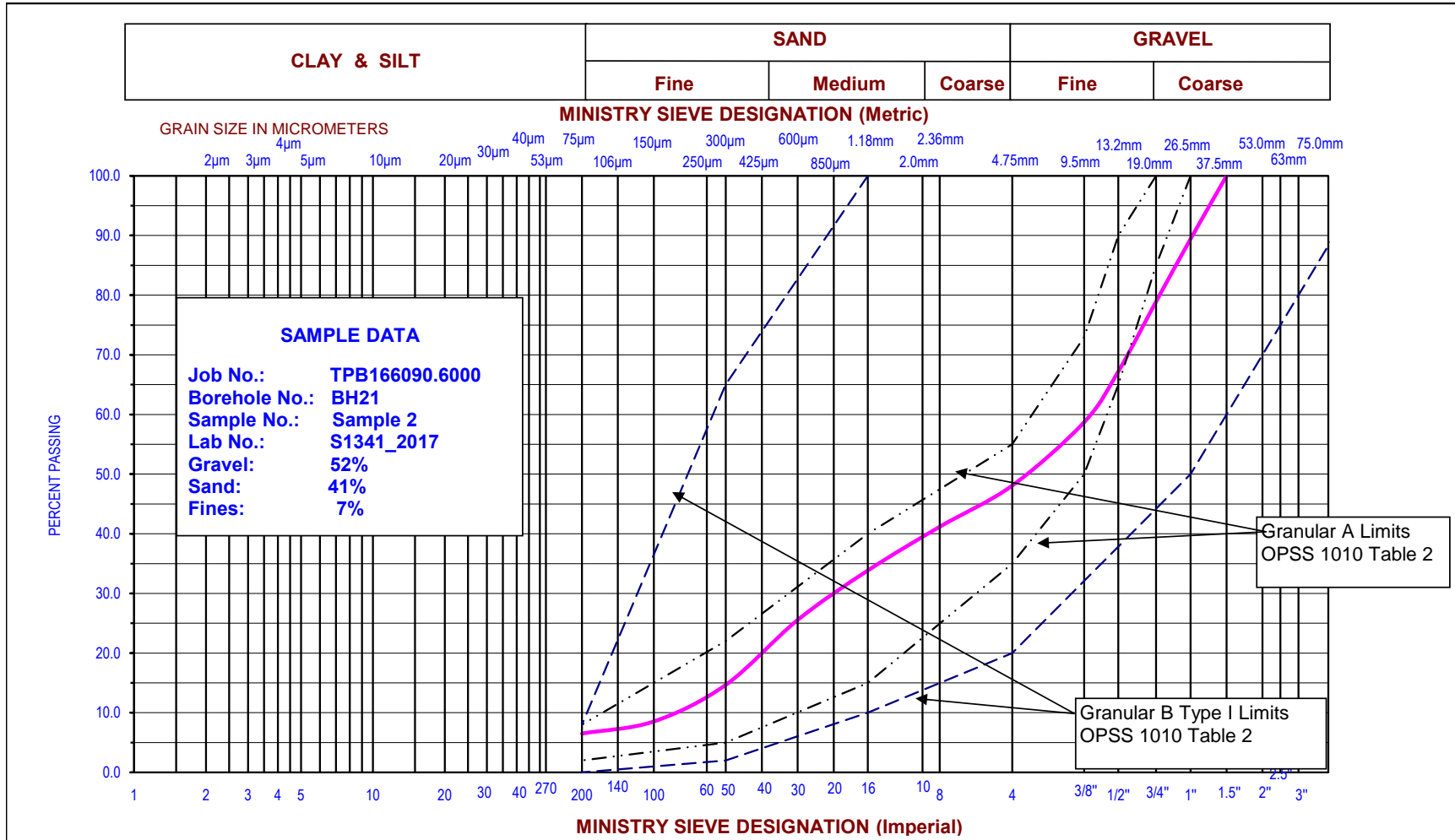
Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH15
Sample ID # :- Sample 1
Lab No. :- S1340_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
19	0.00	100.0
13.20	102.28	88.8
9.5	186.72	79.6
4.75	354.70	61.2
2.36		49.2
1.180		38.9
0.600		28.4
0.300		16.1
0.150		9.5
0.075		7.2

Total Wt (g)		913.60
FINES		
290.37 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	56.81	80.4%
1.18	105.96	63.5%
0.600	155.76	46.4%
0.300	214.02	26.3%
0.15	245.45	15.5%
0.075	256.31	11.7%
Pan	256.59	



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GRAIN SIZE DISTRIBUTION

SAND AND GRAVEL

trace silt

Client :- Town Of Caledon

Project:- EA Widening McLaughlin - Mayfield

Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,

Lab No. :- S1341_2017

Date :- 02 Nov 2017



Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH21
Sample ID # :- Sample 2
Lab No. :- S1341_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

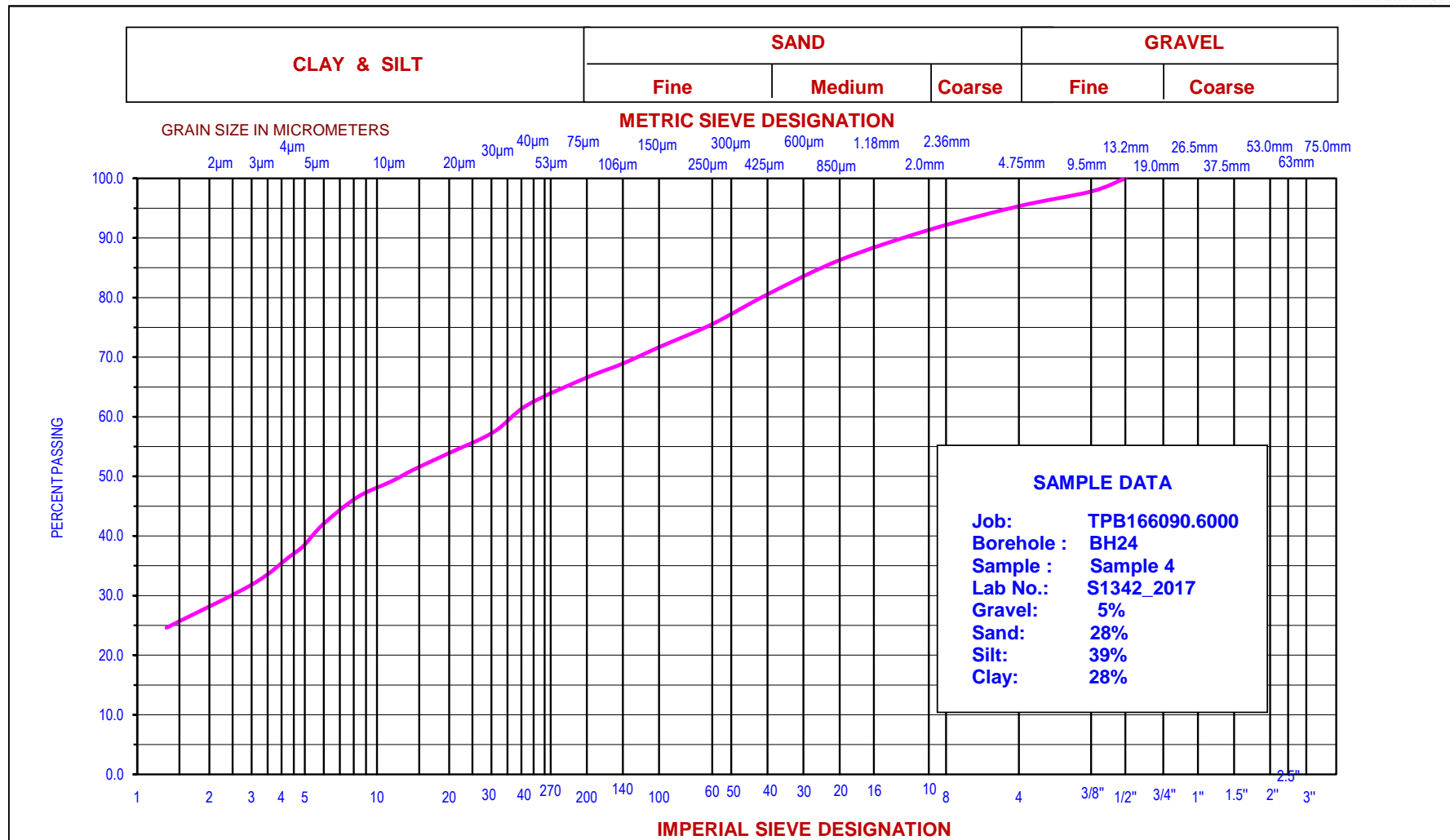
Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
37.50	0.00	100.0
26.5	78.88	89.4
19	157.25	78.9
13.20	244.64	67.2
9.5	308.01	58.7
4.75	387.21	48.1
2.36		41.2
1.180		33.8
0.600		25.5
0.300		14.7
0.150		8.5
0.075		6.5

Total Wt (g)		745.86
FINES		
284.59 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	40.91	85.6%
1.18	84.30	70.4%
0.600	133.39	53.1%
0.300	197.77	30.5%
0.15	234.05	17.8%
0.075	246.09	13.5%
Pan	246.42	



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	SILT with Clay & Sand, trace gravel	Project:- EA Widening McLaughlin - Mayfield	
		Location:- McLaughlin Road Widening, from 2 to 4 lanes, ~ 1.7 km, Caledon, ON.	
		Lab No. :- S1342_2017	Date :- 02 Nov 2017

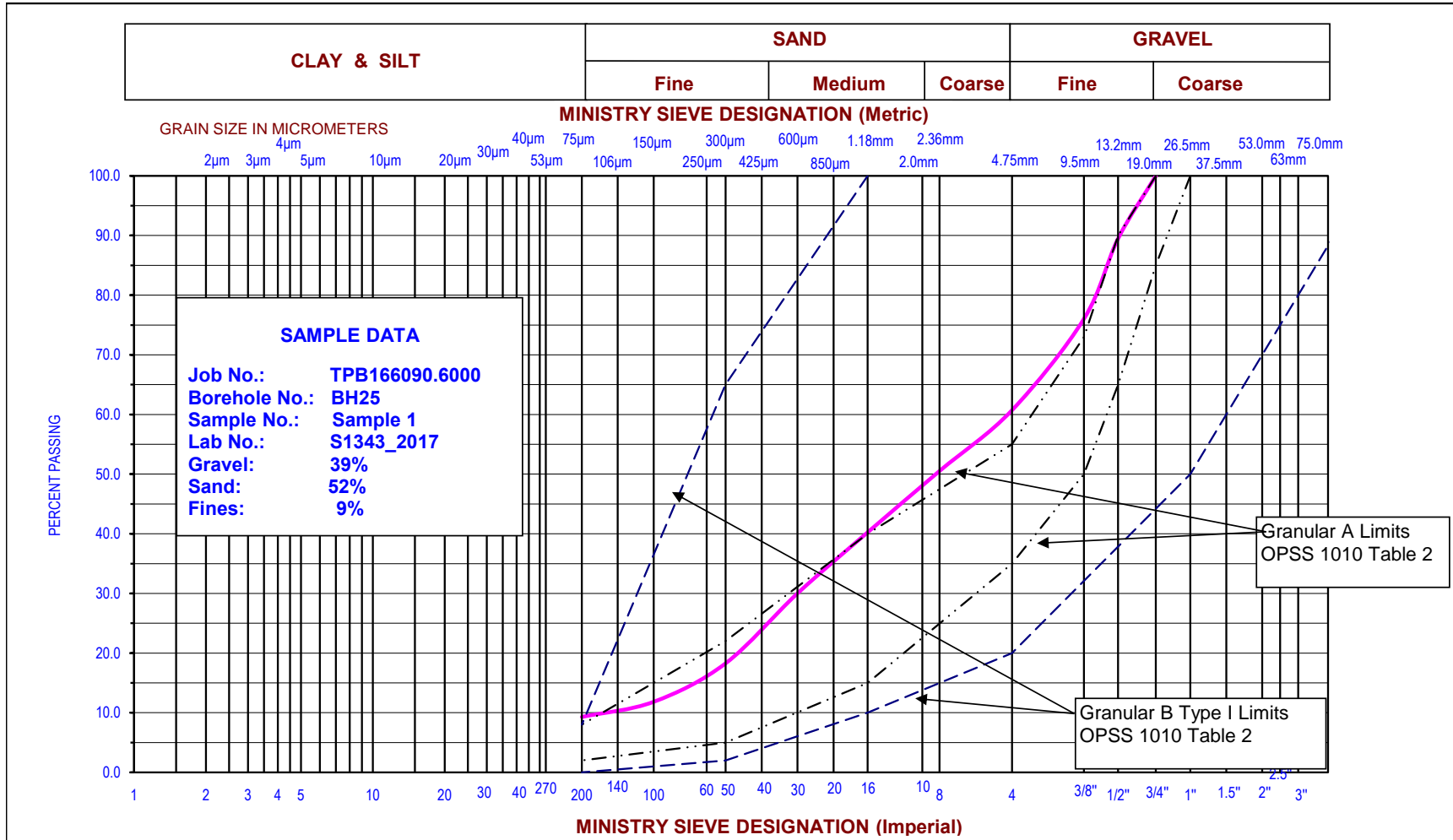
Grain Size Analysis

Project:- EA Widening McLaughlin - Mayfield
Location:- McLaughlin Road Widening, from 2 to 4 lanes ~ 1.7 km, Caledon, ON.
Client :- Town Of Caledon
Job# :- TPB166090.6000
Borehole # :- BH24
Lab No. :- S1342_2017

Date :- 2-Nov-17
Tested By :- WA/DB/CZ
Sample # :- Sample 4
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
13.2	0.00	100.0
9.5	4.98	97.8
4.75	10.54	95.3
2.00	19.56	91.3
0.85		86.3
0.425		80.5
0.25		75.5
0.150		71.7
0.106		68.9
0.0750		66.6
0.0424		62.0
0.0306		57.4
0.0197		53.8
0.0141		51.0
0.0116		49.2
0.0083		46.5
0.0059		41.9
0.0049		38.3
0.0043		36.5
0.0030		31.9
0.0013		24.6

Total Wt. (g)		228.87
Wt used for Hydrometer (g)		
49.55		
Pass 2mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
0.850	2.74	94.5%
0.425	5.86	88.2%
0.250	8.57	82.7%
0.150	10.67	78.5%
0.106	12.16	75.5%
0.075	13.43	72.9%
Pan	13.51	



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	GRAVELLY SAND	Project:- EA Widening McLaughlin - Mayfield	
	trace silt	Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,	
		Lab No. :- S1343_2017	Date :- 02 Nov 2017



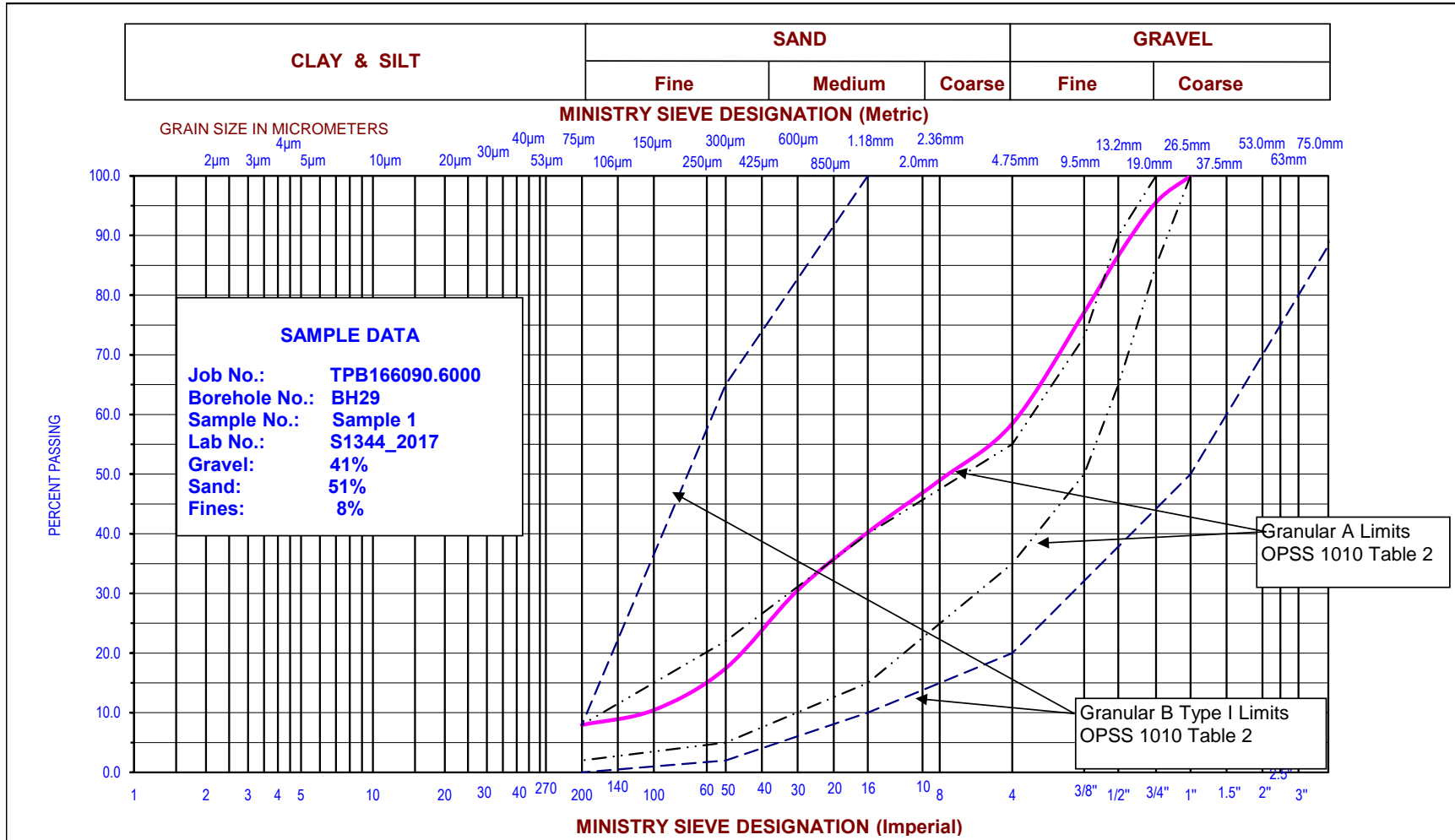
Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH25
Sample ID # :- Sample 1
Lab No. :- S1343_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
19	0.00	100.0
13.20	97.06	89.5
9.5	220.93	76.0
4.75	361.97	60.7
2.36		50.5
1.180		40.2
0.600		30.0
0.300		18.3
0.150		11.8
0.075		9.3

Total Wt (g)		921.52
FINES		
285.25 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	47.93	83.2%
1.18	96.24	66.3%
0.600	144.30	49.4%
0.300	199.39	30.1%
0.15	229.67	19.5%
0.075	241.60	15.3%
Pan	241.95	



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GRAIN SIZE DISTRIBUTION

GRAVEL AND SAND

trace silt

Client :- Town Of Caledon

Project:- EA Widening McLaughlin - Mayfield

Location:- McLaughlin Road Widening, from 2 to 4 lanes, approx. 1.7 km, Caledon, ON.,

Lab No. :- S1344_2017

Date :- 02 Nov 2017



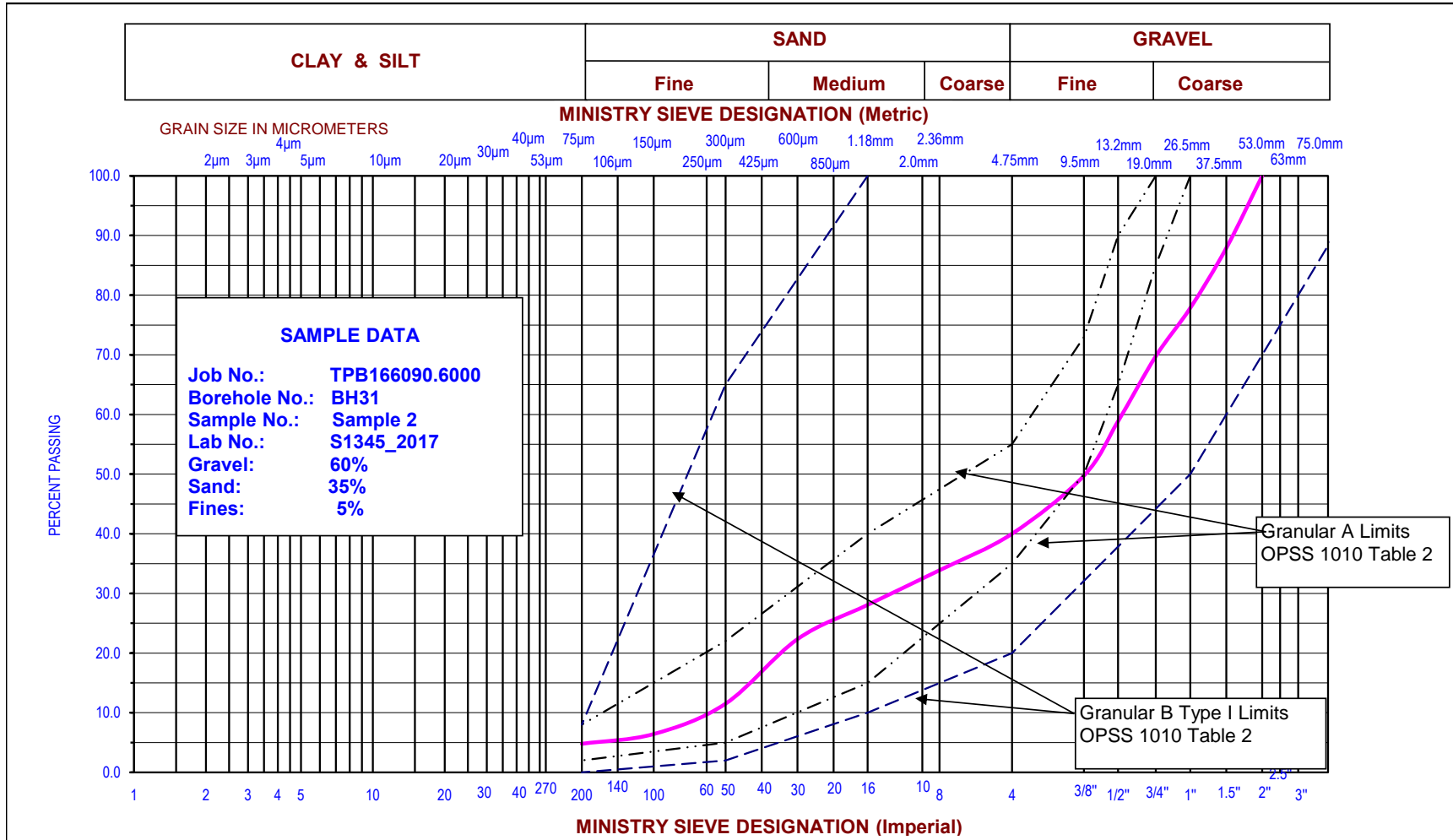
Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH29
Sample ID # :- Sample 1
Lab No. :- S1344_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
26.5	0.00	100.0
19	41.90	95.5
13.20	126.00	86.6
9.5	215.50	77.1
4.75	391.01	58.5
2.36		49.0
1.180		40.2
0.600		30.5
0.300		17.4
0.150		10.4
0.075		7.9

Total Wt (g)		941.18
FINES		
286.14 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	46.41	83.8%
1.18	89.21	68.8%
0.600	136.80	52.2%
0.300	200.75	29.8%
0.15	235.00	17.9%
0.075	247.23	13.6%
Pan	247.40	



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GRAIN SIZE DISTRIBUTION

**SANDY GRAVEL
trace silt**

Client :- Town Of Caledon

Project:- EA Widening McLaughlin - Mayfield

**Location:- McLaughlin Road Widening, from 2 to 4 lanes,
approx. 1.7 km, Caledon, ON.,**

Lab No. :- S1345_2017

Date :- 02 Nov 2017



Grain Size Analysis

Job# :- TPB166090.6000
Project:- EA Widening McLaughlin - Mayfield
Client :- Town Of Caledon
Borehole # :- BH31
Sample ID # :- Sample 2
Lab No. :- S1345_2017

Location:- McLaughlin Road Widening,
 from 2 to 4 lanes, approx. 1.7 km
 Caledon, ON.
Date :- 2-Nov-17
Tested By :- DB
Checked By :- SB

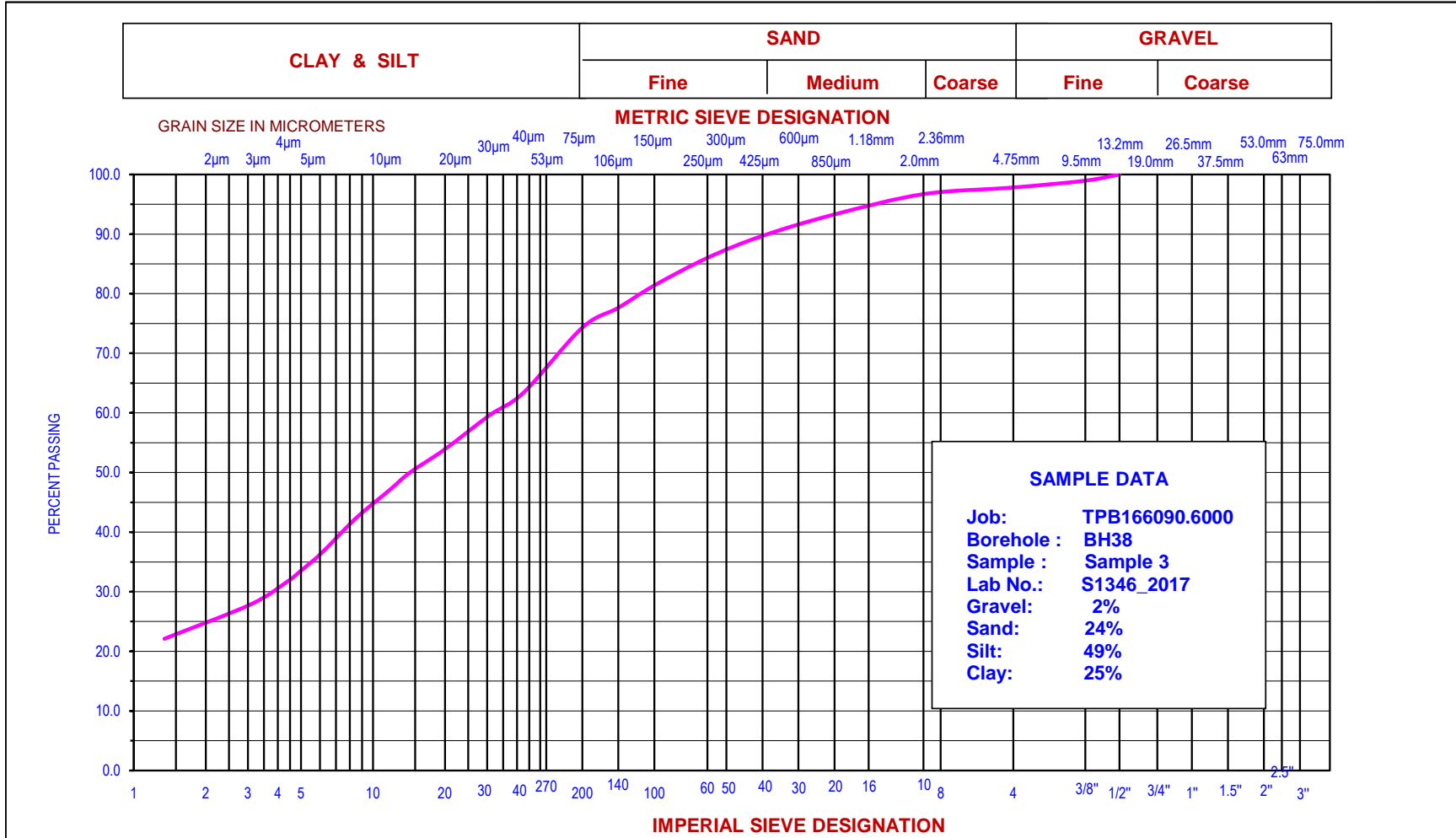
Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
53	0.00	100.0
37.50	115.81	87.9
26.5	211.96	77.9
19	289.44	69.8
13.20	393.91	58.9
9.5	481.20	49.7
4.75	574.41	40.0
2.36		33.9
1.180		28.1
0.600		22.3
0.300		11.5
0.150		6.4
0.075		4.8

Total Wt (g)		957.39
FINES		
296.53 g		
Pass 4.75 mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
2.36	45.36	84.7%
1.18	88.38	70.2%
0.600	131.00	55.8%
0.300	211.16	28.8%
0.15	248.90	16.1%
0.075	261.00	12.0%
Pan	261.29	



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UNIFIED SOIL CLASSIFICATION SYSTEM



Amec Foster Wheeler Environment & Infrastructure 104 Crockford Blvd., Scarborough, Ontario, M1R 3C3 Tel +1 (416) 751 6565, amecfw.com	GRAIN SIZE DISTRIBUTION	Client :- Town Of Caledon	
	SILT	Project:- Spine Road New Construction	
	with clay and sand, trace gravel	Location:- 1.2 km West of Hwy 10 to Railway Crossing (4 lanes) and 1.6 m from West of Railway Crossing to Chinguacousy Road (2 lanes), Caledon, ON.	
		Lab No. :- S1346_2017	Date :- 02 Nov 2017

Grain Size Analysis

Project:- Spine Road New Construction
Location:- 1.2 km West of Hwy 10 to Railway Crossing (4 lanes) and
 1.6 m from West of Railway Crossing to Chinguacousy Road (2 lanes), Caledon, ON.
Client :- Town Of Caledon
Job# :- TPB166090.6000
Borehole # :- BH38
Lab No. :- S1346_2017
Date :- 2-Nov-17
Tested By :- WA/DB/CZ
Sample # :- Sample 3
Checked By :- SB

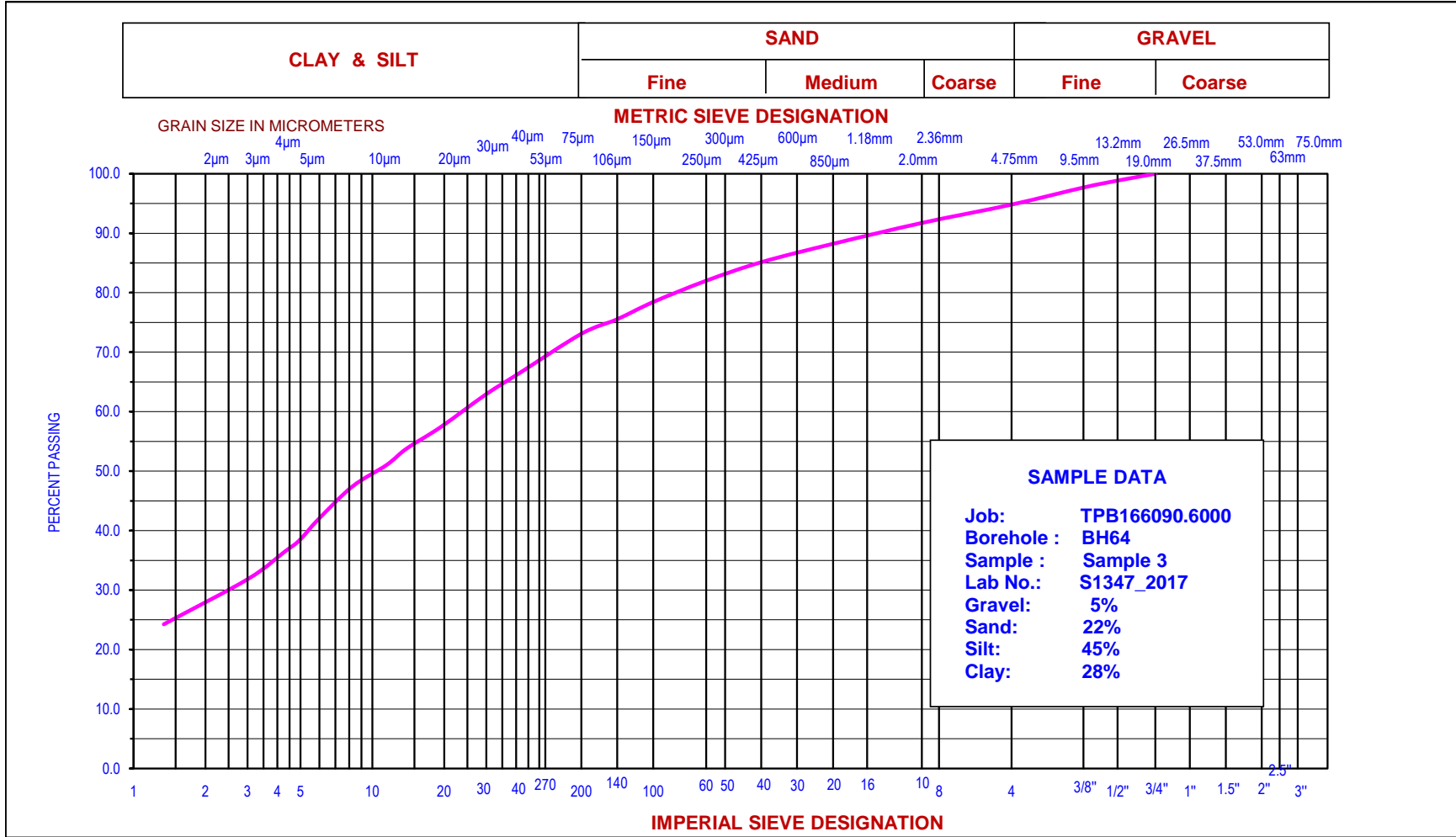
Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
13.2	0.00	100.0
9.5	2.44	99.0
4.75	5.16	97.8
2.00	7.78	96.7
0.85		93.3
0.425		89.7
0.25		86.0
0.150		81.4
0.106		77.6
0.0750		74.3
0.0427		63.4
0.0307		59.6
0.0199		53.8
0.0142		50.0
0.0118		47.1
0.0085		42.3
0.0061		36.5
0.0050		33.6
0.0044		31.7
0.0031		27.9
0.0013		22.1

Total Wt. (g)		239.17
Wt used for Hydrometer (g)		
49.75		
Pass 2mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
0.850	1.75	96.5%
0.425	3.60	92.8%
0.250	5.50	88.9%
0.150	7.88	84.2%
0.106	9.81	80.3%
0.075	11.52	76.8%
Pan	11.68	



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UNIFIED SOIL CLASSIFICATION SYSTEM



Amec Foster Wheeler Environment & Infrastructure 104 Crockford Blvd., Scarborough, Ontario, M1R 3C3 Tel +1 (416) 751 6565, amecfw.com	GRAIN SIZE DISTRIBUTION	Client :- Town Of Caledon	
	SILT	Project:- Spine Road New Construction	
	with clay and sand, trace gravel	Location:- 1.2 km West of Hwy 10 to Railway Crossing (4 lanes) and 1.6 m from West of Railway Crossing to Chinguacousy Road (2 lanes), Caledon, ON.	
		Lab No. :- S1347_2017	Date :- 02 Nov 2017

Grain Size Analysis

Project:- Spine Road New Construction
Location:- 1.2 km West of Hwy 10 to Railway Crossing (4 lanes) and
 1.6 m from West of Railway Crossing to Chinguacousy Road (2 lanes), Caledon, ON.
Client :- Town Of Caledon
Job# :- TPB166090.6000
Borehole # :- BH64
Lab No. :- S1347_2017
Date :- 2-Nov-17
Tested By :- WA/DB/CZ
Sample # :- Sample 3
Checked By :- SB

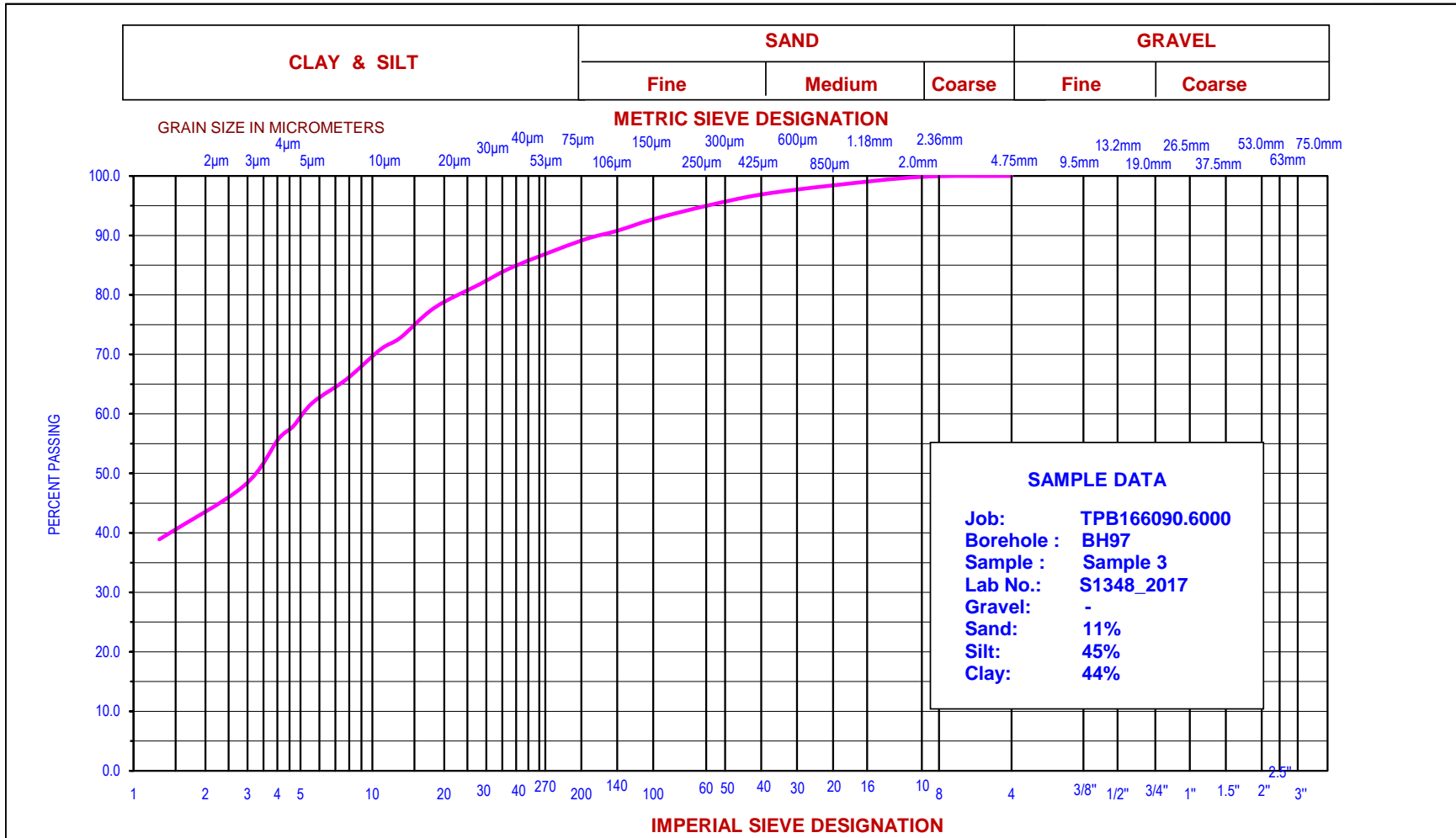
Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
19	0.00	100.0
13.2	3.38	98.8
9.5	6.79	97.7
4.75	15.22	94.8
2.00	24.29	91.7
0.85		88.2
0.425		85.1
0.25		82.0
0.150		78.4
0.106		75.5
0.0750		73.1
0.0415		66.5
0.0299		62.9
0.0194		57.4
0.0139		53.8
0.0115		51.0
0.0082		47.4
0.0060		41.9
0.0049		38.3
0.0043		36.5
0.0030		31.9
0.0013		24.2

Total Wt. (g)		296.67
Wt used for Hydrometer (g)		
49.75		
Pass 2mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
0.850	1.90	96.2%
0.425	3.58	92.8%
0.250	5.27	89.4%
0.150	7.21	85.5%
0.106	8.78	82.4%
0.075	10.11	79.7%
Pan	10.21	



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UNIFIED SOIL CLASSIFICATION SYSTEM



Amec Foster Wheeler Environment & Infrastructure 104 Crockford Blvd., Scarborough, Ontario, M1R 3C3 Tel +1 (416) 751 6565, amecfw.com	GRAIN SIZE DISTRIBUTION	Client :- Town Of Caledon	
	CLAY AND SILT some sand	Project:- Spine Road New Construction	
		Location:- 1.2 km West of Hwy 10 to Railway Crossing (4 lanes) and 1.6 m from West of Railway Crossing to Chinguacousy Road (2 lanes), Caledon, ON.	
		Lab No. :- S1348_2017	Date :- 02 Nov 2017

Grain Size Analysis

Project:- Spine Road New Construction
Location:- 1.2 km West of Hwy 10 to Railway Crossing (4 lanes) and
 1.6 m from West of Railway Crossing to Chinguacousy Road (2 lanes), Caledon, ON.
Client :- Town Of Caledon
Job# :- TPB166090.6000
Borehole # :- BH97
Lab No. :- S1348_2017
Date :- 2-Nov-17
Tested By :- WA/DB/CZ
Sample # :- Sample 3
Checked By :- SB

Sieve size (mm)	Cumm. Wt. Retained (g)	%passing
4.75	0.00	100.0
2.00	0.31	99.8
0.85		98.4
0.425		96.9
0.25		95.0
0.150		92.7
0.106		90.8
0.0750		89.1
0.0393		84.8
0.0282		81.8
0.0182		77.8
0.0131		72.8
0.0108		70.8
0.0078		65.9
0.0056		61.9
0.0047		57.9
0.0041		55.9
0.0029		47.9
0.0013		38.9

Total Wt. (g)		206.98
Wt used for Hydrometer (g)		
49.48		
Pass 2mm Retained 0.075mm		
Sieve size (mm)	wt. retained (g)	%passing
0.850	0.71	98.6%
0.425	1.47	97.0%
0.250	2.42	95.1%
0.150	3.53	92.9%
0.106	4.49	90.9%
0.075	5.31	89.3%
Pan	5.34	

Appendix D
Certificates of Analysis



CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
505 Woodward Avenue Unit 1
Hamilton, ON L8H6H6
(905) 312-0700

ATTENTION TO: Hoda Seddik

PROJECT: East West Spine Rd

AGAT WORK ORDER: 17T273733

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Neli Popnikolova, Senior Chemist

DATE REPORTED: Oct 27, 2017

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.

AGAT Laboratories (V1)

Member of: Association of Professional Engineers and Geoscientists of Alberta (APEGA)
Western Enviro-Agricultural Laboratory Association (WEALA)
Environmental Services Association of Alberta (ESAA)

AGAT Laboratories is accredited to ISO/IEC 17025 by the Canadian Association for Laboratory Accreditation Inc. (CALA) and/or Standards Council of Canada (SCC) for specific tests listed on the scope of accreditation. AGAT Laboratories (Mississauga) is also accredited by the Canadian Association for Laboratory Accreditation Inc. (CALA) for specific drinking water tests. Accreditations are location and parameter specific. A complete listing of parameters for each location is available from www.cala.ca and/or www.scc.ca. The tests in this report may not necessarily be included in the scope of accreditation.

Page 1 of 7

*Results relate only to the items tested and to all the items tested
All reportable information as specified by ISO 17025:2005 is available from AGAT Laboratories upon request*



Certificate of Analysis

AGAT WORK ORDER: 17T273733

PROJECT: East West Spine Rd

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY: J. Farhoodi

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-10-19

DATE REPORTED: 2017-10-27

Parameter	Unit	SAMPLE DESCRIPTION:		BH 54, AS1	BH 62, AS1	BH 68, AS1	BH 77, AS1
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		2017-10-18	2017-10-18	2017-10-18	2017-10-18
		G / S	RDL	8833660	8833663	8833664	8833665
Antimony	µg/g	1.3	0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	18	1	5	5	4	4
Barium	µg/g	220	2	58	103	67	71
Beryllium	µg/g	2.5	0.5	0.7	0.8	0.7	0.7
Boron	µg/g	36	5	<5	7	<5	<5
Boron (Hot Water Soluble)	µg/g	NA	0.10	0.25	0.32	0.42	0.37
Cadmium	µg/g	1.2	0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	70	2	20	29	20	20
Cobalt	µg/g	21	0.5	9.7	14.4	8.4	9.1
Copper	µg/g	92	1	21	23	17	16
Lead	µg/g	120	1	13	11	13	12
Molybdenum	µg/g	2	0.5	<0.5	<0.5	<0.5	<0.5
Nickel	µg/g	82	1	18	31	17	17
Selenium	µg/g	1.5	0.4	<0.4	<0.4	<0.4	<0.4
Silver	µg/g	0.5	0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	1	0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	2.5	0.5	0.6	0.7	0.9	0.7
Vanadium	µg/g	86	1	32	39	30	28
Zinc	µg/g	290	5	60	71	59	65
Chromium VI	µg/g	0.66	0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.051	0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.27	0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.57	0.005	0.139	0.312	0.116	0.096
Sodium Adsorption Ratio	NA	2.4	NA	0.118	0.838	0.163	0.154
pH, 2:1 CaCl ₂ Extraction	pH Units		NA	6.69	7.30	6.68	5.64

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use

Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8833660-8833665 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl₂ extract prepared at 2:1 ratio.

Certified By:

Amanjot Bhela



Certificate of Analysis

AGAT WORK ORDER: 17T273733

PROJECT: East West Spine Rd

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY: J. Farhoodi

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2017-10-19

DATE REPORTED: 2017-10-27

Parameter	Unit	SAMPLE DESCRIPTION:		BH 54, AS1	BH 62, AS1	BH 68, AS1	BH 77, AS1
		SAMPLE TYPE:		Soil	Soil	Soil	Soil
		DATE SAMPLED:		2017-10-18	2017-10-18	2017-10-18	2017-10-18
		G / S	RDL	8833660	8833663	8833664	8833665
Hexachloroethane	µg/g	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g	0.01	0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005
Aldrin	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005
Endosulfan	µg/g	0.04	0.005	<0.005	<0.005	<0.005	<0.005
Chlordane	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007
DDE	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007
DDD	µg/g	0.05	0.007	<0.007	<0.007	<0.007	<0.007
DDT	µg/g	1.4	0.007	<0.007	<0.007	<0.007	<0.007
Dieldrin	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005
Endrin	µg/g	0.04	0.005	<0.005	<0.005	<0.005	<0.005
Methoxychlor	µg/g	0.05	0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	µg/g	0.01	0.005	<0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Moisture Content	%		0.1	17.7	33.0	19.4	18.9
Surrogate	Unit	Acceptable Limits					
TCMX	%	50-140		96	108	94	50
Decachlorobiphenyl	%	60-130		116	70	114	102

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to Table 1: Full Depth Background Site Condition Standards - Soil - Residential/Parkland/Institutional/Industrial/Commercial/Community Property Use
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8833660-8833665 Results are based on the dry weight of the soil.
Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.
Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By:

Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
PROJECT: East West Spine Rd
SAMPLING SITE:

AGAT WORK ORDER: 17T273733
ATTENTION TO: Hoda Seddik
SAMPLED BY: J. Farhoodi

Soil Analysis															
RPT Date: Oct 27, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 153(511) - Metals & Inorganics (Soil)

Antimony	8833660	8833660	<0.8	<0.8	NA	< 0.8	86%	70%	130%	100%	80%	120%	91%	70%	130%
Arsenic	8833660	8833660	5	4	NA	< 1	100%	70%	130%	102%	80%	120%	94%	70%	130%
Barium	8833660	8833660	58	55	5.3%	< 2	103%	70%	130%	108%	80%	120%	110%	70%	130%
Beryllium	8833660	8833660	0.7	0.6	NA	< 0.5	93%	70%	130%	97%	80%	120%	100%	70%	130%
Boron	8833660	8833660	<5	<5	NA	< 5	77%	70%	130%	93%	80%	120%	85%	70%	130%
Boron (Hot Water Soluble)	8833660	8833660	0.25	0.24	NA	< 0.10	97%	60%	140%	99%	70%	130%	101%	60%	140%
Cadmium	8833660	8833660	<0.5	<0.5	NA	< 0.5	103%	70%	130%	100%	80%	120%	96%	70%	130%
Chromium	8833660	8833660	20	20	0.0%	< 2	92%	70%	130%	103%	80%	120%	99%	70%	130%
Cobalt	8833660	8833660	9.7	9.1	6.4%	< 0.5	95%	70%	130%	100%	80%	120%	101%	70%	130%
Copper	8833660	8833660	21	20	4.9%	< 1	91%	70%	130%	107%	80%	120%	119%	70%	130%
Lead	8833660	8833660	13	13	0.0%	< 1	97%	70%	130%	96%	80%	120%	98%	70%	130%
Molybdenum	8833660	8833660	<0.5	<0.5	NA	< 0.5	106%	70%	130%	108%	80%	120%	99%	70%	130%
Nickel	8833660	8833660	18	17	5.7%	< 1	104%	70%	130%	105%	80%	120%	109%	70%	130%
Selenium	8833660	8833660	<0.4	<0.4	NA	< 0.4	78%	70%	130%	105%	80%	120%	90%	70%	130%
Silver	8833660	8833660	<0.2	<0.2	NA	< 0.2	98%	70%	130%	105%	80%	120%	88%	70%	130%
Thallium	8833660	8833660	<0.4	<0.4	NA	< 0.4	91%	70%	130%	101%	80%	120%	90%	70%	130%
Uranium	8833660	8833660	0.6	0.5	NA	< 0.5	96%	70%	130%	99%	80%	120%	90%	70%	130%
Vanadium	8833660	8833660	32	32	0.0%	< 1	96%	70%	130%	100%	80%	120%	111%	70%	130%
Zinc	8833660	8833660	60	59	1.7%	< 5	97%	70%	130%	106%	80%	120%	104%	70%	130%
Chromium VI	8837897		<0.2	<0.2	NA	< 0.2	96%	70%	130%	96%	80%	120%	97%	70%	130%
Cyanide	8831232		<0.040	<0.040	NA	< 0.040	90%	70%	130%	108%	80%	120%	107%	70%	130%
Mercury	8833660	8833660	<0.10	<0.10	NA	< 0.10	92%	70%	130%	96%	80%	120%	90%	70%	130%
Electrical Conductivity	8833660	8833660	0.139	0.121	13.8%	< 0.005	97%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8833660	8833660	0.118	0.115	2.6%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8837897		7.53	7.56	0.4%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.

Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: _____

Amanjot Bhela

Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
PROJECT: East West Spine Rd
SAMPLING SITE:

AGAT WORK ORDER: 17T273733
ATTENTION TO: Hoda Seddik
SAMPLED BY: J. Farhoodi

Trace Organics Analysis

RPT Date: Oct 27, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	8847372		< 0.01	< 0.01	NA	< 0.01	102%	50%	140%	68%	50%	140%	68%	50%	140%
Gamma-Hexachlorocyclohexane	8847372		< 0.005	< 0.005	NA	< 0.005	100%	50%	140%	70%	50%	140%	90%	50%	140%
Heptachlor	8847372		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	88%	50%	140%	86%	50%	140%
Aldrin	8847372		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	80%	50%	140%	90%	50%	140%
Heptachlor Epoxide	8847372		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	90%	50%	140%	102%	50%	140%
Endosulfan	8847372		< 0.005	< 0.005	NA	< 0.005	100%	50%	140%	87%	50%	140%	95%	50%	140%
Chlordane	8847372		< 0.007	< 0.007	NA	< 0.007	100%	50%	140%	89%	50%	140%	91%	50%	140%
DDE	8847372		< 0.007	< 0.007	NA	< 0.007	105%	50%	140%	98%	50%	140%	100%	50%	140%
DDD	8847372		< 0.007	< 0.007	NA	< 0.007	103%	50%	140%	89%	50%	140%	93%	50%	140%
DDT	8847372		< 0.007	< 0.007	NA	< 0.007	112%	50%	140%	94%	50%	140%	92%	50%	140%
Dieldrin	8847372		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	90%	50%	140%	104%	50%	140%
Endrin	8847372		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	96%	50%	140%	110%	50%	140%
Methoxychlor	8847372		< 0.005	< 0.005	NA	< 0.005	103%	50%	140%	100%	50%	140%	102%	50%	140%
Hexachlorobenzene	8847372		< 0.005	< 0.005	NA	< 0.005	112%	50%	140%	90%	50%	140%	94%	50%	140%
Hexachlorobutadiene	8847372		< 0.01	< 0.01	NA	< 0.01	109%	50%	140%	66%	50%	140%	68%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
AGAT WORK ORDER: 17T273733
PROJECT: East West Spine Rd
ATTENTION TO: Hoda Seddik
SAMPLING SITE:
SAMPLED BY: J. Farhoodi

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A; SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl ₂ Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Report Information:

Company: Amec Foster Wheeler
Contact: Hoda Seddik
Address: 505 Woodward Ave #1, Hamilton, ON L8H 6N6, Canada
Hamilton ON
Phone: 905 730 3924 (cell) Fax: +1 905-312-0700
Reports to be sent to: hoda.seddik@amecfw.com
1. Email: hoda.seddik@amecfw.com
2. Email: jonathan.wakani@amecfw.com

Project Information:

Project: East West Spine Rd.
Site Location: Proposed Spine Rd (between McLaughlin and Chinguacousy)
Sampled By: J. Farhoodi
AGAT Quote #: (under MSSA MIS-016) PO: TPB166090.6000
Please note: If quotation number is not provided, client will be billed full price for analysis

Invoice Information:

Company: Amec Foster Wheeler Bill To Same: Yes No
Contact: Hoda Seddik
Address: 505 Woodward Ave #1, Hamilton, ON L8H 6N6, Canada
Email: hoda.seddik@amecfw.com

Regulatory Requirements:

No Regulatory Requirement

Regulation 153/04 Table 1 Indicate One
 Ind/Com
 Res/Park
 Agriculture
 Sewer Use
 Sanitary
 Storm
 Regulation 558
 CCME
 Prov. Water Quality Objectives (PWQO)
 Other
Soil Texture (check One) Coarse Fine
Region Indicate One

Is this submission for a Record of Site Condition?

Yes No

Report Guideline on Certificate of Analysis

Yes No

Sample Matrix Legend

B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

(Check Applicable)

Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	ORPs: <input type="checkbox"/> B-HWS <input type="checkbox"/> Cr <input type="checkbox"/> CN <input type="checkbox"/> Cu <input type="checkbox"/> EC <input type="checkbox"/> FOC <input type="checkbox"/> NO ₃ /NO ₂ <input type="checkbox"/> Total N <input type="checkbox"/> Hg <input type="checkbox"/> pH <input type="checkbox"/> SAR	Nutrients: <input type="checkbox"/> TP <input type="checkbox"/> NH ₄ <input type="checkbox"/> TKN <input type="checkbox"/> NO ₃ <input type="checkbox"/> NO ₂ <input type="checkbox"/> NO _x	Volatiles: <input type="checkbox"/> VOC <input type="checkbox"/> BTEX <input type="checkbox"/> THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use	TCLP VOC	Ignitability	Sulphate	B(a)P	ON HOLD - Do not Test
<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>							
<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>							
<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>							
<input checked="" type="checkbox"/>												<input checked="" type="checkbox"/>							

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions
BH 54, AS1	18/10/2017		2	Soil	2x250
BH 62, AS1	18/10/2017		2	Soil	2x250
BH 68, AS1	18/10/2017		2	Soil	2x250
BH 77, AS1	18/10/2017		2	Soil	2x250

Samples Relinquished By (Print Name and Sign): <u>Shami Malla</u>	Date: <u>19/10/2017</u>	Time:	Samples Received By (Print Name and Sign): <u>Roy</u>	Date: <u>20/10/19</u>	Time: <u>10:46</u>	Page <u>1</u> of <u>1</u>
Samples Relinquished By (Print Name and Sign): <u>Roy</u>	Date: <u>20/10/19</u>	Time: <u>3:36</u>	Samples Received By (Print Name and Sign):	Date:	Time:	N:

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
505 Woodward Avenue Unit 1
Hamilton, ON L8H6H6
(905) 312-0700

ATTENTION TO: Hoda Seddik

PROJECT: East West Spine Rd

AGAT WORK ORDER: 17T273735

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Oct 26, 2017

PAGES (INCLUDING COVER): 11

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



Certificate of Analysis

AGAT WORK ORDER: 17T273735

PROJECT: East West Spine Rd

5835 COOPERS AVENUE
 MISSISSAUGA, ONTARIO
 CANADA L4Z 1Y2
 TEL (905)712-5100
 FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Hoda Seddik

SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

SAMPLED BY: J. Farhoodi

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2017-10-19

DATE REPORTED: 2017-10-26

SAMPLE DESCRIPTION: BH54, AS2+AS3

SAMPLE TYPE: Soil

DATE SAMPLED: 2017-10-18

Parameter	Unit	G / S	RDL	8834648
Arsenic Leachate	mg/L	2.5	0.010	<0.010
Barium Leachate	mg/L	100	0.100	0.493
Boron Leachate	mg/L	500	0.050	0.074
Cadmium Leachate	mg/L	0.5	0.010	<0.010
Chromium Leachate	mg/L	5	0.010	<0.010
Lead Leachate	mg/L	5	0.010	<0.010
Mercury Leachate	mg/L	0.1	0.01	<0.01
Selenium Leachate	mg/L	1	0.010	<0.010
Silver Leachate	mg/L	5	0.010	<0.010
Uranium Leachate	mg/L	10	0.050	<0.050
Fluoride Leachate	mg/L	150	0.05	0.24
Cyanide Leachate	mg/L	20	0.05	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By:

Amanjot Bhela



Certificate of Analysis

AGAT WORK ORDER: 17T273735

PROJECT: East West Spine Rd

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Hoda Seddik

SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

SAMPLED BY: J. Farhoodi

O. Reg. 558 - Benzo(a) pyrene

DATE RECEIVED: 2017-10-19

DATE REPORTED: 2017-10-26

SAMPLE DESCRIPTION: BH54, AS2+AS3

SAMPLE TYPE: Soil

DATE SAMPLED: 2017-10-18

Parameter	Unit	G / S	RDL	8834648
Benzo(a)pyrene	mg/L	0.001	0.001	<0.001

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 8834648 The sample was leached according to Regulation 558 protocol. Analysis was performed on the leachate.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 17T273735

PROJECT: East West Spine Rd

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Hoda Seddik

SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

SAMPLED BY: J. Farhoodi

O. Reg. 558 - OC Pesticides & PCBs

DATE RECEIVED: 2017-10-19

DATE REPORTED: 2017-10-26

SAMPLE DESCRIPTION: BH54, AS2+AS3

SAMPLE TYPE: Soil

DATE SAMPLED: 2017-10-18

Parameter	Unit	G / S	RDL	8834648
Heptachlor + Heptachlor Epoxide	mg/L	0.3	0.0003	<0.0003
Aldrin + Dieldrin	mg/L	0.07	0.0007	<0.0007
DDT + Metabolites	mg/L	3.0	0.003	<0.003
Methoxychlor	mg/L	90.0	0.09	<0.09
Chlordane (Total)	mg/L	0.7	0.0007	<0.0007
Aldrin	mg/L		0.0002	<0.0002
alpha - chlordane	mg/L		0.0001	<0.0001
gamma-Chlordane	mg/L		0.0002	<0.0002
Oxychlordane	mg/L		0.0004	<0.0004
pp'-DDE	mg/L		0.0005	<0.0005
pp'-DDD	mg/L		0.0015	<0.0015
op'-DDT	mg/L		0.0015	<0.0015
pp'-DDT	mg/L		0.0005	<0.0005
Dieldrin	mg/L		0.0005	<0.0005
Heptachlor	mg/L		0.0001	<0.0001
Heptachlor Epoxide	mg/L		0.0002	<0.0002
Lindane	mg/L		0.0004	<0.0004
PCB's	mg/L	0.3	0.0002	<0.0002
Endrin	mg/L	0.02	0.0004	<0.0004
Toxaphene	mg/L	0.5	0.0005	<0.0005
Surrogate	Unit	Acceptable Limits		
Decachlorobiphenyl	%	60-130		78

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8834648 The sample was leached according to Regulation 558 protocol. Analysis was performed after extraction of the leachate.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 17T273735

PROJECT: East West Spine Rd

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Hoda Seddik

SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

SAMPLED BY: J. Farhoodi

O. Reg. 558 - VOCs

DATE RECEIVED: 2017-10-19

DATE REPORTED: 2017-10-26

SAMPLE DESCRIPTION: BH54, AS2+AS3

SAMPLE TYPE: Soil

DATE SAMPLED: 2017-10-18

8834648

Parameter	Unit	G / S	RDL	8834648
Vinyl Chloride	mg/L	0.2	0.030	<0.030
1,1 Dichloroethene	mg/L	1.4	0.020	<0.020
Dichloromethane	mg/L	5.0	0.030	<0.030
Methyl Ethyl Ketone	mg/L	200	0.090	<0.090
Chloroform	mg/L	10.0	0.020	<0.020
1,2-Dichloroethane	mg/L	0.5	0.020	<0.020
Carbon Tetrachloride	mg/L	0.5	0.020	<0.020
Benzene	mg/L	0.5	0.020	<0.020
Trichloroethene	mg/L	5.0	0.020	<0.020
Tetrachloroethene	mg/L	3.0	0.050	<0.050
Chlorobenzene	mg/L	8.0	0.010	<0.010
1,2-Dichlorobenzene	mg/L	20.0	0.010	<0.010
1,4-Dichlorobenzene	mg/L	0.5	0.010	<0.010

Surrogate	Unit	Acceptable Limits
Toluene-d8	% Recovery	60-130 70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
8834648 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

Certified By:

Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T273735

PROJECT: East West Spine Rd

ATTENTION TO: Hoda Seddik

SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

SAMPLED BY: J. Farhoodi

Soil Analysis

RPT Date: Oct 26, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	8834833		<0.010	<0.010	NA	< 0.010	109%	90%	110%	115%	80%	120%	119%	70%	130%
Barium Leachate	8834833		0.296	0.279	NA	< 0.100	101%	90%	110%	99%	80%	120%	103%	70%	130%
Boron Leachate	8834833		<0.050	0.051	NA	< 0.050	99%	90%	110%	101%	80%	120%	112%	70%	130%
Cadmium Leachate	8834833		<0.010	<0.010	NA	< 0.010	105%	90%	110%	101%	80%	120%	104%	70%	130%
Chromium Leachate	8834833		<0.010	<0.010	NA	< 0.010	103%	90%	110%	113%	80%	120%	109%	70%	130%
Lead Leachate	8834833		<0.010	<0.010	NA	< 0.010	102%	90%	110%	98%	80%	120%	101%	70%	130%
Mercury Leachate	8834833		<0.01	<0.01	NA	< 0.01	104%	90%	110%	104%	80%	120%	95%	70%	130%
Selenium Leachate	8834833		<0.010	<0.010	NA	< 0.010	101%	90%	110%	105%	80%	120%	107%	70%	130%
Silver Leachate	8834833		<0.010	<0.010	NA	< 0.010	100%	90%	110%	84%	80%	120%	90%	70%	130%
Uranium Leachate	8834833		<0.050	<0.050	NA	< 0.050	104%	90%	110%	102%	80%	120%	99%	70%	130%
Fluoride Leachate	8834833		0.27	0.27	0.0%	< 0.05	99%	90%	110%	107%	90%	110%	118%	70%	130%
Cyanide Leachate	8834833		<0.05	<0.05	NA	< 0.05	90%	90%	110%	108%	90%	110%	107%	70%	130%
(Nitrate + Nitrite) as N Leachate	8834833		<0.70	<0.70	NA	< 0.70	98%	80%	120%	98%	80%	120%	98%	70%	130%

Comments: NA signifies Not Applicable.

Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:



Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
 PROJECT: East West Spine Rd
 SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

AGAT WORK ORDER: 17T273735
 ATTENTION TO: Hoda Seddik
 SAMPLED BY: J. Farhoodi

Trace Organics Analysis

RPT Date: Oct 26, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 558 - VOCs

Vinyl Chloride	8834648	8834648	< 0.030	< 0.030	NA	< 0.030	75%	60%	140%	74%	60%	140%	NA	60%	140%
1,1 Dichloroethene	8834648	8834648	< 0.020	< 0.020	NA	< 0.020	100%	70%	130%	117%	70%	130%	NA	60%	140%
Dichloromethane	8834648	8834648	< 0.030	< 0.030	NA	< 0.030	88%	70%	130%	110%	70%	130%	NA	60%	140%
Methyl Ethyl Ketone	8834648	8834648	< 0.090	< 0.090	NA	< 0.090	97%	70%	130%	119%	70%	130%	NA	60%	140%
Chloroform	8834648	8834648	< 0.020	< 0.020	NA	< 0.020	100%	70%	130%	118%	70%	130%	NA	60%	140%
1,2-Dichloroethane	8834648	8834648	< 0.020	< 0.020	NA	< 0.020	92%	70%	130%	100%	70%	130%	NA	60%	140%
Carbon Tetrachloride	8834648	8834648	< 0.020	< 0.020	NA	< 0.020	78%	70%	130%	110%	70%	130%	NA	60%	140%
Benzene	8834648	8834648	< 0.020	< 0.020	NA	< 0.020	72%	70%	130%	102%	70%	130%	NA	60%	140%
Trichloroethene	8834648	8834648	< 0.020	< 0.020	NA	< 0.020	71%	70%	130%	97%	70%	130%	NA	60%	140%
Tetrachloroethene	8834648	8834648	< 0.050	< 0.050	NA	< 0.050	74%	70%	130%	121%	70%	130%	NA	60%	140%
Chlorobenzene	8834648	8834648	< 0.010	< 0.010	NA	< 0.010	87%	70%	130%	111%	70%	130%	NA	60%	140%
1,2-Dichlorobenzene	8834648	8834648	< 0.010	< 0.010	NA	< 0.010	98%	70%	130%	113%	70%	130%	NA	60%	140%
1,4-Dichlorobenzene	8834648	8834648	< 0.010	< 0.010	NA	< 0.010	115%	70%	130%	114%	70%	130%	NA	60%	140%

O. Reg. 558 - OC Pesticides & PCBs

Heptachlor + Heptachlor Epoxide	TW	< 0.0003	< 0.0003	NA	< 0.0003	80%	60%	140%	82%	60%	140%	NA	60%	140%
Aldrin + Dieldrin	TW	< 0.0007	< 0.0007	NA	< 0.0007	112%	60%	140%	93%	60%	140%	NA	60%	140%
DDT + Metabolites	TW	< 0.003	< 0.003	NA	< 0.003	95%	60%	140%	85%	60%	140%	NA	60%	140%
Methoxychlor	TW	< 0.09	< 0.09	NA	< 0.09	95%	60%	140%	102%	60%	140%	NA	60%	140%
Chlordane (Total)	TW	< 0.0007	< 0.0007	NA	< 0.0007	95%	60%	140%	93%	60%	140%	NA	60%	140%
Aldrin	TW	< 0.0002	< 0.0002	NA	< 0.0002	93%	60%	140%	78%	60%	140%	NA	60%	140%
alpha - chlordane	TW	< 0.0001	< 0.0001	NA	< 0.0001	95%	60%	140%	85%	60%	140%	NA	60%	140%
gamma-Chlordane	TW	< 0.0002	< 0.0002	NA	< 0.0002	95%	60%	140%	92%	60%	140%	NA	60%	140%
Oxychlordane	TW	< 0.0004	< 0.0004	NA	< 0.0004	92%	60%	140%	107%	60%	140%	NA	60%	140%
pp'-DDE	TW	< 0.0005	< 0.0005	NA	< 0.0005	102%	60%	140%	98%	60%	140%	NA	60%	140%
pp'-DDD	TW	< 0.0015	< 0.0015	NA	< 0.0015	97%	60%	140%	95%	60%	140%	NA	60%	140%
op'-DDT	TW	< 0.0015	< 0.0015	NA	< 0.0015	98%	60%	140%	84%	60%	140%	NA	60%	140%
pp'-DDT	TW	< 0.0005	< 0.0005	NA	< 0.0005	92%	60%	140%	85%	60%	140%	NA	60%	140%
Dieldrin	TW	< 0.0005	< 0.0005	NA	< 0.0005	94%	60%	140%	94%	60%	140%	NA	60%	140%
Heptachlor	TW	< 0.0001	< 0.0001	NA	< 0.0001	89%	60%	140%	82%	60%	140%	NA	60%	140%
Heptachlor Epoxide	TW	< 0.0002	< 0.0002	NA	< 0.0002	94%	60%	140%	94%	60%	140%	NA	60%	140%
Lindane	TW	< 0.0004	< 0.0004	NA	< 0.0004	84%	60%	140%	88%	60%	140%	NA	60%	140%
PCB's	TW	< 0.0002	< 0.0002	NA	< 0.0002	85%	60%	140%	80%	60%	140%	NA	60%	140%
Endrin	TW	< 0.0004	< 0.0004	NA	< 0.0004	94%	60%	140%	97%	60%	140%	NA	60%	140%
Toxaphene	TW	< 0.0005	< 0.0005	NA	< 0.0005	NA	60%	140%	80%	60%	140%	NA	60%	140%

O. Reg. 558 - Benzo(a) pyrene

Benzo(a)pyrene	8822419	< 0.001	< 0.001	NA	< 0.001	106%	70%	130%	102%	70%	130%	NA	70%	130%
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Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T273735

PROJECT: East West Spine Rd

ATTENTION TO: Hoda Seddik

SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

SAMPLED BY: J. Farhoodi

Trace Organics Analysis (Continued)

RPT Date: Oct 26, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE				
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume. When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T273735

PROJECT: East West Spine Rd

ATTENTION TO: Hoda Seddik

SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

SAMPLED BY: J. Farhoodi

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Barium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Boron Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Cadmium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Chromium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Lead Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Mercury Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Selenium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Silver Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Uranium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA SW-846-1311 & SM4500-F- C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA SW-846-1311 & MOE 3015 & SM 4500 CN- I	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA SW 846-1311 & SM 4500 - NO3- I	LACHAT FIA

Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T273735

PROJECT: East West Spine Rd

ATTENTION TO: Hoda Seddik

SAMPLING SITE: Proposed Spine Rd. (between McLaughlin and Chinguacousy)

SAMPLED BY: J. Farhoodi

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzo(a)pyrene	ORG-91-5114	EPA SW846 3540 & 8270	GC/MS
Heptachlor + Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Aldrin + Dieldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
DDT + Metabolites	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Methoxychlor	ORG-91-5112	EPA SW-846 8081A & 8082	GC/MS & GC/ECD
Chlordane (Total)	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Aldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
alpha - chlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
gamma-Chlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Oxychlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDE	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDD	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
op'-DDT	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDT	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Dieldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Heptachlor	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Lindane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
PCB's	ORG-91-5112	EPA SW-846 3550 & 8082	GC/ECD
Endrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Toxaphene	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Vinyl Chloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,1 Dichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Dichloromethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Trichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS



CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
505 Woodward Avenue Unit 1
Hamilton, ON L8H6H6
(905) 312-0700

ATTENTION TO: Hoda Seddik

PROJECT:

AGAT WORK ORDER: 17T275400

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Oct 30, 2017

PAGES (INCLUDING COVER): 11

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



Certificate of Analysis

AGAT WORK ORDER: 17T275400

PROJECT:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Hoda Seddik
SAMPLED BY:

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2017-10-23

DATE REPORTED: 2017-10-30

SAMPLE DESCRIPTION: BH95, AS2+AS3

SAMPLE TYPE: Soil

DATE SAMPLED: 2017-10-20

8847372

Parameter	Unit	G / S	RDL	8847372
Arsenic Leachate	mg/L	2.5	0.010	<0.010
Barium Leachate	mg/L	100	0.100	0.350
Boron Leachate	mg/L	500	0.050	0.064
Cadmium Leachate	mg/L	0.5	0.010	<0.010
Chromium Leachate	mg/L	5	0.010	<0.010
Lead Leachate	mg/L	5	0.010	<0.010
Mercury Leachate	mg/L	0.1	0.01	<0.01
Selenium Leachate	mg/L	1	0.010	<0.010
Silver Leachate	mg/L	5	0.010	<0.010
Uranium Leachate	mg/L	10	0.050	<0.050
Fluoride Leachate	mg/L	150	0.05	0.23
Cyanide Leachate	mg/L	20	0.05	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard; Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

Certified By:

Amanjot Bhela



Certificate of Analysis

AGAT WORK ORDER: 17T275400

PROJECT:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Hoda Seddik
SAMPLED BY:

O. Reg. 558 - Benzo(a) pyrene

DATE RECEIVED: 2017-10-23

DATE REPORTED: 2017-10-30

SAMPLE DESCRIPTION: BH95, AS2+AS3

SAMPLE TYPE: Soil

DATE SAMPLED: 2017-10-20

Parameter	Unit	G / S	RDL	8847372
Benzo(a)pyrene	mg/L	0.001	0.001	<0.001

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
8847372 The sample was leached according to Regulation 558 protocol. Analysis was performed on the leachate.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 17T275400

PROJECT:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Hoda Seddik
SAMPLED BY:

O. Reg. 558 - OC Pesticides & PCBs

DATE RECEIVED: 2017-10-23

DATE REPORTED: 2017-10-30

SAMPLE DESCRIPTION: BH95, AS2+AS3

SAMPLE TYPE: Soil

DATE SAMPLED: 2017-10-20

8847372

Parameter	Unit	G / S	RDL	8847372
Heptachlor + Heptachlor Epoxide	mg/L	0.3	0.0003	<0.0003
Aldrin + Dieldrin	mg/L	0.07	0.0007	<0.0007
DDT + Metabolites	mg/L	3.0	0.003	<0.003
Methoxychlor	mg/L	90.0	0.09	<0.09
Chlordane (Total)	mg/L	0.7	0.0007	<0.0007
Aldrin	mg/L		0.0002	<0.0002
alpha - chlordane	mg/L		0.0001	<0.0001
gamma-Chlordane	mg/L		0.0002	<0.0002
Oxychlordane	mg/L		0.0004	<0.0004
pp'-DDE	mg/L		0.0005	<0.0005
pp'-DDD	mg/L		0.0015	<0.0015
op'-DDT	mg/L		0.0015	<0.0015
pp'-DDT	mg/L		0.0005	<0.0005
Dieldrin	mg/L		0.0005	<0.0005
Heptachlor	mg/L		0.0001	<0.0001
Heptachlor Epoxide	mg/L		0.0002	<0.0002
Lindane	mg/L		0.0004	<0.0004
PCB's	mg/L	0.3	0.0002	<0.0002
Endrin	mg/L	0.02	0.0004	<0.0004
Toxaphene	mg/L	0.5	0.0005	<0.0005
Surrogate	Unit	Acceptable Limits		
Decachlorobiphenyl	%	60-130		95

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.

8847372 The sample was leached according to Regulation 558 protocol. Analysis was performed after extraction of the leachate.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 17T275400

PROJECT:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Hoda Seddik
SAMPLED BY:

O. Reg. 558 - VOCs

DATE RECEIVED: 2017-10-23

DATE REPORTED: 2017-10-30

SAMPLE DESCRIPTION: BH95, AS2+AS3

SAMPLE TYPE: Soil

DATE SAMPLED: 2017-10-20

8847372

Parameter	Unit	G / S	RDL	8847372
Vinyl Chloride	mg/L	0.2	0.030	<0.030
1,1 Dichloroethene	mg/L	1.4	0.020	<0.020
Dichloromethane	mg/L	5.0	0.030	<0.030
Methyl Ethyl Ketone	mg/L	200	0.090	<0.090
Chloroform	mg/L	10.0	0.020	<0.020
1,2-Dichloroethane	mg/L	0.5	0.020	<0.020
Carbon Tetrachloride	mg/L	0.5	0.020	<0.020
Benzene	mg/L	0.5	0.020	<0.020
Trichloroethene	mg/L	5.0	0.020	<0.020
Tetrachloroethene	mg/L	3.0	0.050	<0.050
Chlorobenzene	mg/L	8.0	0.010	<0.010
1,2-Dichlorobenzene	mg/L	20.0	0.010	<0.010
1,4-Dichlorobenzene	mg/L	0.5	0.010	<0.010

Surrogate	Unit	Acceptable Limits
Toluene-d8	% Recovery	60-130 99

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
8847372 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

Certified By:

Quality Assurance

 CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
 PROJECT:
 SAMPLING SITE:

 AGAT WORK ORDER: 17T275400
 ATTENTION TO: Hoda Seddik
 SAMPLED BY:

Soil Analysis

RPT Date: Oct 30, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 558 Metals and Inorganics															
Arsenic Leachate	8842863		<0.010	<0.010	NA	< 0.010	99%	90%	110%	110%	80%	120%	108%	70%	130%
Barium Leachate	8842863		0.458	0.415	NA	< 0.100	105%	90%	110%	93%	80%	120%	72%	70%	130%
Boron Leachate	8842863		0.064	0.066	NA	< 0.050	102%	90%	110%	109%	80%	120%	116%	70%	130%
Cadmium Leachate	8842863		<0.010	<0.010	NA	< 0.010	100%	90%	110%	99%	80%	120%	73%	70%	130%
Chromium Leachate	8842863		<0.010	<0.010	NA	< 0.010	101%	90%	110%	99%	80%	120%	103%	70%	130%
Lead Leachate	8842863		<0.010	0.010	NA	< 0.010	101%	90%	110%	97%	80%	120%	107%	70%	130%
Mercury Leachate	8842863		<0.01	<0.01	NA	< 0.01	100%	90%	110%	97%	80%	120%	101%	70%	130%
Selenium Leachate	8842863		<0.010	<0.010	NA	< 0.010	92%	90%	110%	96%	80%	120%	88%	70%	130%
Silver Leachate	8842863		<0.010	<0.010	NA	< 0.010	97%	90%	110%	91%	80%	120%	72%	70%	130%
Uranium Leachate	8842863		<0.050	<0.050	NA	< 0.050	101%	90%	110%	102%	80%	120%	113%	70%	130%
Fluoride Leachate	8842863		0.20	0.21	NA	< 0.05	101%	90%	110%	107%	90%	110%	93%	70%	130%
Cyanide Leachate	8842863		<0.05	<0.05	NA	< 0.05	94%	90%	110%	92%	90%	110%	104%	70%	130%
(Nitrate + Nitrite) as N Leachate	8842863		<0.70	<0.70	NA	< 0.70	96%	80%	120%	96%	80%	120%	97%	70%	130%

Comments: NA signifies Not Applicable.

Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:



Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T275400

PROJECT:

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 30, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 558 - VOCs															
Vinyl Chloride	8842157		< 0.030	< 0.030	NA	< 0.030	75%	60%	140%	74%	60%	140%	NA	60%	140%
1,1 Dichloroethene	8842157		< 0.020	< 0.020	NA	< 0.020	100%	70%	130%	117%	70%	130%	NA	60%	140%
Dichloromethane	8842157		< 0.030	< 0.030	NA	< 0.030	88%	70%	130%	110%	70%	130%	NA	60%	140%
Methyl Ethyl Ketone	8842157		< 0.090	< 0.090	NA	< 0.090	97%	70%	130%	119%	70%	130%	NA	60%	140%
Chloroform	8842157		< 0.020	< 0.020	NA	< 0.020	100%	70%	130%	118%	70%	130%	NA	60%	140%
1,2-Dichloroethane															
1,2-Dichloroethane	8842157		< 0.020	< 0.020	NA	< 0.020	92%	70%	130%	100%	70%	130%	NA	60%	140%
Carbon Tetrachloride															
Carbon Tetrachloride	8842157		< 0.020	< 0.020	NA	< 0.020	78%	70%	130%	110%	70%	130%	NA	60%	140%
Benzene															
Benzene	8842157		< 0.020	< 0.020	NA	< 0.020	72%	70%	130%	102%	70%	130%	NA	60%	140%
Trichloroethene															
Trichloroethene	8842157		< 0.020	< 0.020	NA	< 0.020	71%	70%	130%	97%	70%	130%	NA	60%	140%
Tetrachloroethene															
Tetrachloroethene	8842157		< 0.050	< 0.050	NA	< 0.050	74%	70%	130%	121%	70%	130%	NA	60%	140%
Chlorobenzene															
Chlorobenzene	8842157		< 0.010	< 0.010	NA	< 0.010	87%	70%	130%	111%	70%	130%	NA	60%	140%
1,2-Dichlorobenzene															
1,2-Dichlorobenzene	8842157		< 0.010	< 0.010	NA	< 0.010	98%	70%	130%	113%	70%	130%	NA	60%	140%
1,4-Dichlorobenzene															
1,4-Dichlorobenzene	8842157		< 0.010	< 0.010	NA	< 0.010	115%	70%	130%	114%	70%	130%	NA	60%	140%
O. Reg. 558 - Benzo(a) pyrene															
Benzo(a)pyrene	8822419		< 0.001	< 0.001	NA	< 0.001	106%	70%	130%	102%	70%	130%	NA	70%	130%
O. Reg. 558 - OC Pesticides & PCBs															
Heptachlor + Heptachlor Epoxide															
Heptachlor + Heptachlor Epoxide	TW		< 0.0003	< 0.0003	NA	< 0.0003	80%	60%	140%	82%	60%	140%	84%	60%	140%
Aldrin + Dieldrin															
Aldrin + Dieldrin	TW		< 0.0007	< 0.0007	NA	< 0.0007	112%	60%	140%	93%	60%	140%	94%	60%	140%
DDT + Metabolites															
DDT + Metabolites	TW		< 0.003	< 0.003	NA	< 0.003	95%	60%	140%	85%	60%	140%	94%	60%	140%
Methoxychlor															
Methoxychlor	TW		< 0.09	< 0.09	NA	< 0.09	95%	60%	140%	102%	60%	140%	94%	60%	140%
Chlordane (Total)															
Chlordane (Total)	TW		< 0.0007	< 0.0007	NA	< 0.0007	95%	60%	140%	93%	60%	140%	98%	60%	140%
Aldrin															
Aldrin	TW		< 0.0002	< 0.0002	NA	< 0.0002	93%	60%	140%	78%	60%	140%	74%	60%	140%
alpha - chlordane															
alpha - chlordane	TW		< 0.0001	< 0.0001	NA	< 0.0001	95%	60%	140%	85%	60%	140%	94%	60%	140%
gamma-Chlordane															
gamma-Chlordane	TW		< 0.0002	< 0.0002	NA	< 0.0002	95%	60%	140%	92%	60%	140%	97%	60%	140%
Oxychlordane															
Oxychlordane	TW		< 0.0004	< 0.0004	NA	< 0.0004	92%	60%	140%	107%	60%	140%	89%	60%	140%
pp'-DDE															
pp'-DDE	TW		< 0.0005	< 0.0005	NA	< 0.0005	102%	60%	140%	98%	60%	140%	86%	60%	140%
pp'-DDD															
pp'-DDD	TW		< 0.0015	< 0.0015	NA	< 0.0015	97%	60%	140%	95%	60%	140%	87%	60%	140%
op'-DDT															
op'-DDT	TW		< 0.0015	< 0.0015	NA	< 0.0015	98%	60%	140%	84%	60%	140%	97%	60%	140%
pp'-DDT															
pp'-DDT	TW		< 0.0005	< 0.0005	NA	< 0.0005	92%	60%	140%	85%	60%	140%	90%	60%	140%
Dieldrin															
Dieldrin	TW		< 0.0005	< 0.0005	NA	< 0.0005	94%	60%	140%	94%	60%	140%	92%	60%	140%
Heptachlor															
Heptachlor	TW		< 0.0001	< 0.0001	NA	< 0.0001	89%	60%	140%	82%	60%	140%	96%	60%	140%
Heptachlor Epoxide															
Heptachlor Epoxide	TW		< 0.0002	< 0.0002	NA	< 0.0002	94%	60%	140%	94%	60%	140%	88%	60%	140%
Lindane															
Lindane	TW		< 0.0004	< 0.0004	NA	< 0.0004	84%	60%	140%	88%	60%	140%	82%	60%	140%
PCB's															
PCB's	TW		< 0.0002	< 0.0002	NA	< 0.0002	85%	60%	140%	80%	60%	140%	NA	60%	140%
Endrin															
Endrin	TW		< 0.0004	< 0.0004	NA	< 0.0004	94%	60%	140%	97%	60%	140%	90%	60%	140%
Toxaphene															
Toxaphene	TW		< 0.0005	< 0.0005	NA	< 0.0005	NA	60%	140%	80%	60%	140%	NA	60%	140%



Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
PROJECT:
SAMPLING SITE:

AGAT WORK ORDER: 17T275400
ATTENTION TO: Hoda Seddik
SAMPLED BY:

Trace Organics Analysis (Continued)

RPT Date: Oct 30, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL		METHOD BLANK SPIKE		MATRIX SPIKE				
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

Comments: Tap water analysis has been performed as QC sample testing for duplicate and matrix spike due to insufficient sample volume. When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T275400

PROJECT:

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Arsenic Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Barium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Boron Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Cadmium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Chromium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Lead Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Mercury Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Selenium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Silver Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Uranium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA SW-846-1311 & SM4500-F- C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA SW-846-1311 & MOE 3015 & SM 4500 CN- I	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA SW 846-1311 & SM 4500 - NO3- I	LACHAT FIA



Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T275400

PROJECT:

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
Benzo(a)pyrene	ORG-91-5114	EPA SW846 3540 & 8270	GC/MS
Heptachlor + Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Aldrin + Dieldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
DDT + Metabolites	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Methoxychlor	ORG-91-5112	EPA SW-846 8081A & 8082	GC/MS & GC/ECD
Chlordane (Total)	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Aldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
alpha - chlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
gamma-Chlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Oxychlordane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDE	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDD	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
op'-DDT	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
pp'-DDT	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Dieldrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Heptachlor	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Lindane	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
PCB's	ORG-91-5112	EPA SW-846 3550 & 8082	GC/ECD
Endrin	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Toxaphene	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5112	EPA SW-846 3550 & 8081	GC/ECD
Vinyl Chloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,1 Dichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Dichloromethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Trichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS

Laboratory Use Only

Work Order #: 17T275400

Cooler Quantity: _____
Arrival Temperatures: 4.1 | 4.2 | 9.0
3.7 | 3.2 | 3.3
Custody Seal Intact: Yes No N/A
Notes: _____

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Report Information:

Company: Amec Foster Wheeler
Contact: Hoda Seddik
Address: 505 Woodward Ave #1, Hamilton, ON L8H 6N6, Canada
Hamilton ON
Phone: 905 730 3924 (cell) Fax: +1 905-312-0700
Reports to be sent to:
1. Email: hoda.seddik@amecfw.com
2. Email: shami.malla@amecfw.com

Regulatory Requirements: No Regulatory Requirement

(Please check all applicable boxes)

Regulation 153/04
Table Indicate One
 Ind/Com
 Res/Park
 Agriculture

Sewer Use
 Sanitary
 Storm

Regulation 558
 CCME
 Prov. Water Quality Objectives (PWQO)
 Other

Soil Texture (Check One)
 Coarse
 Fine

Region Indicate One

Project Information:

Project: _____
Site Location: Spine Rd
Sampled By: J. Farhoodi
AGAT Quote #: 160508 PO: TPB166090.6000
Please note: If quotation number is not provided, client will be billed full price for analysis.

Is this submission for a Record of Site Condition?

Yes No

Report Guideline on Certificate of Analysis

Yes No

Turnaround Time (TAT) Required:

Regular TAT 5 to 7 Business Days
Rush TAT (Rush Surcharges Apply)
 3 Business Days 2 Business Days 1 Business Day

OR Date Required (Rush Surcharges May Apply): _____

Please provide prior notification for rush TAT
*TAT is exclusive of weekends and statutory holidays

Invoice Information:

Bill To Same: Yes No

Company: Amec Foster Wheeler
Contact: Hoda Seddik
Address: 505 Woodward Ave #1, Hamilton, ON L8H 6N6, Canada
Email: hoda.seddik@amecfw.com

Sample Matrix Legend

B Biota
GW Ground Water
O Oil
P Paint
S Soil
SD Sediment
SW Surface Water

(Check Applicable)

ORP: BHWS Cl CN
 Cr EC FOC NO₃/NO₂
 Total N Hg pH SAR
Nutrients: TP NH₄ TKN
 NO₃ NO₂ NO₂/NO₃
Volatiles: VOC BTEX THM
CCME Fractions 1 to 4
ABNs
PAHs
Chlorophenols
PCBs
Organochlorine Pesticides
TCPL Metals/Inorganics
Sewer Use
TCLP VOC
Ignitability
Sulphate
B(a)P

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	ORP: <input type="checkbox"/> BHWS <input type="checkbox"/> Cl <input type="checkbox"/> CN <input type="checkbox"/> Cr <input type="checkbox"/> EC <input type="checkbox"/> FOC <input type="checkbox"/> NO ₃ /NO ₂ <input type="checkbox"/> Total N <input type="checkbox"/> Hg <input type="checkbox"/> pH <input type="checkbox"/> SAR	Nutrients: <input type="checkbox"/> TP <input type="checkbox"/> NH ₄ <input type="checkbox"/> TKN <input type="checkbox"/> NO ₃ <input type="checkbox"/> NO ₂ <input type="checkbox"/> NO ₂ /NO ₃	Volatiles: <input type="checkbox"/> VOC <input type="checkbox"/> BTEX <input type="checkbox"/> THM	CCME Fractions 1 to 4	ABNs	PAHs	Chlorophenols	PCBs	Organochlorine Pesticides	TCPL Metals/Inorganics	Sewer Use	TCLP VOC	Ignitability	Sulphate	B(a)P	ON HOLD - Do not Test	
BH 95, AS2+AS3	20/10/2017		4	Soil	3x250, 1X120													<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>			<input checked="" type="checkbox"/>		

Sample Relinquished By (Print Name and Sign) <u>Shami malla</u>	Date <u>20/10/2017</u>	Time <u>5:10</u>	Sample Received By (Print Name and Sign) <u>Craig</u>	Date <u>10/23/17</u>	Time <u>1:20</u>	Page <u>1</u> of <u>1</u>
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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
505 Woodward Avenue Unit 1
Hamilton, ON L8H6H6
(905) 312-0700

ATTENTION TO: Hoda Seddik

PROJECT: TPB166090.6000

AGAT WORK ORDER: 17T275401

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Oct 30, 2017

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



Certificate of Analysis

AGAT WORK ORDER: 17T275401

PROJECT: TPB166090.6000

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Hoda Seddik
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-10-23

DATE REPORTED: 2017-10-30

Parameter	Unit	SAMPLE DESCRIPTION:				
		SAMPLE TYPE:		BH103 AS1	BH86 AS1	BH96 AS1
		G / S	RDL	2017-10-20	2017-10-20	2017-10-20
				8845495	8845506	8845507
Antimony	µg/g		0.8	<0.8	<0.8	<0.8
Arsenic	µg/g		1	5	4	4
Barium	µg/g		2	92	51	62
Beryllium	µg/g		0.5	0.7	0.6	0.6
Boron	µg/g		5	<5	<5	<5
Boron (Hot Water Soluble)	µg/g		0.10	0.77	0.28	0.52
Cadmium	µg/g		0.5	<0.5	<0.5	<0.5
Chromium	µg/g		2	23	17	19
Cobalt	µg/g		0.5	12.3	8.2	8.7
Copper	µg/g		1	19	17	18
Lead	µg/g		1	15	11	16
Molybdenum	µg/g		0.5	0.6	<0.5	<0.5
Nickel	µg/g		1	18	16	16
Selenium	µg/g		0.4	0.5	<0.4	0.4
Silver	µg/g		0.2	<0.2	<0.2	<0.2
Thallium	µg/g		0.4	<0.4	<0.4	<0.4
Uranium	µg/g		0.5	0.7	<0.5	0.6
Vanadium	µg/g		1	33	26	27
Zinc	µg/g		5	83	52	74
Chromium VI	µg/g		0.2	<0.2	<0.2	<0.2
Cyanide	µg/g		0.040	<0.040	<0.040	<0.040
Mercury	µg/g		0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm		0.005	0.182	0.068	0.200
Sodium Adsorption Ratio	NA		NA	0.316	0.114	0.208
pH, 2:1 CaCl2 Extraction	pH Units		NA	6.49	5.43	7.12

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8845495-8845507 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

Amanjot Bhela



Certificate of Analysis

AGAT WORK ORDER: 17T275401

PROJECT: TPB166090.6000

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Hoda Seddik
SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2017-10-23

DATE REPORTED: 2017-10-30

Parameter	Unit	SAMPLE DESCRIPTION:				
		G / S	RDL	BH103 AS1	BH86 AS1	BH96 AS1
				Soil	Soil	Soil
				2017-10-20	2017-10-20	2017-10-20
				8845495	8845506	8845507
Hexachloroethane	µg/g		0.01	<0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g		0.005	<0.005	<0.005	<0.005
Heptachlor	µg/g		0.005	<0.005	<0.005	<0.005
Aldrin	µg/g		0.005	<0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g		0.005	<0.005	<0.005	<0.005
Endosulfan	µg/g		0.005	<0.005	<0.005	<0.005
Chlordane	µg/g		0.007	<0.007	<0.007	<0.007
DDE	µg/g		0.007	<0.007	<0.007	<0.007
DDD	µg/g		0.007	<0.007	<0.007	<0.007
DDT	µg/g		0.007	<0.007	<0.007	<0.007
Dieldrin	µg/g		0.005	<0.005	<0.005	<0.005
Endrin	µg/g		0.005	<0.005	<0.005	<0.005
Methoxychlor	µg/g		0.005	<0.005	<0.005	<0.005
Hexachlorobenzene	µg/g		0.005	<0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g		0.01	<0.01	<0.01	<0.01
Moisture Content	%		0.1	22.4	14.9	17.7
Surrogate	Unit	Acceptable Limits				
TCMX	%	50-140	66	62	78	
Decachlorobiphenyl	%	60-130	82	72	88	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8845495-8845507 Results are based on the dry weight of the soil.

Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.

Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By:

Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
 PROJECT: TPB166090.6000
 SAMPLING SITE:

AGAT WORK ORDER: 17T275401
 ATTENTION TO: Hoda Seddik
 SAMPLED BY:

Soil Analysis															
RPT Date: Oct 30, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 153(511) - Metals & Inorganics (Soil)

Antimony	8844576		<0.8	<0.8	NA	< 0.8	91%	70%	130%	104%	80%	120%	90%	70%	130%
Arsenic	8844576		4	4	NA	< 1	113%	70%	130%	103%	80%	120%	104%	70%	130%
Barium	8844576		81	83	2.4%	< 2	110%	70%	130%	102%	80%	120%	102%	70%	130%
Beryllium	8844576		0.5	0.5	NA	< 0.5	79%	70%	130%	108%	80%	120%	93%	70%	130%
Boron	8844576		6	6	NA	< 5	89%	70%	130%	106%	80%	120%	79%	70%	130%
Boron (Hot Water Soluble)	8852714		<0.10	<0.10	NA	< 0.10	97%	60%	140%	98%	70%	130%	94%	60%	140%
Cadmium	8844576		<0.5	<0.5	NA	< 0.5	104%	70%	130%	101%	80%	120%	100%	70%	130%
Chromium	8844576		22	21	4.7%	< 2	94%	70%	130%	99%	80%	120%	98%	70%	130%
Cobalt	8844576		7.0	6.9	1.4%	< 0.5	98%	70%	130%	98%	80%	120%	95%	70%	130%
Copper	8844576		29	28	3.5%	< 1	95%	70%	130%	105%	80%	120%	94%	70%	130%
Lead	8844576		16	15	6.5%	< 1	104%	70%	130%	100%	80%	120%	98%	70%	130%
Molybdenum	8844576		0.7	0.6	NA	< 0.5	100%	70%	130%	100%	80%	120%	97%	70%	130%
Nickel	8844576		18	18	0.0%	< 1	102%	70%	130%	100%	80%	120%	94%	70%	130%
Selenium	8844576		<0.4	<0.4	NA	< 0.4	78%	70%	130%	103%	80%	120%	104%	70%	130%
Silver	8844576		<0.2	<0.2	NA	< 0.2	82%	70%	130%	93%	80%	120%	90%	70%	130%
Thallium	8844576		<0.4	<0.4	NA	< 0.4	97%	70%	130%	98%	80%	120%	99%	70%	130%
Uranium	8844576		<0.5	<0.5	NA	< 0.5	98%	70%	130%	91%	80%	120%	93%	70%	130%
Vanadium	8844576		25	24	4.1%	< 1	98%	70%	130%	97%	80%	120%	95%	70%	130%
Zinc	8844576		54	53	1.9%	< 5	98%	70%	130%	108%	80%	120%	110%	70%	130%
Chromium VI	8844480		<0.2	<0.2	NA	< 0.2	100%	70%	130%	98%	80%	120%	98%	70%	130%
Cyanide	8845159		<0.040	<0.040	NA	< 0.040	94%	70%	130%	92%	80%	120%	105%	70%	130%
Mercury	8844576		<0.10	<0.10	NA	< 0.10	121%	70%	130%	97%	80%	120%	104%	70%	130%
Electrical Conductivity	8852254		0.216	0.204	5.7%	< 0.005	93%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8846088		1.04	1.05	1.0%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8849680		4.79	4.77	0.4%	NA	101%	80%	120%	NA			NA		

Comments: NA signifies Not Applicable.

Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: _____

Amanjot Bhela

Quality Assurance

 CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
 PROJECT: TPB166090.6000
 SAMPLING SITE:

 AGAT WORK ORDER: 17T275401
 ATTENTION TO: Hoda Seddik
 SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 30, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	
O. Reg. 153(511) - OC Pesticides (Soil)																
Hexachloroethane	8847372		< 0.01	< 0.01	NA	< 0.01	102%	50%	140%	68%	50%	140%	68%	50%	140%	
Gamma-Hexachlorocyclohexane	8847372		< 0.005	< 0.005	NA	< 0.005	100%	50%	140%	70%	50%	140%	90%	50%	140%	
Heptachlor	8847372		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	88%	50%	140%	86%	50%	140%	
Aldrin	8847372		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	80%	50%	140%	90%	50%	140%	
Heptachlor Epoxide	8847372		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	90%	50%	140%	102%	50%	140%	
Endosulfan	8847372		< 0.005	< 0.005	NA	< 0.005	100%	50%	140%	87%	50%	140%	95%	50%	140%	
Chlordane	8847372		< 0.007	< 0.007	NA	< 0.007	100%	50%	140%	89%	50%	140%	91%	50%	140%	
DDE	8847372		< 0.007	< 0.007	NA	< 0.007	105%	50%	140%	98%	50%	140%	100%	50%	140%	
DDD	8847372		< 0.007	< 0.007	NA	< 0.007	103%	50%	140%	89%	50%	140%	93%	50%	140%	
DDT	8847372		< 0.007	< 0.007	NA	< 0.007	112%	50%	140%	94%	50%	140%	92%	50%	140%	
Dieldrin	8847372		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	90%	50%	140%	104%	50%	140%	
Endrin	8847372		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	96%	50%	140%	110%	50%	140%	
Methoxychlor	8847372		< 0.005	< 0.005	NA	< 0.005	103%	50%	140%	100%	50%	140%	102%	50%	140%	
Hexachlorobenzene	8847372		< 0.005	< 0.005	NA	< 0.005	112%	50%	140%	90%	50%	140%	94%	50%	140%	
Hexachlorobutadiene	8847372		< 0.01	< 0.01	NA	< 0.01	109%	50%	140%	66%	50%	140%	68%	50%	140%	

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T275401

PROJECT: TPB166090.6000

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A; SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl ₂ Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
505 Woodward Avenue Unit 1
Hamilton, ON L8H6H6
(905) 312-0700

ATTENTION TO: Hoda Seddik

PROJECT:

AGAT WORK ORDER: 17T275410

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Oct 30, 2017

PAGES (INCLUDING COVER): 7

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



Certificate of Analysis

AGAT WORK ORDER: 17T275410

PROJECT:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Hoda Seddik
SAMPLED BY:

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-10-23

DATE REPORTED: 2017-10-30

Parameter	Unit	SAMPLE DESCRIPTION:		BH36 AS1	BH46 AS1
		G / S	RDL	8845488	8845489
Antimony	µg/g		0.8	<0.8	<0.8
Arsenic	µg/g		1	4	5
Barium	µg/g		2	70	77
Beryllium	µg/g		0.5	0.6	0.6
Boron	µg/g		5	<5	<5
Boron (Hot Water Soluble)	µg/g		0.10	0.24	0.34
Cadmium	µg/g		0.5	<0.5	<0.5
Chromium	µg/g		2	18	20
Cobalt	µg/g		0.5	7.8	9.8
Copper	µg/g		1	18	23
Lead	µg/g		1	13	15
Molybdenum	µg/g		0.5	<0.5	<0.5
Nickel	µg/g		1	16	18
Selenium	µg/g		0.4	0.5	0.6
Silver	µg/g		0.2	<0.2	<0.2
Thallium	µg/g		0.4	<0.4	<0.4
Uranium	µg/g		0.5	0.7	0.8
Vanadium	µg/g		1	28	30
Zinc	µg/g		5	58	70
Chromium VI	µg/g		0.2	<0.2	<0.2
Cyanide	µg/g		0.040	<0.040	<0.040
Mercury	µg/g		0.10	<0.10	<0.10
Electrical Conductivity	mS/cm		0.005	0.133	0.140
Sodium Adsorption Ratio	NA		NA	0.141	0.157
pH, 2:1 CaCl2 Extraction	pH Units		NA	6.83	6.12

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8845488-8845489 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Certified By:

Amanjot Bhela



Certificate of Analysis

AGAT WORK ORDER: 17T275410

PROJECT:

5835 COOPERS AVENUE
MISSISSAUGA, ONTARIO
CANADA L4Z 1Y2
TEL (905)712-5100
FAX (905)712-5122
<http://www.agatlabs.com>

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY:

O. Reg. 153(511) - OC Pesticides (Soil)

DATE RECEIVED: 2017-10-23

DATE REPORTED: 2017-10-30

Parameter	Unit	SAMPLE DESCRIPTION:		BH36 AS1	BH46 AS1
		G / S	RDL	8845488	8845489
Hexachloroethane	µg/g		0.01	<0.01	<0.01
Gamma-Hexachlorocyclohexane	µg/g		0.005	<0.005	<0.005
Heptachlor	µg/g		0.005	<0.005	<0.005
Aldrin	µg/g		0.005	<0.005	<0.005
Heptachlor Epoxide	µg/g		0.005	<0.005	<0.005
Endosulfan	µg/g		0.005	<0.005	<0.005
Chlordane	µg/g		0.007	<0.007	<0.007
DDE	µg/g		0.007	<0.007	<0.007
DDD	µg/g		0.007	<0.007	<0.007
DDT	µg/g		0.007	<0.007	<0.007
Dieldrin	µg/g		0.005	<0.005	<0.005
Endrin	µg/g		0.005	<0.005	<0.005
Methoxychlor	µg/g		0.005	<0.005	<0.005
Hexachlorobenzene	µg/g		0.005	<0.005	<0.005
Hexachlorobutadiene	µg/g		0.01	<0.01	<0.01
Moisture Content	%		0.1	17.8	17.5
Surrogate	Unit	Acceptable Limits			
TCMX	%		50-140	62	74
Decachlorobiphenyl	%		60-130	80	96

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8845488-8845489 Results are based on the dry weight of the soil.

Note: DDT applies to the total of op'DDT and pp'DDT, DDD applies to the total of op'DDD and pp'DDD and DDE applies to the total of op'DDE and pp'DDE. Endosulfan applies to the total of Endosulfan I and Endosulfan II.

Chlordane applies to the total of Alpha-Chlordane and Gamma-Chlordane.

Certified By:

Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T275410

PROJECT:

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY:

Soil Analysis															
RPT Date: Oct 30, 2017			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 153(511) - Metals & Inorganics (Soil)

Antimony	8844576		<0.8	<0.8	NA	< 0.8	91%	70%	130%	104%	80%	120%	90%	70%	130%
Arsenic	8844576		4	4	NA	< 1	113%	70%	130%	103%	80%	120%	104%	70%	130%
Barium	8844576		81	83	2.4%	< 2	110%	70%	130%	102%	80%	120%	102%	70%	130%
Beryllium	8844576		0.5	0.5	NA	< 0.5	79%	70%	130%	108%	80%	120%	93%	70%	130%
Boron	8844576		6	6	NA	< 5	89%	70%	130%	106%	80%	120%	79%	70%	130%
Boron (Hot Water Soluble)	8851023		0.11	0.13	NA	< 0.10	94%	60%	140%	99%	70%	130%	92%	60%	140%
Cadmium	8844576		<0.5	<0.5	NA	< 0.5	104%	70%	130%	101%	80%	120%	100%	70%	130%
Chromium	8844576		22	21	4.7%	< 2	94%	70%	130%	99%	80%	120%	98%	70%	130%
Cobalt	8844576		7.0	6.9	1.4%	< 0.5	98%	70%	130%	98%	80%	120%	95%	70%	130%
Copper	8844576		29	28	3.5%	< 1	95%	70%	130%	105%	80%	120%	94%	70%	130%
Lead	8844576		16	15	6.5%	< 1	104%	70%	130%	100%	80%	120%	98%	70%	130%
Molybdenum	8844576		0.7	0.6	NA	< 0.5	100%	70%	130%	100%	80%	120%	97%	70%	130%
Nickel	8844576		18	18	0.0%	< 1	102%	70%	130%	100%	80%	120%	94%	70%	130%
Selenium	8844576		<0.4	<0.4	NA	< 0.4	78%	70%	130%	103%	80%	120%	104%	70%	130%
Silver	8844576		<0.2	<0.2	NA	< 0.2	82%	70%	130%	93%	80%	120%	90%	70%	130%
Thallium	8844576		<0.4	<0.4	NA	< 0.4	97%	70%	130%	98%	80%	120%	99%	70%	130%
Uranium	8844576		<0.5	<0.5	NA	< 0.5	98%	70%	130%	91%	80%	120%	93%	70%	130%
Vanadium	8844576		25	24	4.1%	< 1	98%	70%	130%	97%	80%	120%	95%	70%	130%
Zinc	8844576		54	53	1.9%	< 5	98%	70%	130%	108%	80%	120%	110%	70%	130%
Chromium VI	8844480		<0.2	<0.2	NA	< 0.2	100%	70%	130%	98%	80%	120%	98%	70%	130%
Cyanide	8845159		<0.040	<0.040	NA	< 0.040	94%	70%	130%	92%	80%	120%	105%	70%	130%
Mercury	8844576		<0.10	<0.10	NA	< 0.10	121%	70%	130%	97%	80%	120%	104%	70%	130%
Electrical Conductivity	8849033		0.136	0.130	4.5%	< 0.005	93%	90%	110%						
Sodium Adsorption Ratio	8844299		0.845	0.849	0.5%	NA									
pH, 2:1 CaCl2 Extraction	8849680		4.79	4.77	0.4%	NA	101%	80%	120%						

Comments: NA signifies Not Applicable.

Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By:



Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T275410

PROJECT:

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY:

Trace Organics Analysis

RPT Date: Oct 30, 2017			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - OC Pesticides (Soil)															
Hexachloroethane	8847372		< 0.01	< 0.01	NA	< 0.01	102%	50%	140%	68%	50%	140%	68%	50%	140%
Gamma-Hexachlorocyclohexane	8847372		< 0.005	< 0.005	NA	< 0.005	100%	50%	140%	70%	50%	140%	90%	50%	140%
Heptachlor	8847372		< 0.005	< 0.005	NA	< 0.005	109%	50%	140%	88%	50%	140%	86%	50%	140%
Aldrin	8847372		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	80%	50%	140%	90%	50%	140%
Heptachlor Epoxide	8847372		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	90%	50%	140%	102%	50%	140%
Endosulfan	8847372		< 0.005	< 0.005	NA	< 0.005	100%	50%	140%	87%	50%	140%	95%	50%	140%
Chlordane	8847372		< 0.007	< 0.007	NA	< 0.007	100%	50%	140%	89%	50%	140%	91%	50%	140%
DDE	8847372		< 0.007	< 0.007	NA	< 0.007	105%	50%	140%	98%	50%	140%	100%	50%	140%
DDD	8847372		< 0.007	< 0.007	NA	< 0.007	103%	50%	140%	89%	50%	140%	93%	50%	140%
DDT	8847372		< 0.007	< 0.007	NA	< 0.007	112%	50%	140%	94%	50%	140%	92%	50%	140%
Dieldrin	8847372		< 0.005	< 0.005	NA	< 0.005	101%	50%	140%	90%	50%	140%	104%	50%	140%
Endrin	8847372		< 0.005	< 0.005	NA	< 0.005	106%	50%	140%	96%	50%	140%	110%	50%	140%
Methoxychlor	8847372		< 0.005	< 0.005	NA	< 0.005	103%	50%	140%	100%	50%	140%	102%	50%	140%
Hexachlorobenzene	8847372		< 0.005	< 0.005	NA	< 0.005	112%	50%	140%	90%	50%	140%	94%	50%	140%
Hexachlorobutadiene	8847372		< 0.01	< 0.01	NA	< 0.01	109%	50%	140%	66%	50%	140%	68%	50%	140%

Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____



Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T275410

PROJECT:

ATTENTION TO: Hoda Seddik

SAMPLING SITE:

SAMPLED BY:

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A; SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl ₂ Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Trace Organics Analysis			
Hexachloroethane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Gamma-Hexachlorocyclohexane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Aldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Heptachlor Epoxide	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endosulfan	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Chlordane	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDE	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDD	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
DDT	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Dieldrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Endrin	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Methoxychlor	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobenzene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Hexachlorobutadiene	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
TCMX	ORG-91-5112	EPA SW-846 3541,3620 & 8081	GC/ECD
Decachlorobiphenyl	ORG-91-5113	EPA SW-846 3541,3620 & 8081	GC/ECD
Moisture Content		MOE E3139	BALANCE

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
104 CROCKFORD BLVD
SCARBOROUGH, ON M1R3C3
(416) 751-6565

ATTENTION TO: Shami Malla

PROJECT: TPB 166090.6000

AGAT WORK ORDER: 17T276361

SOIL ANALYSIS REVIEWED BY: Amanjot Bhela, Inorganic Coordinator

TRACE ORGANICS REVIEWED BY: Oksana Gushyla, Trace Organics Lab Supervisor

DATE REPORTED: Nov 02, 2017

PAGES (INCLUDING COVER): 16

VERSION*: 1

Should you require any information regarding this analysis please contact your client services representative at (905) 712-5100

*NOTES

All samples will be disposed of within 30 days following analysis. Please contact the lab if you require additional sample storage time.



Certificate of Analysis

AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

5835 COOPERS AVENUE
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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Shami Malla
SAMPLED BY: Javad Farhoodi

O. Reg. 153(511) - Metals & Inorganics (Soil)

DATE RECEIVED: 2017-10-25

DATE REPORTED: 2017-11-01

Parameter	Unit	SAMPLE DESCRIPTION:								
		SAMPLE TYPE:		BH4, AS1	BH12, AS1	BH18, AS1	BH24, AS1	BH28, AS1	BH30, AS1	BH34, AS1
		DATE SAMPLED:		Soil	Soil	Soil	Soil	Soil	Soil	Soil
		G / S	RDL	8852230	8852289	8852292	8852298	8852302	8852303	8852304
Antimony	µg/g	0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8	<0.8
Arsenic	µg/g	1	3	3	3	3	3	3	3	3
Barium	µg/g	2	40	30	30	31	30	30	29	37
Beryllium	µg/g	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Boron	µg/g	5	<5	<5	<5	<5	<5	<5	<5	5
Boron (Hot Water Soluble)	µg/g	0.10	0.27	0.23	0.37	0.16	0.20	0.26	0.26	0.36
Cadmium	µg/g	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chromium	µg/g	2	17	22	41	19	22	26	26	42
Cobalt	µg/g	0.5	4.8	4.1	4.1	4.9	4.4	4.6	4.6	6.5
Copper	µg/g	1	27	26	32	32	31	28	28	33
Lead	µg/g	1	24	21	25	16	36	24	24	37
Molybdenum	µg/g	0.5	0.5	1.7	1.6	0.9	0.7	0.9	0.9	1.4
Nickel	µg/g	1	10	8	12	10	11	13	13	13
Selenium	µg/g	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Silver	µg/g	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Thallium	µg/g	0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4	<0.4
Uranium	µg/g	0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Vanadium	µg/g	1	18	15	16	17	19	20	20	20
Zinc	µg/g	5	63	88	142	75	94	117	117	155
Chromium VI	µg/g	0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
Cyanide	µg/g	0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040	<0.040
Mercury	µg/g	0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10
Electrical Conductivity	mS/cm	0.005	0.535	0.125	0.190	0.168	0.169	0.238	0.238	0.302
Sodium Adsorption Ratio	NA	NA	7.88	0.173	0.193	0.402	5.14	6.22	6.22	7.47
pH, 2:1 CaCl2 Extraction	pH Units	NA	7.58	7.44	7.33	7.62	8.02	7.90	7.90	7.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8852230-8852304 EC & SAR were determined on the DI water extract obtained from the 2:1 leaching procedure (2 parts DI water:1 part soil). pH was determined on the 0.01M CaCl2 extract prepared at 2:1 ratio.

Sampling dates were not mentioned on COC.

Certified By:

Amanjot Bhela



Certificate of Analysis

AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
 SAMPLING SITE:

ATTENTION TO: Shami Malla
 SAMPLED BY: Javad Farhoodi

O. Reg. 558 Metals and Inorganics

DATE RECEIVED: 2017-10-25

DATE REPORTED: 2017-10-31

SAMPLE DESCRIPTION: BH6, AS2 + AS3

SAMPLE TYPE: Soil

DATE SAMPLED:

Parameter	Unit	G / S	RDL	8852232
Arsenic Leachate	mg/L	2.5	0.010	<0.010
Barium Leachate	mg/L	100	0.100	1.01
Boron Leachate	mg/L	500	0.050	0.052
Cadmium Leachate	mg/L	0.5	0.010	<0.010
Chromium Leachate	mg/L	5	0.010	<0.010
Lead Leachate	mg/L	5	0.010	0.017
Mercury Leachate	mg/L	0.1	0.01	<0.01
Selenium Leachate	mg/L	1	0.010	<0.010
Silver Leachate	mg/L	5	0.010	<0.010
Uranium Leachate	mg/L	10	0.050	<0.050
Fluoride Leachate	mg/L	150	0.05	0.16
Cyanide Leachate	mg/L	20	0.05	<0.05
(Nitrate + Nitrite) as N Leachate	mg/L	1000	0.70	<0.70

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 8852232 Sampling date was not mentioned on COC.

Certified By:

Amanjot Bhela



Certificate of Analysis

AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Shami Malla
SAMPLED BY: Javad Farhoodi

O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)

DATE RECEIVED: 2017-10-25

DATE REPORTED: 2017-10-30

Parameter	Unit	SAMPLE DESCRIPTION:		BH8, AS1	BH22, AS1
		G / S	RDL	Soil	Soil
		DATE SAMPLED:		8852256	8852295
F1 (C6 to C10)	µg/g		5	<5	<5
F1 (C6 to C10) minus BTEX	µg/g		5	<5	<5
F2 (C10 to C16)	µg/g		10	<10	<10
F3 (C16 to C34)	µg/g		50	210	89
F4 (C34 to C50)	µg/g		50	200	71
Gravimetric Heavy Hydrocarbons	µg/g		50	NA	NA
Moisture Content	%		0.1	3.3	5.9
Surrogate	Unit	Acceptable Limits			
Terphenyl	%	60-140		110	100

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8852256-8852295 Results are based on sample dry weight.
The C6-C10 fraction is calculated using toluene response factor.
The C10 - C16, C16 - C34, and C34 - C50 fractions are calculated using the average response factor for n-C10, n-C16, and n-C34.
Gravimetric Heavy Hydrocarbons are not included in the Total C16-C50 and are only determined if the chromatogram of the C34 - C50 hydrocarbons indicates that hydrocarbons >C50 are present.
The chromatogram has returned to baseline by the retention time of nC50.
Total C6 - C50 results are corrected for BTEX contributions.
This method complies with the Reference Method for the CWS PHC and is validated for use in the laboratory.
nC6 and nC10 response factors are within 30% of Toluene response factor.
nC10, nC16 and nC34 response factors are within 10% of their average.
C50 response factor is within 70% of nC10 + nC16 + nC34 average.
Linearity is within 15%.
Extraction and holding times were met for this sample.
Fractions 1-4 are quantified without the contribution of PAHs. Under Ontario Regulation 153, results are considered valid without determining the PAH contribution if not requested by the client.

Certified By:



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AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Shami Malla
SAMPLED BY: Javad Farhoodi

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2017-10-25

DATE REPORTED: 2017-10-30

Parameter	Unit	SAMPLE DESCRIPTION:		BH8, AS1	BH22, AS1
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		8852256	8852295
	G / S	RDL			
Dichlorodifluoromethane	ug/g	0.05	<0.05	<0.05	<0.05
Vinyl Chloride	ug/g	0.02	<0.02	<0.02	<0.02
Bromomethane	ug/g	0.05	<0.05	<0.05	<0.05
Trichlorofluoromethane	ug/g	0.05	<0.05	<0.05	<0.05
Acetone	ug/g	0.50	<0.50	<0.50	<0.50
1,1-Dichloroethylene	ug/g	0.05	<0.05	<0.05	<0.05
Methylene Chloride	ug/g	0.05	<0.05	<0.05	<0.05
Trans- 1,2-Dichloroethylene	ug/g	0.05	<0.05	<0.05	<0.05
Methyl tert-butyl Ether	ug/g	0.05	<0.05	<0.05	<0.05
1,1-Dichloroethane	ug/g	0.02	<0.02	<0.02	<0.02
Methyl Ethyl Ketone	ug/g	0.50	<0.50	<0.50	<0.50
Cis- 1,2-Dichloroethylene	ug/g	0.02	<0.02	<0.02	<0.02
Chloroform	ug/g	0.04	<0.04	<0.04	<0.04
1,2-Dichloroethane	ug/g	0.03	<0.03	<0.03	<0.03
1,1,1-Trichloroethane	ug/g	0.05	<0.05	<0.05	<0.05
Carbon Tetrachloride	ug/g	0.05	<0.05	<0.05	<0.05
Benzene	ug/g	0.02	<0.02	<0.02	<0.02
1,2-Dichloropropane	ug/g	0.03	<0.03	<0.03	<0.03
Trichloroethylene	ug/g	0.03	<0.03	<0.03	<0.03
Bromodichloromethane	ug/g	0.05	<0.05	<0.05	<0.05
Methyl Isobutyl Ketone	ug/g	0.50	<0.50	<0.50	<0.50
1,1,2-Trichloroethane	ug/g	0.04	<0.04	<0.04	<0.04
Toluene	ug/g	0.02	<0.02	<0.02	<0.02
Dibromochloromethane	ug/g	0.05	<0.05	<0.05	<0.05
Ethylene Dibromide	ug/g	0.04	<0.04	<0.04	<0.04
Tetrachloroethylene	ug/g	0.05	<0.05	<0.05	<0.05
1,1,1,2-Tetrachloroethane	ug/g	0.04	<0.04	<0.04	<0.04
Chlorobenzene	ug/g	0.05	<0.05	<0.05	<0.05
Ethylbenzene	ug/g	0.05	<0.05	<0.05	<0.05
m & p-Xylene	ug/g	0.05	<0.05	<0.05	<0.05

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AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Shami Malla
SAMPLED BY: Javad Farhoodi

O. Reg. 153(511) - VOCs (Soil)

DATE RECEIVED: 2017-10-25

DATE REPORTED: 2017-10-30

Parameter	Unit	SAMPLE DESCRIPTION:		BH8, AS1	BH22, AS1
		SAMPLE TYPE:		Soil	Soil
		DATE SAMPLED:		8852256	8852295
		G / S	RDL		
Bromoform	ug/g		0.05	<0.05	<0.05
Styrene	ug/g		0.05	<0.05	<0.05
1,1,2,2-Tetrachloroethane	ug/g		0.05	<0.05	<0.05
o-Xylene	ug/g		0.05	<0.05	<0.05
1,3-Dichlorobenzene	ug/g		0.05	<0.05	<0.05
1,4-Dichlorobenzene	ug/g		0.05	<0.05	<0.05
1,2-Dichlorobenzene	ug/g		0.05	<0.05	<0.05
Xylene Mixture	ug/g		0.05	<0.05	<0.05
1,3-Dichloropropene	µg/g		0.04	<0.04	<0.04
n-Hexane	µg/g		0.05	<0.05	<0.05
Surrogate	Unit	Acceptable Limits			
Toluene-d8	% Recovery	50-140	80	78	
4-Bromofluorobenzene	% Recovery	50-140	95	97	

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard

8852256-8852295 The sample was analysed using the high level technique. The sample was extracted using methanol, a small amount of the methanol extract was diluted in water and the purge & trap GC/MS analysis was performed. Results are based on the dry weight of the soil.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

ATTENTION TO: Shami Malla

SAMPLING SITE:

SAMPLED BY: Javad Farhoodi

O. Reg. 558 - Benzo(a) pyrene

DATE RECEIVED: 2017-10-25

DATE REPORTED: 2017-10-31

SAMPLE DESCRIPTION: BH6, AS2 + AS3

SAMPLE TYPE: Soil

DATE SAMPLED:

Parameter	Unit	G / S	RDL	8852232
Benzo(a)pyrene	mg/L	0.001	0.001	<0.001

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
 Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
 8852232 The sample was leached according to Regulation 558 protocol. Analysis was performed on the leachate.

Certified By:



Certificate of Analysis

AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

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CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
SAMPLING SITE:

ATTENTION TO: Shami Malla
SAMPLED BY: Javad Farhoodi

O. Reg. 558 - VOCs

DATE RECEIVED: 2017-10-25

DATE REPORTED: 2017-10-31

SAMPLE DESCRIPTION: BH6, AS2 + AS3

SAMPLE TYPE: Soil

DATE SAMPLED:

Parameter	Unit	G / S	RDL	8852232
Vinyl Chloride	mg/L	0.2	0.030	<0.030
1,1 Dichloroethene	mg/L	1.4	0.020	<0.020
Dichloromethane	mg/L	5.0	0.030	<0.030
Methyl Ethyl Ketone	mg/L	200	0.090	<0.090
Chloroform	mg/L	10.0	0.020	<0.020
1,2-Dichloroethane	mg/L	0.5	0.020	<0.020
Carbon Tetrachloride	mg/L	0.5	0.020	<0.020
Benzene	mg/L	0.5	0.020	<0.020
Trichloroethene	mg/L	5.0	0.020	<0.020
Tetrachloroethene	mg/L	3.0	0.050	<0.050
Chlorobenzene	mg/L	8.0	0.010	<0.010
1,2-Dichlorobenzene	mg/L	20.0	0.010	<0.010
1,4-Dichlorobenzene	mg/L	0.5	0.010	<0.010

Surrogate	Unit	Acceptable Limits
Toluene-d8	% Recovery	60-130 101

Comments: RDL - Reported Detection Limit; G / S - Guideline / Standard: Refers to O. Reg. 558 - Schedule IV Leachate Quality Criteria
Guideline values are for general reference only. The guidelines provided may or may not be relevant for the intended use. Refer directly to the applicable standard for regulatory interpretation.
8852232 Sample was prepared using Regulation 558 protocol and a zero headspace extractor.

Certified By:

Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
PROJECT: TPB 166090.6000
SAMPLING SITE:

AGAT WORK ORDER: 17T276361
ATTENTION TO: Shami Malla
SAMPLED BY: Javad Farhoodi

Soil Analysis															
RPT Date:			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE		MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 153(511) - Metals & Inorganics (Soil)

Antimony	8852141		<0.8	<0.8	NA	< 0.8	82%	70%	130%	97%	80%	120%	95%	70%	130%
Arsenic	8852141		3	2	NA	< 1	115%	70%	130%	107%	80%	120%	109%	70%	130%
Barium	8852141		74	70	5.6%	< 2	100%	70%	130%	100%	80%	120%	97%	70%	130%
Beryllium	8852141		0.5	0.5	NA	< 0.5	81%	70%	130%	108%	80%	120%	95%	70%	130%
Boron	8852141		5	6	NA	< 5	91%	70%	130%	115%	80%	120%	88%	70%	130%
Boron (Hot Water Soluble)	8848391		0.48	0.46	NA	< 0.10	104%	60%	140%	100%	70%	130%	101%	60%	140%
Cadmium	8852141		<0.5	<0.5	NA	< 0.5	107%	70%	130%	108%	80%	120%	107%	70%	130%
Chromium	8852141		20	19	5.1%	< 2	93%	70%	130%	105%	80%	120%	108%	70%	130%
Cobalt	8852141		6.4	6.1	4.8%	< 0.5	100%	70%	130%	103%	80%	120%	105%	70%	130%
Copper	8852141		10	10	0.0%	< 1	101%	70%	130%	114%	80%	120%	110%	70%	130%
Lead	8852141		10	9	10.5%	< 1	115%	70%	130%	110%	80%	120%	106%	70%	130%
Molybdenum	8852141		<0.5	<0.5	NA	< 0.5	102%	70%	130%	108%	80%	120%	107%	70%	130%
Nickel	8852141		11	11	0.0%	< 1	103%	70%	130%	106%	80%	120%	107%	70%	130%
Selenium	8852141		0.4	<0.4	NA	< 0.4	101%	70%	130%	104%	80%	120%	107%	70%	130%
Silver	8852141		<0.2	<0.2	NA	< 0.2	87%	70%	130%	108%	80%	120%	95%	70%	130%
Thallium	8852141		<0.4	<0.4	NA	< 0.4	103%	70%	130%	107%	80%	120%	105%	70%	130%
Uranium	8852141		0.5	0.5	NA	< 0.5	117%	70%	130%	108%	80%	120%	105%	70%	130%
Vanadium	8852141		32	29	9.8%	< 1	99%	70%	130%	104%	80%	120%	103%	70%	130%
Zinc	8852141		44	41	7.1%	< 5	108%	70%	130%	119%	80%	120%	113%	70%	130%
Chromium VI	8852289	8852289	<0.2	<0.2	NA	< 0.2	94%	70%	130%	94%	80%	120%	100%	70%	130%
Cyanide	8852289	8852289	<0.040	<0.040	NA	< 0.040	101%	70%	130%	106%	80%	120%	101%	70%	130%
Mercury	8852141		<0.10	<0.10	NA	< 0.10	109%	70%	130%	110%	80%	120%	104%	70%	130%
Electrical Conductivity	8842265		0.698	0.705	1.0%	< 0.005	96%	90%	110%	NA			NA		
Sodium Adsorption Ratio	8852141		0.513	0.438	15.8%	NA	NA			NA			NA		
pH, 2:1 CaCl2 Extraction	8852289	8852289	7.44	7.50	0.8%	NA	101%	80%	120%	NA			NA		

O. Reg. 153(511) - Metals & Inorganics (Soil)

Cyanide	8861757		<0.040	<0.040	NA	< 0.040	94%	70%	130%	100%	80%	120%	104%	70%	130%
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O. Reg. 558 Metals and Inorganics

Arsenic Leachate	8855318		<0.010	<0.010	NA	< 0.010	101%	90%	110%	95%	80%	120%	99%	70%	130%
Barium Leachate	8855318		0.388	0.351	NA	< 0.100	101%	90%	110%	101%	80%	120%	92%	70%	130%
Boron Leachate	8855318		<0.050	<0.050	NA	< 0.050	97%	90%	110%	87%	80%	120%	73%	70%	130%
Cadmium Leachate	8855318		<0.010	<0.010	NA	< 0.010	101%	90%	110%	90%	80%	120%	95%	70%	130%
Chromium Leachate	8855318		<0.010	<0.010	NA	< 0.010	99%	90%	110%	102%	80%	120%	95%	70%	130%
Lead Leachate	8855318		<0.010	<0.010	NA	< 0.010	98%	90%	110%	94%	80%	120%	94%	70%	130%
Mercury Leachate	8855318		<0.01	<0.01	NA	< 0.01	102%	90%	110%	96%	80%	120%	96%	70%	130%
Selenium Leachate	8855318		<0.010	<0.010	NA	< 0.010	100%	90%	110%	95%	80%	120%	95%	70%	130%
Silver Leachate	8855318		<0.010	<0.010	NA	< 0.010	101%	90%	110%	90%	80%	120%	87%	70%	130%
Uranium Leachate	8855318		<0.050	<0.050	NA	< 0.050	92%	90%	110%	94%	80%	120%	93%	70%	130%



Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
 PROJECT: TPB 166090.6000
 SAMPLING SITE:

AGAT WORK ORDER: 17T276361
 ATTENTION TO: Shami Malla
 SAMPLED BY: Javad Farhoodi

Soil Analysis (Continued)

RPT Date:			DUPLICATE				Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD	Measured Value		Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits		
								Lower	Upper		Lower	Upper		Lower	Upper	
Fluoride Leachate	8855318		0.29	0.29	0.0%	< 0.05	102%	90%	110%	100%	90%	110%	93%	70%	130%	
Cyanide Leachate	8855318		<0.05	<0.05	NA	< 0.05	101%	90%	110%	106%	90%	110%	107%	70%	130%	
(Nitrate + Nitrite) as N Leachate	8855318		<0.70	<0.70	NA	< 0.70	96%	80%	120%	94%	80%	120%	93%	70%	130%	

Comments: NA signifies Not Applicable.

Duplicate Qualifier: As the measured result approaches the RL, the uncertainty associated with the value increases dramatically, thus duplicate acceptance limits apply only where the average of the two duplicates is greater than five times the RL.

Certified By: _____

Amanjot Bhela

Quality Assurance

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

ATTENTION TO: Shami Malla

SAMPLING SITE:

SAMPLED BY: Javad Farhoodi

Trace Organics Analysis

RPT Date:			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper
O. Reg. 153(511) - VOCs (Soil)															
Dichlorodifluoromethane	8852166		< 0.05	< 0.05	NA	< 0.05	125%	50%	140%	107%	50%	140%	127%	50%	140%
Vinyl Chloride	8852166		< 0.02	< 0.02	NA	< 0.02	114%	50%	140%	126%	50%	140%	97%	50%	140%
Bromomethane	8852166		< 0.05	< 0.05	NA	< 0.05	100%	50%	140%	107%	50%	140%	105%	50%	140%
Trichlorofluoromethane	8852166		< 0.05	< 0.05	NA	< 0.05	94%	50%	140%	121%	50%	140%	118%	50%	140%
Acetone	8852166		< 0.50	< 0.50	NA	< 0.50	98%	50%	140%	82%	50%	140%	82%	50%	140%
1,1-Dichloroethylene	8852166		< 0.05	< 0.05	NA	< 0.05	76%	50%	140%	109%	60%	130%	113%	50%	140%
Methylene Chloride	8852166		< 0.05	< 0.05	NA	< 0.05	77%	50%	140%	115%	60%	130%	101%	50%	140%
Trans- 1,2-Dichloroethylene	8852166		< 0.05	< 0.05	NA	< 0.05	93%	50%	140%	106%	60%	130%	116%	50%	140%
Methyl tert-butyl Ether	8852166		< 0.05	< 0.05	NA	< 0.05	76%	50%	140%	74%	60%	130%	72%	50%	140%
1,1-Dichloroethane	8852166		< 0.02	< 0.02	NA	< 0.02	72%	50%	140%	95%	60%	130%	79%	50%	140%
Methyl Ethyl Ketone	8852166		< 0.50	< 0.50	NA	< 0.50	88%	50%	140%	93%	50%	140%	93%	50%	140%
Cis- 1,2-Dichloroethylene	8852166		< 0.02	< 0.02	NA	< 0.02	86%	50%	140%	93%	60%	130%	85%	50%	140%
Chloroform	8852166		< 0.04	< 0.04	NA	< 0.04	89%	50%	140%	81%	60%	130%	99%	50%	140%
1,2-Dichloroethane	8852166		< 0.03	< 0.03	NA	< 0.03	99%	50%	140%	100%	60%	130%	112%	50%	140%
1,1,1-Trichloroethane	8852166		< 0.05	< 0.05	NA	< 0.05	80%	50%	140%	91%	60%	130%	97%	50%	140%
Carbon Tetrachloride	8852166		< 0.05	< 0.05	NA	< 0.05	71%	50%	140%	89%	60%	130%	97%	50%	140%
Benzene	8852166		< 0.02	< 0.02	NA	< 0.02	79%	50%	140%	95%	60%	130%	109%	50%	140%
1,2-Dichloropropane	8852166		< 0.03	< 0.03	NA	< 0.03	76%	50%	140%	92%	60%	130%	105%	50%	140%
Trichloroethylene	8852166		< 0.03	< 0.03	NA	< 0.03	70%	50%	140%	94%	60%	130%	108%	50%	140%
Bromodichloromethane	8852166		< 0.05	< 0.05	NA	< 0.05	84%	50%	140%	90%	60%	130%	99%	50%	140%
Methyl Isobutyl Ketone	8852166		< 0.50	< 0.50	NA	< 0.50	83%	50%	140%	88%	50%	140%	88%	50%	140%
1,1,2-Trichloroethane	8852166		< 0.04	< 0.04	NA	< 0.04	90%	50%	140%	78%	60%	130%	89%	50%	140%
Toluene	8852166		< 0.02	< 0.02	NA	< 0.02	75%	50%	140%	77%	60%	130%	89%	50%	140%
Dibromochloromethane	8852166		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	99%	60%	130%	77%	50%	140%
Ethylene Dibromide	8852166		< 0.04	< 0.04	NA	< 0.04	83%	50%	140%	78%	60%	130%	85%	50%	140%
Tetrachloroethylene	8852166		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	77%	60%	130%	86%	50%	140%
1,1,1,2-Tetrachloroethane	8852166		< 0.04	< 0.04	NA	< 0.04	87%	50%	140%	76%	60%	130%	82%	50%	140%
Chlorobenzene	8852166		< 0.05	< 0.05	NA	< 0.05	86%	50%	140%	78%	60%	130%	87%	50%	140%
Ethylbenzene	8852166		< 0.05	< 0.05	NA	< 0.05	82%	50%	140%	73%	60%	130%	83%	50%	140%
m & p-Xylene	8852166		< 0.05	< 0.05	NA	< 0.05	88%	50%	140%	101%	60%	130%	89%	50%	140%
Bromoform	8852166		< 0.05	< 0.05	NA	< 0.05	87%	50%	140%	72%	60%	130%	76%	50%	140%
Styrene	8852166		< 0.05	< 0.05	NA	< 0.05	74%	50%	140%	75%	60%	130%	82%	50%	140%
1,1,2,2-Tetrachloroethane	8852166		< 0.05	< 0.05	NA	< 0.05	105%	50%	140%	83%	60%	130%	94%	50%	140%
o-Xylene	8852166		< 0.05	< 0.05	NA	< 0.05	90%	50%	140%	80%	60%	130%	90%	50%	140%
1,3-Dichlorobenzene	8852166		< 0.05	< 0.05	NA	< 0.05	91%	50%	140%	73%	60%	130%	85%	50%	140%
1,4-Dichlorobenzene	8852166		< 0.05	< 0.05	NA	< 0.05	96%	50%	140%	83%	60%	130%	94%	50%	140%
1,2-Dichlorobenzene	8852166		< 0.05	< 0.05	NA	< 0.05	93%	50%	140%	78%	60%	130%	88%	50%	140%
1,3-Dichloropropene	8852166		< 0.04	< 0.04	NA	< 0.04	73%	50%	140%	73%	60%	130%	92%	50%	140%
n-Hexane	8852166		< 0.05	< 0.05	NA	< 0.05	116%	50%	140%	114%	60%	130%	119%	50%	140%

Quality Assurance

 CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
 PROJECT: TPB 166090.6000
 SAMPLING SITE:

 AGAT WORK ORDER: 17T276361
 ATTENTION TO: Shami Malla
 SAMPLED BY: Javad Farhoodi

Trace Organics Analysis (Continued)

RPT Date:			DUPLICATE			Method Blank	REFERENCE MATERIAL			METHOD BLANK SPIKE			MATRIX SPIKE		
PARAMETER	Batch	Sample Id	Dup #1	Dup #2	RPD		Measured Value	Acceptable Limits		Recovery	Acceptable Limits		Recovery	Acceptable Limits	
								Lower	Upper		Lower	Upper		Lower	Upper

O. Reg. 153(511) - PHCs F1 - F4 (-BTEX) (Soil)

F1 (C6 to C10)	8849195		< 5	< 5	NA	< 5	92%	60%	130%	87%	85%	115%	74%	70%	130%
F2 (C10 to C16)	8848234		< 10	< 10	NA	< 10	99%	60%	130%	102%	80%	120%	102%	70%	130%
F3 (C16 to C34)	8848234		< 50	< 50	NA	< 50	106%	60%	130%	108%	80%	120%	109%	70%	130%
F4 (C34 to C50)	8848234		< 50	< 50	NA	< 50	96%	60%	130%	105%	80%	120%	104%	70%	130%

O. Reg. 558 - VOCs


Vinyl Chloride	8852232	8852232	< 0.030	< 0.030	NA	< 0.030	106%	60%	140%	92%	60%	140%	NA	60%	140%
1,1 Dichloroethene	8852232	8852232	< 0.020	< 0.020	NA	< 0.020	76%	70%	130%	72%	70%	130%	NA	60%	140%
Dichloromethane	8852232	8852232	< 0.030	< 0.030	NA	< 0.030	89%	70%	130%	104%	70%	130%	NA	60%	140%
Methyl Ethyl Ketone	8852232	8852232	< 0.090	< 0.090	NA	< 0.090	111%	70%	130%	116%	70%	130%	NA	60%	140%
Chloroform	8852232	8852232	< 0.020	< 0.020	NA	< 0.020	104%	70%	130%	97%	70%	130%	NA	60%	140%
1,2-Dichloroethane	8852232	8852232	< 0.020	< 0.020	NA	< 0.020	85%	70%	130%	93%	70%	130%	NA	60%	140%
Carbon Tetrachloride	8852232	8852232	< 0.020	< 0.020	NA	< 0.020	80%	70%	130%	75%	70%	130%	NA	60%	140%
Benzene	8852232	8852232	< 0.020	< 0.020	NA	< 0.020	72%	70%	130%	84%	70%	130%	NA	60%	140%
Trichloroethene	8852232	8852232	< 0.020	< 0.020	NA	< 0.020	74%	70%	130%	105%	70%	130%	NA	60%	140%
Tetrachloroethene	8852232	8852232	< 0.050	< 0.050	NA	< 0.050	88%	70%	130%	75%	70%	130%	NA	60%	140%
Chlorobenzene	8852232	8852232	< 0.010	< 0.010	NA	< 0.010	101%	70%	130%	99%	70%	130%	NA	60%	140%
1,2-Dichlorobenzene	8852232	8852232	< 0.010	< 0.010	NA	< 0.010	94%	70%	130%	97%	70%	130%	NA	60%	140%
1,4-Dichlorobenzene	8852232	8852232	< 0.010	< 0.010	NA	< 0.010	93%	70%	130%	94%	70%	130%	NA	60%	140%

O. Reg. 558 - Benzo(a) pyrene

Benzo(a)pyrene	8852232	8852232	< 0.001	< 0.001	NA	< 0.001	106%	70%	130%	102%	70%	130%	NA	70%	130%
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Comments: When the average of the sample and duplicate results is less than 5x the RDL, the Relative Percent Difference (RPD) will be indicated as Not Applicable (NA).

Certified By: _____





Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR
PROJECT: TPB 166090.6000
SAMPLING SITE:

AGAT WORK ORDER: 17T276361
ATTENTION TO: Shami Malla
SAMPLED BY: Javad Farhoodi

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Soil Analysis			
Antimony	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Arsenic	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Barium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Beryllium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Boron (Hot Water Soluble)	MET-93-6104	EPA SW 846 6010C; MSA, Part 3, Ch.21	ICP/OES
Cadmium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Cobalt	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Copper	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Lead	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Molybdenum	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Nickel	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Selenium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Silver	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Thallium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Uranium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Vanadium	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Zinc	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Chromium VI	INOR-93-6029	SM 3500 B; MSA Part 3, Ch. 25	SPECTROPHOTOMETER
Cyanide	INOR-93-6052	MOE CN-3015 & E 3009 A; SM 4500 CN	TECHNICON AUTO ANALYZER
Mercury	MET-93-6103	EPA SW-846 3050B & 6020A	ICP-MS
Electrical Conductivity	INOR-93-6036	McKeague 4.12, SM 2510 B	EC METER
Sodium Adsorption Ratio	INOR-93-6007	McKeague 4.12 & 3.26 & EPA SW-846 6010B	ICP/OES
pH, 2:1 CaCl2 Extraction	INOR-93-6031	MSA part 3 & SM 4500-H+ B	PH METER
Arsenic Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Barium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Boron Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Cadmium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Chromium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Lead Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Mercury Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Selenium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Silver Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Uranium Leachate	MET-93-6103	EPA SW-846 1311 & 3010A & 6020A	ICP-MS
Fluoride Leachate	INOR-93-6018	EPA SW-846-1311 & SM4500-F- C	ION SELECTIVE ELECTRODE
Cyanide Leachate	INOR-93-6052	EPA SW-846-1311 & MOE 3015 & SM 4500 CN- I	TECHNICON AUTO ANALYZER
(Nitrate + Nitrite) as N Leachate	INOR-93-6053	EPA SW 846-1311 & SM 4500 - NO3- I	LACHAT FIA

Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

ATTENTION TO: Shami Malla

SAMPLING SITE:

SAMPLED BY: Javad Farhoodi

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Trace Organics Analysis			
F1 (C6 to C10)	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P & T GC / FID
F1 (C6 to C10) minus BTEX	VOL-91-5009	CCME Tier 1 Method, SW846 5035	P & T GC / FID
F2 (C10 to C16)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F3 (C16 to C34)	VOL-91-5009	CCME Tier 1 Method	GC / FID
F4 (C34 to C50)	VOL-91-5009	CCME Tier 1 Method	GC / FID
Gravimetric Heavy Hydrocarbons	VOL-91-5009	CCME Tier 1 Method	Balance
Moisture Content	VOL-91-5009	CCME Tier 1 Method, SW846 5035,8015	BALANCE
Terphenyl	VOL-91-5009	CCME Tier 1 Method	GC/FID
Dichlorodifluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Vinyl Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromomethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichlorofluoromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Acetone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methylene Chloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trans- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl tert-butyl Ether	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Cis- 1,2-Dichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chloroform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,1-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Benzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichloropropane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Trichloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromodichloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Methyl Isobutyl Ketone	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,2-Trichloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Toluene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Dibromochloromethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylene Dibromide	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Tetrachloroethylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,1,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Ethylbenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
m & p-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Bromoform	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Styrene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,1,2,2-Tetrachloroethane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
o-Xylene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,3-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Xylene Mixture	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
1,3-Dichloropropene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
n-Hexane	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS

Method Summary

CLIENT NAME: AMEC FOSTER WHEELER ENVIRO&INFRASTR

AGAT WORK ORDER: 17T276361

PROJECT: TPB 166090.6000

ATTENTION TO: Shami Malla

SAMPLING SITE:

SAMPLED BY: Javad Farhoodi

PARAMETER	AGAT S.O.P	LITERATURE REFERENCE	ANALYTICAL TECHNIQUE
Toluene-d8	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
4-Bromofluorobenzene	VOL-91-5002	EPA SW-846 5035 & 8260	(P&T)GC/MS
Benzo(a)pyrene	ORG-91-5114	EPA SW846 3540 & 8270	GC/MS
Vinyl Chloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,1 Dichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Dichloromethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Methyl Ethyl Ketone	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chloroform	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichloroethane	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Carbon Tetrachloride	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Benzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Trichloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Tetrachloroethene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Chlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,2-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
1,4-Dichlorobenzene	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS
Toluene-d8	VOL-91-5001	EPA SW-846 5230B & 8260	(P&T)GC/MS



1 lg blk

Chain of Custody Record

If this is a Drinking Water sample, please use Drinking Water Chain of Custody Form (potable water intended for human consumption)

Report Information:

Company: Amec Foster Wheeler
Contact: Shami Malla / Huda Seddik
Address: 50 vogell rd, Richmond Hill
ON,
Phone: 416 735 1733 Fax: _____
Reports to be sent to:
1. Email: shami.malla@amecfw.com
2. Email: Huda.Seddik@amecfw.com

Project Information:

Project: TPB 166090.6000
Site Location: _____
Sampled By: Javad Farhadi
AGAT Quote #: _____ PO: _____
Please note: If quotation number is not provided, client will be billed full price for analysis.

Invoice Information:

Bill To Same: Yes No
Company: Amec Foster Wheeler
Contact: Huda Seddik
Address: _____
Email: huda.seddik@amecfw.com

Regulatory Requirements:

No Regulatory Requirement
(Please check all applicable boxes)
 Regulation 153/04
Table _____ Indicate One
 Ind/Com
 Res/Park
 Agriculture
Soil Texture (Check One)
 Coarse
 Fine
 Sewer Use
 Sanitary
 Storm
Region _____ Indicate One
 Regulation 558
 CCME
 Prov. Water Quality Objectives (PWQO)
 Other
_____ Indicate One

Is this submission for a Record of Site Condition?

Yes No

Report Guideline on Certificate of Analysis

Yes No

Sample Matrix Legend

- B Biota
- GW Ground Water
- O Oil
- P Paint
- S Soil
- SD Sediment
- SW Surface Water

Sample Identification	Date Sampled	Time Sampled	# of Containers	Sample Matrix	Comments/ Special Instructions	(Check Applicable)															ON HOLD - Do not Test						
						Metals and Inorganics	Metal Scan	Hydride Forming Metals	Client Custom Metals	ORP: <input type="checkbox"/> B-HMS <input type="checkbox"/> <input type="checkbox"/> CN <input type="checkbox"/> Cr <input type="checkbox"/> SEC <input type="checkbox"/> FOC <input type="checkbox"/> NO ₃ /NO ₂ <input type="checkbox"/> Total N <input type="checkbox"/> Hg <input type="checkbox"/> pH <input type="checkbox"/> SAR	Nutrients: <input type="checkbox"/> TP <input type="checkbox"/> NH ₃ <input type="checkbox"/> TKN <input type="checkbox"/> NO ₃ <input type="checkbox"/> NO ₂	Volatiles: <input type="checkbox"/> VOC <input type="checkbox"/> BTEX <input type="checkbox"/> THM	CCME Fractions 1 to 4	ABNS	PAHS	Chlorophenols	PCBs	Organochlorine Pesticides	TCLP Metals/Inorganics	Sewer Use		TCLP VOC	BaP	PhC			
BH4, AS1			1		1x250	✓																					
BH6, AS2+AS3			3		2x250, 1x120																						
BH8, AS1			3		2x40, 1x120																						
BH12, AS1			1		1x250	✓																					
BH18, AS1			1		1x250	✓																					
BH22, AS1+AS2			3		2x40, 1x120																						
BH24, AS1			1		1x250	✓																					
BH28, AS1			1		1x250	✓																					
BH30, AS1			1		1x250	✓																					
BH34, AS1			1		1x250	✓																					

Samples Relinquished By (Print Name and Sign): Shami malla	Date: 24/06/2017	Time:	Samples Received By (Print Name and Sign): Shamim	Date: Oct 25/17	Time: 10:30am	Page <u>1</u> of <u>1</u>
Samples Relinquished By (Print Name and Sign):	Date:	Time:	Samples Received By (Print Name and Sign):	Date:	Time:	No:

**Table 3.2 - Borehole Soil Chemical Analysis
Metals & Inorganic Parameters**

Sample Location					Borehole 4	Borehole 12	Borehole 18	Borehole 24	Borehole 28	Borehole 30	Borehole 34	Borehole 36	Borehole 46
Sample ID					BH4, AS1	BH12, AS1	BH18, AS1	BH24, AS1	BH28, AS1	BH30, AS1	BH34, AS1	BH36 AS1	BH46 AS1
Soil Type					Topsoil	Silty Sand and Gravel	Silty Sand	Topsoil	Silty Sand and Gravel	Silty Sand and Gravel	Silty Sand with Clay	Silty Sand with Clay	Topsoil
Depth (metres below ground level)					0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2	0.0 - 0.2
Field Vapour Reading (COV/TOV)					0/2	0/1	0/2	0/0	0/0	0/1	0/0	0/0	0/1
Sampling Date					10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/23/2017	10/20/2017	10/20/2017
Laboratory ID					8852230	8852289	8852292	8852298	8852302	8852303	8852304	8845488	8845489
Certificate of Analysis No.					17T276361	17T276361	17T276361	17T276361	17T276361	17T276361	17T276361	17T275410	17T275410
	Unit	RDL	Table 1 ^A	Table 3 ^B									
Antimony	µg/g	0.8	1.3	7.5	<	<	<	<	<	<	<	<	<
Arsenic	µg/g	1	18	18	3	3	3	3	3	3	3	4	5
Barium	µg/g	2	220	390	40	30	30	31	30	29	37	70	77
Beryllium	µg/g	0.5	2.5	(5) 4	<	<	<	<	<	<	<	0.6	0.6
Boron	µg/g	5	36	120	<	<	<	<	<	<	5	<	<
Boron (Hot Water Soluble)	µg/g	0.10	NA	1.5	0.27	0.23	0.37	0.16	0.2	0.26	0.36	0.24	0.34
Cadmium	µg/g	0.5	1.2	1.2	<	<	<	<	<	<	<	<	<
Chromium	µg/g	2	70	160	17	22	41	19	22	26	42	18	20
Cobalt	µg/g	0.5	21	22	4.8	4.1	4.1	4.9	4.4	4.6	6.5	7.8	9.8
Copper	µg/g	1	92	(180) 40	27	26	32	32	31	28	33	18	23
Lead	µg/g	1	120	120	24	21	25	16	36	24	37	13	15
Molybdenum	µg/g	0.5	2	6.9	0.5	1.7	1.6	0.9	0.7	0.9	1.4	<	<
Nickel	µg/g	1	82	(130) 100	10	8	12	10	11	13	13	16	18
Selenium	µg/g	0.4	1.5	2.4	<	<	<	<	<	<	<	0.5	0.6
Silver	µg/g	0.2	0.5	(25) 20	<	<	<	<	<	<	<	<	<
Thallium	µg/g	0.4	1	1	<	<	<	<	<	<	<	<	<
Uranium	µg/g	0.5	2.5	23	<	<	<	<	<	<	<	0.7	0.8
Vanadium	µg/g	1	86	86	18	15	16	17	19	20	20	28	30
Zinc	µg/g	5	290	340	63	88	142	75	94	117	155	58	70
Chromium VI	µg/g	0.2	0.66	(10) 8	<	<	<	<	<	<	<	<	<
Cyanide	µg/g	0.040	0.051	0.051	<	<	<	<	<	<	<	<	<
Mercury	µg/g	0.10	0.27	(1.8) 0.27	<	<	<	<	<	<	<	<	<
Electrical Conductivity	mS/cm	0.005	0.57	0.7	0.535	0.125	0.190	0.168	0.169	0.238	0.302	0.133	0.140
Sodium Adsorption Ratio	NA	NA	2.4	5	7.88	0.173	0.193	0.402	5.14	6.22	7.47	0.141	0.157
pH, 2:1 CaCl2 Extraction	pH Units	NA	NA	See Note*	7.58	7.44	7.33	7.62	8.02	7.90	7.70	6.83	6.12

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Residential / Parkland / Institutional Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). *** As per Ontario Regulation 153/04, in order to apply the generic Site Condition Standards, pH for surface soil (<1.5 metres) should be between 5 and 9 and for subsurface soil (>1.5 metres), pH should be between 5 and 11. "µg/g" means micrograms per gram. "mS/cm" means milli-Siemens per centimetre. "NA" means not applicable/available.

**Table 3.2 - Borehole Soil Chemical Analysis
Metals & Inorganic Parameters**

Sample Location					Borehole 54	Borehole 62	Borehole 68	Borehole 77	Borehole 86	Borehole 96	Borehole 103
Sample ID					BH 54, AS1	BH 62, AS1	BH 68, AS1	BH 77, AS1	BH86 AS1	BH96 AS1	BH103 AS1
Soil Type					Silty Clay to Silty Sand	Topsoil	Clayey Silt	Topsoil	Topsoil	Topsoil	Topsoil
Depth (metres below ground level)					0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.2
Field Vapour Reading (COV/TOV)					0/0	0/0	0/1	0/0	0/1	0/0	0/0
Sampling Date					10/18/2017	10/18/2017	10/18/2017	10/18/2017	10/20/2017	10/20/2017	10/20/2017
Laboratory ID					8833660	8833663	8833664	8833665	8845506	8845507	8845495
Certificate of Analysis No.					171273733	171273733	171273733	171273733	171275401	171275401	171275401
	Unit	RDL	Table 1 ^A	Table 3 ^B							
Antimony	µg/g	0.8	1.3	(50) 40	<	<	<	<	<	<	<
Arsenic	µg/g	1	18	18	5	5	4	4	4	4	5
Barium	µg/g	2	220	670	58	103	67	71	51	62	92
Beryllium	µg/g	0.5	2.5	(10) 8	0.7	0.8	0.7	0.7	0.6	0.6	0.7
Boron	µg/g	5	36	120	<	7	<	<	<	<	<
Boron (Hot Water Soluble)	µg/g	0.10	NA	2	0.25	0.32	0.42	0.37	0.28	0.52	0.77
Cadmium	µg/g	0.5	1.2	1.9	<	<	<	<	<	<	<
Chromium	µg/g	2	70	160	20	29	20	20	17	19	23
Cobalt	µg/g	0.5	21	(100) 80	9.7	14.4	8.4	9.1	8.2	8.7	12.3
Copper	µg/g	1	92	(300) 230	21	23	17	16	17	18	19
Lead	µg/g	1	120	120	13	11	13	12	11	16	15
Molybdenum	µg/g	0.5	2	40	<	<	<	<	<	<	0.6
Nickel	µg/g	1	82	(340) 270	18	31	17	17	16	16	18
Selenium	µg/g	0.4	1.5	5.5	<	<	<	<	<	0.4	0.5
Silver	µg/g	0.2	0.5	(50) 40	<	<	<	<	<	<	<
Thallium	µg/g	0.4	1	3.3	<	<	<	<	<	<	<
Uranium	µg/g	0.5	2.5	33	0.6	0.7	0.9	0.7	<	0.6	0.7
Vanadium	µg/g	1	86	86	32	39	30	28	26	27	33
Zinc	µg/g	5	290	340	60	71	59	65	52	74	83
Chromium VI	µg/g	0.2	0.66	(10) 8	<	<	<	<	<	<	<
Cyanide	µg/g	0.040	0.051	0.051	<	<	<	<	<	<	<
Mercury	µg/g	0.10	0.27	(20) 3.9	<	<	<	<	<	<	<
Electrical Conductivity	mS/cm	0.005	0.57	1.4	0.139	0.312	0.116	0.096	0.068	0.200	0.182
Sodium Adsorption Ratio	NA	NA	2.4	12	0.118	0.838	0.163	0.154	0.114	0.208	0.316
pH, 2:1 CaCl ₂ Extraction	pH Units	NA	NA	See Note*	6.69	7.30	6.68	5.64	5.43	7.12	6.49

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Residential / Parkland / Institutional Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "*" As per Ontario Regulation 153/04, in order to apply the generic Site Condition Standards, pH for surface soil (<1.5 metres) should be between 5 and 9 and for subsurface soil (>1.5 metres), pH should be between 5 and 11. "µg/g" means micrograms per gram. "mS/cm" means milli-Siemens per centimetre. "NA" means not applicable/available.

**Table 3.3 - Borehole Soil Chemical Analysis
Petroleum Parameters**

Sample Location					Borehole 8	Borehole 22
Sample ID					BH8, AS1	BH22, AS1
Soil Type					Silty Sand and Gravel	Sand and Gravel
Depth (metres below ground level)					0.0 - 0.2	0.2 - 0.5
Field Vapour Reading (COV/TOV)					0/5	0/0
Sampling Date					10/23/2017	10/23/2017
Laboratory ID					8852256	8852295
Certificate of Analysis No.					17T276361	17T276361
	Unit	RDL	Table 1 ^A	Table 3 ^B		
Benzene	µg/g	0.02	0.02	(0.17) 0.21	<	<
Toluene	µg/g	0.02	0.2	(6) 2.3	<	<
Ethylbenzene	µg/g	0.05	0.05	(15) 2	<	<
Xylene Mixture	µg/g	0.05	0.05	(25) 3.1	<	<
F1 (C6 to C10) minus BTEX	µg/g	5	25	(65) 55	<	<
F2 (C10 to C16)	µg/g	10	10	(150) 98	<	<
F3 (C16 to C34)	µg/g	50	240	(1,300) 300	210	89
F4 (C34 to C50)	µg/g	50	120	(5,600) 2,800	200	71
Gravimetric Heavy Hydrocarbons	µg/g	50	120	(5,600) 2,800	NA	NA

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Residential / Parkland / Institutional Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "µg/g" means micrograms per gram. C10 notation means 10 (or corresponding number) carbon chain. "NA" means not applicable/available.

**Table 3.4 - Borehole Soil Chemical Analysis
Volatile Organic Compounds**



Sample Location					Borehole 8	Borehole 22
Sample ID					BH8, AS1	BH22, AS1
Soil Type					Silty Sand and Gravel	Sand and Gravel
Depth (metres below ground level)					0.0 - 0.2	0.2 - 0.5
Field Vapour Reading (COV/TOV)					0/5	0/0
Sampling Date					10/23/2017	10/23/2017
Laboratory ID					8852256	8852295
Certificate of Analysis No.					17T276361	17T276361
	Unit	RDL	Table 1 ^A	Table 3 ^B		
Dichlorodifluoromethane	µg/g	0.05	0.05	(25) 16	<	<
Vinyl Chloride	µg/g	0.02	0.02	(0.022) 0.02	<	<
Bromomethane	µg/g	0.05	0.05	0.05	<	<
Trichlorofluoromethane	µg/g	0.05	0.25	(5.8) 4	<	<
Acetone	µg/g	0.50	0.5	(28) 16	<	<
1,1-Dichloroethylene	µg/g	0.05	0.05	0.05	<	<
Methylene Chloride	µg/g	0.05	0.05	(0.96) 0.1	<	<
Trans- 1,2-Dichloroethylene	µg/g	0.05	0.05	(0.75) 0.084	<	<
Methyl tert-butyl Ether	µg/g	0.05	0.05	(1.4) 0.75	<	<
1,1-Dichloroethane	µg/g	0.02	0.05	(11) 3.5	<	<
Methyl Ethyl Ketone	µg/g	0.50	0.5	(44) 16	<	<
Cis- 1,2-Dichloroethylene	µg/g	0.02	0.05	(30) 3.4	<	<
Chloroform	µg/g	0.04	0.05	(0.18) 0.05	<	<
1,2-Dichloroethane	µg/g	0.03	0.05	0.05	<	<
1,1,1-Trichloroethane	µg/g	0.05	0.05	(3.4) 0.38	<	<
Carbon Tetrachloride	µg/g	0.05	0.05	(0.12) 0.05	<	<
1,2-Dichloropropane	µg/g	0.03	0.05	(0.085) 0.05	<	<
Trichloroethylene	µg/g	0.03	0.05	(0.52) 0.061	<	<
Bromodichloromethane	µg/g	0.05	0.05	13	<	<
Methyl Isobutyl Ketone	µg/g	0.50	0.5	(4.3) 1.7	<	<
1,1,2-Trichloroethane	µg/g	0.04	0.05	(0.05)	<	<
Dibromochloromethane	µg/g	0.05	0.05	9.4	<	<
Ethylene Dibromide	µg/g	0.04	0.05	0.05	<	<
Tetrachloroethylene	µg/g	0.05	0.05	(2.3) 0.28	<	<
1,1,1,2-Tetrachloroethane	µg/g	0.04	0.05	(0.05) 0.058	<	<
Chlorobenzene	µg/g	0.05	0.05	(2.7) 2.4	<	<
Bromoform	µg/g	0.05	0.05	(0.26) 0.27	<	<
Styrene	µg/g	0.05	0.05	(2.2) 0.7	<	<
1,1,2,2-Tetrachloroethane	µg/g	0.05	0.05	0.05	<	<
1,3-Dichlorobenzene	µg/g	0.05	0.05	(6) 4.8	<	<
1,4-Dichlorobenzene	µg/g	0.05	0.05	(0.097) 0.083	<	<
1,2-Dichlorobenzene	µg/g	0.05	0.05	(4.3) 3.4	<	<
1,3-Dichloropropene	µg/g	0.04	0.05	(0.083) 0.05	<	<
n-Hexane	µg/g	0.05	0.05	(34) 2.8	<	<

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Industrial / Commercial / Community Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "µg/g" means micrograms per gram.

**Table 3.5 - Borehole Soil Chemical Analysis
OC Pesticides**

Sample Location	Borehole 36	Borehole 46	Borehole 54	Borehole 62	Borehole 68	Borehole 77	Borehole 86	Borehole 96	Borehole 103
Sample ID	BH36 AS1	BH46 AS1	BH 54, AS1	BH62, AS1	BH 68, AS1	BH 77, AS1	BH86 AS1	BH96 AS1	BH103 AS1
Soil Type	Silty Sand with Clay	Topsoil	Silty Clay to Silty Sand	Topsoil	Clayey Silt	Topsoil	Topsoil	Topsoil	Topsoil
Depth (metres below ground level)	0.0 - 0.2	0.0 - 0.2	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.3	0.0 - 0.2
Field Vapour Reading (COV/TOV)	0/0	0/1	0/0	0/0	0/1	0/0	0/1	0/0	0/0
Sampling Date	10/20/2017	10/20/2017	10/18/2017	10/18/2017	10/18/2017	10/18/2017	10/20/2017	10/20/2017	10/20/2017
Laboratory ID	8845488	8845489	8833660	8833663	8833664	8833665	8845506	88445507	8845495
Certificate of Analysis No.	17T275410	17T275410	17T273733	17T273733	17T273733	17T273733	17T275401	17T275401	17T276401
	Unit	RDL	Table 1 ^A	Table 3 ^B					
Hexachloroethane	µg/g	0.01	0.01	(0.071) 0.089	<	<	<	<	<
Gamma-Hexachlorocyclohexane	µg/g	0.005	0.01	(0.063) 0.056	<	<	<	<	<
Heptachlor	µg/g	0.005	0.05	0.15	<	<	<	<	<
Aldrin	µg/g	0.005	0.05	0.05	<	<	<	<	<
Heptachlor Epoxide	µg/g	0.005	0.05	0.05	<	<	<	<	<
Endosulfan	µg/g	0.005	0.04	0.04	<	<	<	<	<
Chlordane	µg/g	0.007	0.05	0.05	<	<	<	<	<
DDE	µg/g	0.007	0.05	(0.33) 0.26	<	<	<	<	<
DDD	µg/g	0.007	0.05	3.3	<	<	<	<	<
DDT	µg/g	0.007	1.4	1.4	<	<	<	<	<
Dieldrin	µg/g	0.005	0.05	0.05	<	<	<	<	<
Endrin	µg/g	0.005	0.04	0.04	<	<	<	<	<
Methoxychlor	µg/g	0.005	0.05	0.13	<	<	<	<	<
Hexachlorobenzene	µg/g	0.005	0.01	0.52	<	<	<	<	<
Hexachlorobutadiene	µg/g	0.01	0.01	(0.014) 0.012	<	<	<	<	<

Notes: (A) "Ontario Regulation 153/04-Records of Site Condition" Table 1 Full Depth Background Site Condition Standards for Residential / Parkland / Institutional / Industrial / Commercial / Community Property Use. Table 1 exceedances if any, indicated by **BOLD**. (B) "Ontario Regulation 153/04-Records of Site Condition" Table 3 Full Depth Generic Site Condition Standards in a Non-Potable Ground Water Condition for Industrial / Commercial / Community Property Use. () Standards in brackets apply to medium and fine textured soils. Table 3 exceedances if any, indicated by a **SHADED** box. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "COV" means combustible organic vapour. "TOV" means total organic vapour. COV and TOV readings reported in parts per million (ppm). "µg/g" means micrograms per gram.

**Table 3.6 - Ontario Regulation 347
Volatile Organic Compounds, Benzo(a)Pyrene, Metals & Inorganics and
OC Pesticides & PCB Parameters**



Sample Location Sample ID	Borehole 6 BH6, AS2 + AS3	Borehole 54 BH54, AS2+AS3	Borehole 95 BH95, AS2+AS3
Sampling Date	10/23/2017	10/18/2017	10/20/2017
Laboratory ID	8852232	8834648	8847372
Certificate of Analysis No.	17T276361	17T273735	17T275400
	Units	RDL	Schedule 4 ^A
Volatile Organic Compounds			
Vinyl Chloride	mg/L	0.030	0.2
1,1 Dichloroethene	mg/L	0.020	1.4
Dichloromethane	mg/L	0.030	5.0
Methyl Ethyl Ketone	mg/L	0.090	200
Chloroform	mg/L	0.020	10.0
1,2-Dichloroethane	mg/L	0.020	0.5
Carbon Tetrachloride	mg/L	0.020	0.5
Benzene	mg/L	0.020	0.5
Trichloroethene	mg/L	0.020	5.0
Tetrachloroethene	mg/L	0.050	3.0
Chlorobenzene	mg/L	0.010	8.0
1,2-Dichlorobenzene	mg/L	0.010	20.0
1,4-Dichlorobenzene	mg/L	0.010	0.5
Benzo(a)Pyrene			
Benzo(a)Pyrene	mg/L	0.001	0.001
Metals & Inorganics			
Arsenic Leachate	mg/L	0.010	2.5
Barium Leachate	mg/L	0.100	100
Boron Leachate	mg/L	0.050	500
Cadmium Leachate	mg/L	0.010	0.5
Chromium Leachate	mg/L	0.010	5.0
Lead Leachate	mg/L	0.010	5.0
Mercury Leachate	mg/L	0.01	0.1
Selenium Leachate	mg/L	0.010	1.0
Silver Leachate	mg/L	0.010	5.0
Uranium Leachate	mg/L	0.050	10.0
Fluoride Leachate	mg/L	0.05	150
Cyanide Leachate	mg/L	0.05	20.0
(Nitrate + Nitrite) as N Leachate	mg/L	0.70	1,000
OC Pesticides & PCBs			
Heptachlor + Heptachlor Epoxide	mg/L	0.0003	0.3
Aldrin + Dieldrin	mg/L	0.0007	0.07
DDT + Metabolites	mg/L	0.003	3.0
Methoxychlor	mg/L	0.09	90.0
Chlordane (Total)	mg/L	0.0007	0.7
Aldrin	mg/L	0.0002	N/A
alpha - chlordane	mg/L	0.0001	N/A
gamma-Chlordane	mg/L	0.0002	N/A
Oxychlordane	mg/L	0.0004	N/A
pp'-DDE	mg/L	0.0005	N/A
pp'-DDD	mg/L	0.0015	N/A
op'-DDT	mg/L	0.0015	3.0
pp'-DDT	mg/L	0.0005	N/A
Dieldrin	mg/L	0.0005	N/A
Heptachlor	mg/L	0.0001	N/A
Heptachlor Epoxide	mg/L	0.0002	N/A
Lindane	mg/L	0.0004	0.4
PCB's	mg/L	0.0002	0.3
Endrin	mg/L	0.0004	0.02
Toxaphene	mg/L	0.0005	0.5

Notes: (A) Ontario Ministry of the Environment (MOE) "Registration Guidance Manual for Generators of Liquid Industrial and Hazardous Waste" (October 2000) Schedule 4 Leachate Quality Criteria, as amended by Ontario Regulation 558/00. Schedule 4 exceedances if any, indicated by **BOLD**. "RDL" means reportable detection limit. "<" indicates not detected above the reportable detection limit. "mg/L" means milligrams per litre.