APPENDIX F

Preliminary Geotechnical and Pavement Investigation Report

Project: 10001223 **April 27, 2015**

Leslie Green, M.A.Sc., P.Eng.
Manager, Transportation Projects

City of Mississauga – Transportation & Works Dept.
Transportation and Infrastructure Planning Division
201 City Centre Drive, Suite 800
Mississauga, ON L5B 2T4

Re: Letter of Reliance –Geotechnical and Pavement Investigation
Courtneypark Drive East, Mississauga, Ontario

SPL Consultants Limited (the "Consultant") has prepared this letter to allow the use of and reliance on the following report by the City of Mississauga, its successors and assigns:

> "*Preliminary Geotechnical and Pavement Investigation for Class EA and Preliminary Design, Courtneypark Drive East, Mississauga, Ontario"*; prepared for Stantec and dated January 28, 2015 under SPL Project No. 10001223

It should be noted that use of and reliance on the above-noted report is governed by the terms and conditions as presented in the report. In addition, the City of Mississauga recognizes and agrees to the following:

1. The information in the report relates only to the property described in the report and was presented in accordance with and subject to the scope of work of the assessment agreed upon by the Consultant and Stantec.
2. The information and conclusions provided in the report apply only to the subject property as it existed at the time of the Consultants site investigations. Should the site use or conditions change, the information and conclusions in the report may no longer apply.
3. The Consultant makes no representation regarding the marketability of this property or its suitability for any particular use, and none should be inferred based on the report.
4. The report is intended to be used in its entirety and no excerpts may be taken to be representative of the findings of the assessments.

We trust that the foregoing is satisfactory. Should you have any further questions, please contact our office.

Very truly yours,

SPL CONSULTANTS LIMITED

Dave Lewis, P.Eng.
President

WDL:sk

SPL Consultants Limited | ENGINEERING SOLUTIONS

PRELIMINARY GEOTECHNICAL AND PAVEMENT INVESTIGATION

FOR CLASS EA STUDY AND PRELIMINARY DESIGN

COURTNEYPARK DRIVE EAST, MISSISSAUGA, ONTARIO

Prepared For:

Stantec

SPL Project No.: 10001223

Report Date: April 27, 2015

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Figures **No.**

1. INTRODUCTION

SPL Consultants Limited (SPL) was retained by Stantec to undertake a preliminary geotechnical and pavement investigation for Class EA study and preliminary design of the potential improvements of Courtneypark Drive East, between Kennedy Road and Dixie Road, in the City of Mississauga, Ontario. The designs of the proposed improvements of the existing interchange of Hwy 410 and Courtneypark Drive East and ramps have been carried out by another consultant and are not part of the scope of the work of the current investigation.

The purpose of the preliminary geotechnical and pavement investigation was to obtain the subsurface conditions at the requested sixteen (16) borehole locations and from the findings in the boreholes provide preliminary geotechnical and pavement engineering recommendations for the proposed Class EA study and the preliminary design for the improvements of Courtneypark Drive East.

This report is provided on the basis of the terms of reference presented in our proposal P13.07.073 dated July 24, 2013 and on the assumption that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon.

This report deals with geotechnical issues only. A Phase I ESA has been carried out and will be reported under a separate cover.

The site investigation and recommendations follow generally accepted practice for geotechnical consultants in Ontario. This report has been prepared for Stantec. Third party use of this report without SPL consent is prohibited. The limitation conditions presented in this report form an integral part of the report and they must be considered in conjunction with this report.

2. FIELD AND LABORATORY WORK

Sixteen (16) boreholes were drilled at the subject site to depths ranging from 1.5 m to 6.7 m below the existing grade. The approximate borehole locations are shown on the Drawings 1 and 2. Boreholes BH1 to BH8 were drilled on the existing pavement of Courtneypark Drive East and three asphalt cores were taken at the selected borehole locations. Boreholes BH101 to BH108 were drilled at the proposed widening areas.

The boreholes were advanced using a truck mounted drill rig supplied by a drilling specialist subcontracted to SPL under the full time supervision of SPL technical personnel. Soil samples were retrieved at regular intervals of depth with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm in accordance with the Standard Penetration Test (SPT) method. Boreholes on the existing pavement (BH1 to BH8) were carried out using an auger sampling technique. Asphalt cores samples were obtained at the selected locations. It should be noted that the Boreholes BH4 to BH8 were carried out on the westbound lanes due to the existence of watermains under the eastbound lanes. The asphalt cores with a 100 mm nominal diameter, were obtained using a portable water cooled coring machine. The photographs of the asphalt cores are attached in Appendix A. The soil samples were logged in the field and returned to the SPL laboratory for detailed examination by the project engineer and for laboratory testing.

In addition to the visual examination of the samples in the laboratory, all soil samples were tested for moisture contents. Selected soil samples were subjected to grain size analysis testing and Atterberg tests. Test results are presented on Figures 1 to 10 as well as shown on the individual borehole logs. Laboratory testing for most part followed ASTM or CSA Standards or modifications of these standards that have become standard practice.

Water level observations were made during drilling in the open boreholes and at the completion of the drilling operations.

The borehole locations in the field were staked out by SPL. The approximate elevations at the as-drilled borehole locations were inferred from the topographic drawings provided by Stantec and should be considered to be approximate. The approximate borehole locations are plotted on the Drawings 1 and 2 based on the measurement of the site features and should be considered to be approximate.

3. SITE AND SUBSURFACE CONDITIONS

The section of the Courtneypark Drive East within the study area, between Kennedy Road to Dixie Road, is a 2.73 km long, servicing a partial interchange at Highway 410. Courtneypark Drive East is classified as a major arterial road. The existing Courtneypark Drive East within the project limits has a 4-lane cross section, with left-turn and right-turn lanes at some intersections. The section of the Courtneypark Drive East over the Highway 410 has a 5- lane cross section for the overpass structure including 2 through travel lanes in each direction and one exclusive westbound lane, allowing access to Highway 410 southbound on-ramp.

Boreholes BH1 to BH8 were drilled on the existing pavement of Courtneypark Drive East to a depth of 1.5 m below the existing grade and three asphalt cores were taken in Boreholes BH1, BH3 and BH6. Boreholes BH101 to BH108 were drilled at the proposed widening areas to depths ranging from 6.6 m to 6.7 m below the existing grade. The approximate borehole locations are shown on the Drawings 1 and 2. Notes on sample descriptions and explanation of terms used in the record of borehole are presented on Enclosures Nos. 1A and 1B. The subsurface conditions encountered in the boreholes are presented on the individual borehole logs (Enclosure Nos.2 to 17). The following is a summarized account of the subsurface conditions encountered in the boreholes, followed by more detailed descriptions of the major soil strata and the groundwater conditions encountered in the boreholes drilled at the site.

3.1 SOIL CONDITIONS AND PAVEMENT STRUCTURE

3.1.1 Existing Pavement Structure

Boreholes were advanced through the existing pavement to obtain the information of the thickness of the pavement structure of Courtneypark Drive East. The asphalt thickness encountered in the boreholes ranged from 120 mm to 250 mm, with an average thickness of about 179 mm. The thickness of the asphalt core samples extracted from Borehole BH1, BH3 and BH6 ranged from 120 mm to 170 mm with an average of 147 mm. The thickness of the granular base and subbase ranged from 380 mm to 560 mm. The average granular base thickness was approximately 178 mm. The average granular subbase thickness was approximately 260 mm. It should be noted that the exact boundary of the granular subbase and the subgrade may not be accurate due to the sandy nature of the subgrade materials in some of the boreholes.

The results of four (4) grain size analyses are shown on the borehole logs and on Figures 1 to 4. They are also summarized in the following table:

BH No.	Sample No.	Grain Size Distribution			
		% Gravel	%Sand	%Silt	%Clay
BH2	AS1	33.2	54.1	12.7	
BH2	AS2	31.4	55.7	12.9	
BH6	AS1	43.5	47.5	9.0	
BH6	AS2	25.2	55.4	19.4	

The results of grain size distribution tests indicate that the granular base/subbase samples do not meet the gradation requirements for OPSS 1010 Granular A or OPSS Granular B Type I due to excessive sand/fines.

Topsoil

Topsoil with a thickness of 100 mm was encountered surficially in Boreholes BH101, BH103, BH105, BH107 and BH108, which are located on the boulevard of the road.

Concrete Sidewalk

Concrete with thicknesses ranging from 150 mm to 170 mm were encountered surficially in Boreholes BH102, BH104 and BH106, which are located on the concrete sidewalks.

Fill

Fill materials were encountered in all boreholes and extended to depths ranging from 0.4 m to 2.1 m below the existing grade. The fill materials generally consisted of cohesive clayey silt to silty clay materials and cohesionless sandy silt to silty sand and sand and gravel materials. The consistency of the cohesive fill was found to be firm as inferred from SPT 'N' values ranging from 6 to 8 blows per 0.3 m penetration. The cohesionless sandy fills were found to be loose to very dense as inferred from SPT 'N' values ranging from 6 per 300 mm penetration to 56 per 200 mm penetration. In-situ water contents measured in the fill samples ranged from 5 % to 28 %.

The result of one (1) grain size analysis is shown on the borehole log and on Figure 5. It is also summarized in the following table:

BH No.	Sample No.	Grain Size Distribution			
		% Gravel	%Sand	%Silt	%Clay
BH102	SS2	57.2	18	12.8	12.0

Silty Clay Till to Clayey Silt Till

Silty clay till to clayey silt till deposits were encountered in Boreholes BH101 to BH108 and extended to depths ranging from 5.6 m to 6.7 m below the existing grade. Boreholes BH101 to BH107 were terminated in these deposits. SPT tests carried out within the cohesive till gave 'N' values ranging from 4 blows per 0.3 m penetration to 86 per 0.28 m penetration, indicating a soft to hard consistency. Natural water contents measured in cohesive till samples ranged from 5 % to 23 %.

The results of three (3) grain size analyses are shown on the borehole logs and on Figures 6 to 8. They are also summarized in the following table:

BH No.	Sample No.	Grain Size Distribution			
		% Gravel	%Sand	%Silt	%Clay
BH105	SS2	9.4	23.3	40.8	26.5
BH108	SS5	9.4	22.4	36.6	31.6
BH101	SS4	7.5	27.5	38.2	26.8

Silty Clay

Silty clay deposit was encountered in Borehole BH108 and extended to a depth of 6.6 m below the existing grade. Silty clay deposit was found to have a firm consistency with measured SPT 'N' value of 7 blows per 300 mm penetration. The natural water content of the silty sample was about 13 %.

The result of one (1) grain size analysis is shown on the borehole log and on Figure 9. It is also summarized in the following table:

BH No.	Sample No.	Grain Size Distribution			
		% Gravel	%Sand	%Silt	%Clay
BH108	SS7	1.6	12.6	39.3	46.5

Atterberg limits test was carried out on one (1) selected sample. The result of which is presented on Figure 10 as well as shown on the borehole log and is summarized in the following table:

Plasticity Indices

BH No.	Sample No.	Atterberg Limits		
		Liquid Limit (W_L)	Plastic Limit (W_P)	Plasticity Index (PI)
BH108	SS7	31	16	15

The test suggested a clay of low to medium plasticity [CL] in the Unified Soil Classification System. Natural water content of the sample was slightly below the plastic limit of the same sample.

3.2 GROUNDWATER CONDITIONS

All the boreholes were open and dry except for Boreholes BH1, BH103 and BH104. Water was encountered at a depth of 3.0 m below the existing grade in Borehole BH103 and at a depth of 1.5 m below the existing grade in Boreholes BH1 and BH104 upon completion of drilling.

It should be noted that the groundwater levels can vary and are subject to seasonal fluctuations in response to weather events.

4. DISCUSSION AND RECOMMENDATIONS

In this section of the report, the soil and groundwater conditions are interpreted as relevant to the preliminary design of the proposed road improvements. Comments relating to construction are intended for the guidance of the design engineer to establish constructability.

The construction methods described in this report must not be considered as being specifications or recommendations to the contractors, or as being the only suitable methods. Prospective contractors should evaluate all of the factual information, obtain additional subsurface information as they might deem necessary and should select their construction methods, sequencing and equipment based on their own experience in similar ground conditions. The readers of this report are also reminded that the conditions are known only at the borehole locations and conditions may vary significantly in-between.

The following preliminary geotechnical recommendations are provided for the preliminary design purposes. A detailed geotechnical investigation should be carried out during the detailed design stage.

4.1 *PAVEMENT DESIGN*

4.1.1 Existing Pavement Conditions

The pavement conditions of the existing Courtneypark Drive East between Kennedy Road and Dixie Road are generally in fair condition with slight to moderate distresses in the forms of edge cracking, longitudinal and transverse cracking, center line cracking, map cracking, alligator cracking, loss of aggregates, rutting and pavement distortions.

Typical photographs of the pavement conditions are shown in Appendix B.

4.1.2 Pavement Design

It is understood that according to City of Mississauga's Official Plan (OP), Courtneypark Drive East is classified as the only municipal arterial road running east/west in the northern part of the City, which provides connections to Mavis Road, Hurontario Street and Dixie Road. The section of Courtneypark Drive East between Kennedy Road and Tomken Road will be improved and put in operation in 2021 and the section between Tomken Road and Dixie Road will be improved and put in operation in 2031. The design life of the proposed pavement is 20 years.

The updated traffic data of Courtneypark Drive East were provided by Stantec on January 15, 2015. It is understood that the 2021 AADT and 2031 AADT volumes used for the pavement design were estimated from the traffic volume forecasts. Heavy (truck) vehicle percentages were referenced from the 2013 traffic data based on the assumption that the percentage of heavy vehicles in 2021 and 2031 would remain the same as the percentage in 2013. The anticipated traffic growth rates after 2021 and 2031 were referenced from the growth rates of the previous traffic data. Traffic volumes as provided by Stantec are presented in the following tables:

2021 AADT Volumes- Full Interchange Scenario

Road	Direction	Section	2021 AADT	% Heavy Vehicles (truck %)	Annual Growth Rate
Courtneypark Drive East	EB	West of Kennedy Road	8546	16%	1.0%
		Between Kennedy Road-Hwy 410 West Terminal	11239	19%	
		Between Hwy 410 West Terminal- Hwy 410 East Terminal	9421	21%	
		Between Hwy 410 East Terminal-Tomken Road	7947	25%	
		Between Tomken Road- Ordan Drive/Shawson Drive	5625	21%	
		Between Ordan Drive/Shawson Drive-Vipond Drive	5292	16%	
		Between Vipond Drive-Ordan Drive	6418	14%	
		Between Ordan Drive-Dixie Road	8019	17%	
		East of Dixie Road	4267	18%	
	WB	East of Dixie Road	14332	30%	
		Between Dixie Road- Ordan Drive	14315	17%	
		Between Ordan Drive-Vipond Drive	15113	20%	
		Between Vipond Drive-Ordan Drive/Shawson Drive	16886	23%	

		Between Ordan Drive/Shawson Drive-Tomken Road	19419	29%	
		Between Token Road- Hwy 410 East Terminal	29134	31%	
		Between Hwy 410 East Terminal-Hwy 410 West Terminal	25177	19%	
		Between Hwy 410 West Terminal- Kennedy Road	21021	14%	
		West of Kennedy Road	16637	13%	
	Two-Way	West of Kennedy Road	25183	-	
		Between Kennedy Road-Hwy 410 West Terminal	32260	-	
		Between Hwy 410 west Terminal- Hwy 410 East Terminal	34599	-	
		Between Hwy 410 East Terminal-Tomken Road	37081	-	
		Between Tomken Road- Ordan Drive/Shawson Drive	25044	-	
		Between Ordan Drive/Shawson Drive-Vipond Drive	22578	-	
		Between Vipond Drive-Ordan Drive	21531	-	
		Between Ordan Drive-Dixie Road	22334	-	
		East of Dixie Road	18599	-	
Kennedy Road	NB	North of Courtneypark Drive	13910	12%	0.5%
	SB		9041	9%	
	Two-Way		22951	-	
	NB	South of Courtneypark Drive	14377	14%	
	SB		11003	13%	
	Two-Way		25381	-	
Dixie Road	NB	North of Courtneypark Drive	29346	23%	0.5%
	SB		12083	16%	
	Two-Way		41429	-	
	NB	South of Courtneypark Drive	25297	19%	
	SB		11772	16%	
	Two-Way		37069	-	

2031 AADT Volumes- Full Interchange Scenario

Road	Direction	Section	2031 AADT	% Heavy Vehicles	Annual Growth
Courtneypark Drive East	EB	West of Kennedy Road	9288	16%	1.0%
		Between Kennedy Road-HWY 410 West Terminal	12436	19%	
		Between Hwy 410 West Terminal- Hwy 410 East Terminal	10402	21%	
		Between Hwy 410 East Terminal-Tomken Road	8751	25%	
		Between Tomken Road- Ordan Drive/Shawson Drive	6157	21%	
		Between Ordan Drive/Shawson Drive-Vipond Drive	6257	16%	
		Between Vipond Drive-Ordan Drive	7055	14%	
		Between Ordan Drive-Dixie Road	8662	17%	
		East of Dixie Road	4600	18%	
	WB	East of Dixie Road	15440	30%	
		Between Dixie Road- Ordan Drive	15706	17%	
		Between Ordan Drive-Vipond Drive	16665	20%	
		Between Vipond Drive-Ordan Drive/Shawson Drive	18593	23%	
		Between Ordan Drive/Shawson Drive-Tomken Road	21320	29%	
		Between Token Road- Hwy 410 East Terminal	31922	31%	
		Between Hwy 410 East Terminal-Hwy 410 West Terminal	28042	19%	
		Between Hwy 410 West Terminal- Kennedy Road	23093	14%	
		West of Kennedy Road	18255	13%	
	Two-Way	West of Kennedy Road	27544	-	
		Between Kennedy Road-Hwy 410 West Terminal	35530	-	
		Between Hwy 410 west Terminal- Hwy 410 East Terminal	38445	-	
		Between Hwy 410 East Terminal-Tomken Road	40673	-	
		Between Tomken Road- Ordan Drive/Shawson Drive	27477	-	
		Between Ordan Drive/Shawson Drive-Vipond Drive	24850	-	
		Between Vipond Drive-Ordan Drive	23720	-	
		Between Ordan Drive-Dixie Road	24368	-	

		East of Dixie Road	20040	-	
Kennedy Road	NB	North of Courtneypark Drive	14626	12%	0.5%
	SB		9509	9%	
	Two-Way		24135	-	
	NB	South of Courtneypark Drive	15218	14%	
	SB		11637	13%	
	Two-Way		26855	-	
Dixie Road	NB	North of Courtneypark Drive	30841	23%	0.5%
	SB		12695	16%	
	Two-Way		43536	-	
	NB	South of Courtneypark Drive	26782	19%	
	SB		12394	16%	
	Two-Way		39176	-	

The following design parameters were selected for the AASHTO design analysis:

DESIGN PARAMETERS FOR WIDENING CONSTRUCTION/RECONSTRUCTION	
Initial Serviceability Index	4.5
Terminal Serviceability Index	2.5
Total Loss in Serviceability Index	2.0
Desired Reliability (%)	90
Subgrade Resilient Modulus – M_R (MPa)	30
Standard Deviation	0.47

4.1.3 New Pavement Structure Thickness Design – Widening Section

The equivalent single axle loads (ESAL) for the design lane of Courtneypark Drive East were calculated using traffic data presented in the above tables. The input parameters for the design lane ESAL calculation were derived from MTO publication MI-183 *'Adaptation and Verification of AASHTO Pavement Design*

Guide for Ontario Conditions' and 'Procedures for Estimating Traffic Loads for Pavement Design, 1995'. The input parameters used to calculate ESALs in the design lane are summarized in the following table.

Input Parameters for ESAL Calculations for Widening of Courtneypark Drive East - 20 Year design life

Section	AADT (Assumed Year of Operation)	Percentage of Truck Vehicles (Weighted Average for EBL and WBL) %	Avg. Truck Factor	Design Period (Years)	Cumulative ESAL's (million)
From Kennedy Road to Hwy 410 East Terminal	34,598 (2021)	20	1.925	20	37.5
From Hwy 410 East Terminal to Tomken Road	37,081 (2021)	30	1.925	20	60.3
From Tomken Road to Ordan Drive/ Shawson Drive Road	27,477 (2031)	27	1.925	20	40.2
From Ordan Drive/ Shawson Drive to Dixie Road	24,850 (2031)	21	1.925	20	31.3

Pavement structure thickness design for the design lane was determined using the AASHTO design method based on the assumed subgrade (i.e. Mr=30 MPa engineered fill using low frost susceptible soils). Superpave hot mix asphalt and conventional hot mix asphalt are provided for the pavement design. The recommended pavement structure is provided in the following table

New Pavement Structure Thickness for Widening

SECTION	MATERIAL THICKNESS	SN
1. Courtneypark Drive East from Kennedy Road to Hwy 410 East Terminal	50 mm HL1	174
	60 mm HDBC	
	60 mm HDBC	
	70 mm HDBC	
	200 mm Granular A	
	500 mm Granular B Type I	
Total	940 mm	

2. Courtneypark Drive East from Hwy 410 East Terminal to Tomken Road	50 mm HL1 70 mm HDBC 70 mm HDBC 70 mm HDBC 200 mm Granular A 500 mm Granular B Type I	182
Total	960 mm	
3. Courtneypark Drive East from Tomken Road to Ordan Drive/ Shawson Drive Road	50 mm HL1 60 mm HDBC 60 mm HDBC 70 mm HDBC 200 mm Granular A 500 mm Granular B Type I	174
Total	940 mm	
4. Courtneypark Drive East from Ordan Drive/ Shawson Drive to Dixie Road	50 mm HL1 60 mm HDBC 60 mm HDBC 70 mm HDBC 200 mm Granular A 500 mm Granular B Type I	174
Total	940 mm	
5. Kennedy Road and Courtneypark Drive East Intersection*	50 mm HL1 60 mm HDBC 60 mm HDBC 70 mm HDBC 200 mm Granular A 500 mm Granular B Type I	174
Total	940 mm	
6. Dixie Road and Courtneypark Drive East Intersection	50 mm HL1 60 mm HDBC 60 mm HDBC 70 mm HDBC 200 mm Granular A 500 mm Granular B Type I	174
Total	940 mm	

*pavement structure slightly modified to match the pavement structure of Courtneypark Drive East.

The Superpave Hot Mix Asphalt can be substituted, i.e. SP12.5 FC2 for the surface course and SP19.0 for the binder course. The use of Limestone material is preferred for Granular materials, i.e. 19 mm CRL for

Granular A and 50 mm CRL or Granular B Type II for Granular B Type I, as per the City of Mississauga Standard.

The minimum Structural Numbers required for the new pavement at widening Selection of Courtneypark Drive East are shown in the following table:

Section	**Minimum Structural Number for 20 Yr**
Courtneypark Drive East from Kennedy Road to Hwy 410 East Terminal	171
Courtneypark Drive East from Hwy 410 East Terminal to Tomken Road	181
Courtneypark Drive East from Tomken Road to Ordan Drive/ Shawson Drive Road	172
Courtneypark Drive East from Ordan Drive/ Shawson Drive to Dixie Road	167

4.1.4 Roadway Rehabilitation Options – Existing Lanes

Pavement Structure Design Values

Based on the existing pavement structure data, provided in Section 3.1.1 and individual borehole logs (Enclosure Nos. 2 to 9) , the chosen design values to represent the existing pavement structure are shown in table below:

Section	**Asphalt** (mm)	**Granular Base** (mm)	**Granular Subbase** (mm)	**Total Pavement Structure** (mm)	**Reference Boreholes**
Courtneypark Drive East from Kennedy Road to Hwy 410 East Terminal	175	180	325	680	BH1 and BH2
Courtneypark Drive East from Hwy 410 East Terminal to Tomken Road	200	160	400	760	BH2
Courtneypark Drive East from Tomken Road to Ordan Drive/ Shawson Drive Road	175	170	240	585	BH3, BH4 and BH5
Courtneypark Drive East from Ordan Drive/ Shawson Drive to Dixie Road	210	180	240	630	BH6, BH7 and BH8

Equivalent Single Axle Loads(ESAL's)

The equivalent single axle loads (ESAL) for the design lane of the roads were calculated using traffic data presented in the above tables. The input parameters for the design lane ESAL calculation were derived from MTO publication MI-183 'Adaptation and Verification of AASHTO Pavement Design Guide for Ontario Conditions' and 'Procedures for Estimating Traffic Loads for Pavement Design, 1995'.The input parameters used to calculate ESALs in the design lane are summarized in the following table.

Input Parameters for ESAL Calculations for Rehabilitation of Courtneypark Drive East

Section	AADT (Assumed Year of Operation)	Percentage of Truck Vehicles (Weighted Average for EBL and WBL) %	Avg. Truck Factor	Design Period (Years)	Cumulative ESAL's (million)
From Kennedy Road to Hwy 410 East Terminal	34,598 (2021)	20	1.925	14	25.5
				20	37.5
From Hwy 410 East Terminal to Tomken Road	37,081 (2021)	30	1.925	13	37.8
				20	60.3
From Tomken Road to Ordan Drive/ Shawson Drive Road	27,477 (2031)	27	1.925	13	25.2
				20	40.2
From Ordan Drive/ Shawson Drive to Dixie Road	24,850 (2031)	21	1.925	15	22.9
				16	24.5
				20	31.3

The minimum Structural Numbers required for the rehabilitation of the existing lanes of Courtneypark Drive East are shown in the following table for different deign lives and options:

Section	Minimum Structural Number				
	13 Yr	14 Yr	15 Yr	16 Yr	20 Yr
From Kennedy Road to Hwy 410 East Terminal		162	-	-	171
From Hwy 410 East Terminal to Tomken Road	171	-	-	-	181
From Tomken Road to Ordan Drive/Shawson Drive Rd	162	-	-	-	172
From Ordan Drive/ Shawson Drive to Dixie Road		-	160	162	167

Three rehabilitation options were selected for resurfacing the existing pavement. The rehabilitation strategies not only take minimum traffic delay, cost and/or disruption of traffic into consideration, but also consider the road conditions, subgrade type and traffic. However, the 20 years design life will not be achieved in some of rehabilitation options presented below.

Option 1: Rehabilitation by 300 mm Pulverization and Pave (20 Year Design Life)

This option is generally to mill the existing pavement surface, pulverize the existing asphalt and underlying granular base to a depth of 300 mm, then place the new Granular A and pave. This option will result in 240 mm to 285 mm grade raise within the project limits for a 20-year design life.
Pavement structure thickness design for the design lane was determined using the AASHTO design method based on the assumed subgrade (i.e. Mr=30 MPa engineered fill using low frost susceptible soils), ESALs and minimum required Structural Number (shown above). The Superpave Hot Mix Asphalt can be substituted, i.e. SP12.5 FC2 for the surface course and SP19.0 for the binder course. The recommended rehabilitation strategy is provided in the following table:

Pavement Design for Rehabilitation of Courtneypark Dr. East by Pulverization (Option 1)

<table>
<tr><th>SECTION</th><th colspan="2">METHOD</th><th>GRADE RAISE (mm)</th><th>SN (mm)</th></tr>
<tr><td rowspan="5">1. Courtneypark Drive East from Kennedy Road to Hwy 410 East Terminal</td><td colspan="2">Mill 55 mm on average, from existing surface</td><td rowspan="5">245</td><td rowspan="5">171</td></tr>
<tr><td colspan="2">Pulverize existing asphalt and underlying granular base to a depth of 300 mm</td></tr>
<tr><td colspan="2">Place 50 mm new Granular A</td></tr>
<tr><td rowspan="2">Pave 250 mm Hot Mix Asphalt</td><td>50 mm HL1 Surface Course</td></tr>
<tr><td>200 mm (60+70+70) HDBC Binder Course</td></tr>
<tr><td rowspan="5">2. Courtneypark Drive East from Hwy 410 East Terminal to Tomken Road</td><td colspan="2">Mill 60 mm on average, from existing surface</td><td rowspan="5">250</td><td rowspan="5">181</td></tr>
<tr><td colspan="2">Pulverize existing asphalt and underlying granular base to a depth of 300 mm</td></tr>
<tr><td colspan="2">Place 50 mm new Granular A</td></tr>
<tr><td rowspan="2">Pave 260 mm Hot Mix Asphalt</td><td>50 mm HL1 Surface Course</td></tr>
<tr><td>210 mm (70+70+70) HDBC Binder Course</td></tr>
<tr><td rowspan="5">3. Courtneypark Drive East from Tomken Road to Ordan Drive/ Shawson Drive Road</td><td colspan="2">Mill 25 mm on average, from existing surface</td><td rowspan="5">285</td><td rowspan="5">172</td></tr>
<tr><td colspan="2">Pulverize existing asphalt and underlying granular base to a depth of 300 mm</td></tr>
<tr><td colspan="2">Place 50 mm new Granular A</td></tr>
<tr><td rowspan="2">Pave 260 mm Hot Mix Asphalt</td><td>50 mm HL1 Surface Course</td></tr>
<tr><td>210 mm (70+70+70) HDBC Binder Course</td></tr>
</table>

4. Courtneypark Drive East from Ordan Drive/ Shawson Drive to Dixie Road	Mill 60 mm on average, from existing surface		240	169
	Pulverize existing asphalt and underlying granular base to a depth of 300 mm			
	Place 50 mm new Granular A			
	Pave 250 mm Hot Mix Asphalt	50 mm HL1 Surface Course		
		200 mm (60+70+70) HDBC Binder Course		

Note:

1- These rehabilitation Options will not be applicable at structure.

2- Grade raise at intersections have to be evaluated by Stantec and if grade raise being applied, transition detail based on preferred option will be provided.

<u>Option 2: Rehabilitation by Mill and Pave (13 to 15 Year Design Life)</u>

This option is generally to mill the existing pavement surface (80 to 140 mm) and pave (250 to 270 mm) hot mix asphalt. This option will result in 120 mm to 190 mm grade raise with a design life of 13 to 15 years for four different sections.

Pavement structure thickness design for the design lane was determined using the AASHTO design method based on the assumed subgrade (i.e. Mr=30 MPa engineered fill using low frost susceptible soils), ESALs and minimum required Structural Number (shown above). The Superpave Hot Mix Asphalt can be substituted, i.e. SP12.5 FC2 for the surface course and SP19.0 for the binder course. The recommended rehabilitation strategy is provided in the following table:

Pavement Design for Rehabilitation of Courtneypark Dr. East by Mill and Pave (Option 2)

SECTION	**METHOD**		**GRADE RAISE** (mm)	**SN** (mm)	**DESIGN LIFE** (Yr)
1. Courtneypark Drive East from Kennedy Road to Hwy 410 East Terminal	Mill 100 mm on average, from existing surface		150	164	14
	Pave 250 mm Hot Mix Asphalt	50 mm HL1 Surface Course			
		200 mm (60+70+70) HDBC Binder Course			
2. Courtneypark Drive East from Hwy 410 East Terminal to Tomken Road	Mill 140 mm on average, from existing surface		130	172	13
	Pave 270 mm Hot Mix Asphalt	50 mm HL1 Surface Course			
		220 mm (70+75+75) HDBC Binder Course			
3. Courtneypark Drive East from Tomken Road to Ordan Drive/ Shawson Drive Road	Mill 80 mm on average, from existing surface		190	169	13
	Pave 270 mm Hot Mix Asphalt	50 mm HL1 Surface Course			
		220 mm (70+75+75) HDBC Binder Course			

4. Courtneypark Drive East from Ordan Drive/ Shawson Drive to Dixie Road	Mill 130 mm on average, from existing surface		120	160	15
	Pave 250 mm Hot Mix Asphalt	50 mm HL1 Surface Course			
		200 mm (60+70+70) HDBC Binder Course			

Note:

1- These rehabilitation Options will not be applicable at structure.

2- Grade raise at intersections have to be evaluated by Stantec and if grade raise being applied, transition detail based on preferred option will be provided.

Option 3: Rehabilitation by Cold In-Place Recycling (Partial Depth) using Expanded Asphalt 100 mm and Pave (13 to 16 Year Design Life)

This option is generally to perform Cold In-Place Recycling with Expanded Asphalt (CIREAM) 100 mm and pave (160 to 180 mm) hot mix asphalt. This option will result in 160 mm to 180 mm grade raise with a design life of 13 to 16 years within the project limits.
Pavement structure thickness design for the design lane was determined using the AASHTO design method based on the assumed subgrade (i.e. Mr=30 MPa engineered fill using low frost susceptible soils), ESALs and minimum required Structural Number (shown above). The Superpave Hot Mix Asphalt can be substituted, i.e. SP12.5 FC2 for the surface course and SP19.0 for the binder course. The recommended rehabilitation strategy is provided in the following table:

Pavement Design for Rehabilitation of Courtneypark Dr. East by CIREAM and Pave (Option 3)

SECTION	**METHOD**		**GRADE RAISE** (mm)	**SN** (mm)	**DESIGN LIFE** (Yr)
1. Courtneypark Drive East from Kennedy Road to Hwy 410 East Terminal	Perform Cold In-Place Recycling with Expanded Asphalt (CIREAM) to depth of 100 mm		160	162	14
	Pave 160 mm Hot Mix Asphalt	50 mm HL1 Surface Course			
		110 mm (50+60) HDBC Binder Course			
2. Courtneypark Drive East from Hwy 410 East Terminal to Tomken Road	Perform Cold In-Place Recycling with Expanded Asphalt (CIREAM) to depth of 100 mm		160	171	13
	Pave 160 mm Hot Mix Asphalt	50 mm HL1 Surface Course			
		110 mm (50+60) HDBC Binder Course			
3. Courtneypark Drive East from Tomken Road to Ordan Drive/ Shawson Drive Road	Perform Cold In-Place Recycling with Expanded Asphalt (CIREAM) to depth of 100 mm		180	163	13
	Pave 180 mm Hot Mix Asphalt	50 mm HL1 Surface Course			
		110mm (60+70) HDBC Binder Course			
4. Courtneypark Drive East from Ordan Drive/ Shawson Drive to Dixie Road	Perform Cold In-Place Recycling with Expanded Asphalt (CIREAM) to depth of 100 mm		160	163	16
	Pave 160 mm Hot Mix Asphalt	50 mm HL1 Surface Course			
		110mm (50+60) HDBC Binder Course			

Note:
1- Grade raise at intersections have to be evaluated by Stantec and if grade raise being applied, transition detail based on preferred Option will be provided.

As no borehole was planned and drilled at the intersection of Kennedy Road and Courtneypark Drive East and the intersection of Dixie Road and Courtneypark Drive East during this investigation, the existing pavement structures at the two intersections are unknown at this time, the rehabilitation options did not include the two intersections.

4.1.5 General Considerations for Pavement Design

Prior to placing the granular subbase material, the exposed soil subgrade should be proofrolled using a heavily loaded truck in conjunction with an inspection by qualified geotechnical personnel. Remedial work (i.e. further subexcavation and replacement) should be carried out on any disturbed, softened or poorly performing zones, as directed by a qualified geotechnical personnel.

It is understood that majority of the existing granular base/subbase materials do not meet the OPSS Granular A and B Type I gradation specification, with excessive contents of sand/fines. Therefore, the existing granular base/subbase materials could not be reused as subbase/base materials of the new pavement structures; however, it can be reused as subgrade materials to replace soft, wet or otherwise disturbed areas identified during proof-rolling.

If deemed practical during construction, the existing asphalt may be pulverized and reused as subbase material, provided it can be processed to meet the OPSS Granular B Type I gradation specification. It should be noted the process of pulverizing asphalt typically generates fines and as such the pulverized materials should only be utilized in the lower lift of the subbase. The existing asphalt could also be salvaged and utilized as Recycled Asphalt Pavement (RAP) in the production of the binder course of the new hot mix asphalt.

The pavement and road base design shall conform to Mississauga City Standard 2220.000. Where Granular B Type II is used, the Granular A should be sourced from a crushing quarried bedrock. The granular subbase and base materials should be uniformly compacted to 100 % of their Standard Proctor Maximum Dry Densities (SPMDD). The asphalt materials should be compacted as per OPSS310, Table 10.

The asphalt cement used in the Superpave mixes or alternative HL1 and HDBC mixes selected for this project should be PG 64-28, performance graded asphalt cement.

The long term performance of the pavement structure is highly dependent upon the subgrade support conditions. Stringent construction control procedures should be maintained to ensure uniform subgrade moisture and density conditions are achieved. In addition, the need for adequate drainage cannot be over-emphasized. The finished pavement surface and underlying subgrade should be free of depressions and should be sloped to provide effective surface drainage.

Subdrains should be installed to intercept excess subsurface moisture and prevent subgrade softening. The sub-drains system should consist of 100 mm or 150 mm diameter geotextile wrapped perforated pipe, placed inside a 300 mm by 300 mm trench and surrounded on all sides by 20 mm clear stone (minimum 50 mm at the bottom side), wrapped in filter cloth (Terrafix 270R or approved alternative), overlap to be at least 150 mm. The pipes should be placed such that the top of the filter cloth is at subgrade level and connected to catchbasins or some other permanently frost free outlet to provide positive drainage. The subdrains shall conform to Mississauga City Standard 2220.040.

The most severe loading conditions on pavement areas and the subgrade may occur during construction. Consequently, special provisions such as restricted access lanes, half-loads during paving, etc., may be required, especially if construction is carried out during unfavorable weather.

It is recommended that the geotechnical engineers be retained to review the final pavement structure designs and drainage plans prior to construction to confirm that they are consistent with the recommendations of this report.

Where new pavement abuts existing pavement (e.g. at the construction limits), proper longitudinal lap joints should be constructed to key the new asphalt into the existing pavement. The existing asphalt edges should be provided with a proper sawcut edge prior to keying in the new asphalt. It should be ensured that any undermined or broken edges resulting from the construction activities are removed by saw cut.

The above pavement designs should provide serviceable pavements for the anticipated traffic levels over a normal design period of 20 years, provided that timely maintenance is carried out (i.e. crack sealing). The existing pavement conditions are generally in fair conditions, however, the pavement conditions would keep deteriorating and the pavement conditions may change greatly before 2021 and 2031. The pavement designs presented in this report should be further evaluated during the detailed design stage.

4.2 STORM SEWERS

It is understood that storm sewers are proposed within the project limits. It should be noted that the alignment and invert elevations of the storm sewers are not known at this time. The following preliminary geotechnical recommendations are provided for the preliminary design purposes. A detailed geotechnical investigation should be carried out during the detailed design stage.

4.2.1 Trenching Excavation

It is understood that the proposed invert depths of the storm sewers are anticipated to be less than 3 m below the existing ground surface. Based on the results of this investigation, the storm sewer installations will be subexcavated through the existing fill and glacial tills. Some difficulty may be encountered in excavating the tills at some locations. In addition, these tills contain cobbles and boulders, as previously noted. Groundwater during excavation within the predominant glacial tills at the site can be handled, as required, by pumping from properly constructed and filtered sumps located within the excavations. However, more groundwater seepage should be expected locally from the existing fill materials. Depending upon the actual thickness and extent of the existing fills and the finalized design pipe invert depths, some forms of positive (pro-active) groundwater control or depressurization, if required, will be utilized to maintain the stability of the base and side slopes of the trench excavations.

All excavations must be carried out in accordance with the most recent Occupational Health and Safety Act (OHSA). In accordance with OHSA, the existing fill materials can be classified as Type 3 Soil; the stiff to hard native clayey soils can be classified as Type 2 Soil; the firm clayey soils and existing fill materials can be classified as Type 4 Soil below groundwater tables.

For the installations off the existing pavement, the trench excavations may consist of conventional temporary open cuts, with side slopes not steeper than 1 horizontal to 1 vertical. However, depending upon the construction procedures adopted by the contractor, actual groundwater seepage conditions, the success of the contractor's groundwater control methods and weather conditions at the time of construction, some flattening and/or blanketing of the slopes may be required. Care should be taken to direct surface runoff away from the open excavations and all excavations should be carried out in accordance with the Occupational Health and Safety Act and Regulations for Construction Projects.

Should the installations be carried out on the existing pavement, the extent of the excavations will have to be minimized to allow for traffic to continue using a reduced portion of existing roadway. A temporary supporting system, such as trench box should be required. Where permissible under the OHSA and where its use is considered to be a safe alternative for shoring and bracing, contractors may elect to utilize trench boxes for temporary trench wall support for trenches less than 6 m deep in Type 2 and 3 Soils. While the use of trench boxes is an effective and economical trench-support method, its use can cause increased loss of ground relative to properly braced shoring, especially when working close to granular base courses below existing pavements or along existing utility trenches backfilled with granular materials. Trench boxes also reduce the contractor's ability to compact backfill materials placed between the trench wall and the outer trench box shell, thereby increasing the likelihood of post-construction settlements along the trench walls. When trench boxes are used along existing roadways, settlements frequently occur along the trench wall, which may manifest months after completion of backfilling. In such cases, following the backfilling of the trench, road reconstruction should include a provision for saw-cutting the asphalt at least 1 m back from the trench walls, recompacting the upper trench backfill, and then repaving. Where trench depths greater than 6 m or in Type 4 soil of any trench depth, Engineered Support Systems are required under the OHSA.

4.2.2 Bedding

The bedding for underground utilities should be compatible with the type and class of pipe, the surrounding subsoil and anticipated loading conditions and should be designed in accordance with City of Mississauga standards. Where granular bedding is deemed to be acceptable, it should consist of at least 150 mm of OPSS Granular A or 19 mm crusher run limestone material. The thickness of the bedding may, however, have to be increased depending on the pipe diameter or in accordance with local standards or if wet or weak subgrade conditions are encountered.

To avoid the loss of soil fines from the subgrade, clear stone bedding material should not be used in any case for pipe bedding or to stabilize the bases.

Class B sewer trench bedding is to be used as per Mississauga City Standard 2112.080. Sewer bedding and cover material shall conform to Mississauga City Standard 2112.090 and 2112.100. If water is present in the trench excavation, 19 mm clear stone or 6 mm washed crushed gravel is to be used for bedding in accordance with Mississauga City Standard 2112.110 and 2112.140.

Where wet or soft trench subgrade conditions are encountered, further on-site geotechnical assessment may be required to determine or re-examine the appropriate bedding in order to stabilize the subgrade for sewer construction (i.e. increase in bedding thickness, stone immersion techniques, leak proofing or wrapping of sewer pipe joints, Class A bedding, etc.).

4.2.3 Backfilling of Trenches

Based on visual and tactile examination and the measured nature water contents of the soil samples, the on-site majority of the excavated inorganic soil deposits will generally near their estimated optimum water contents for compaction. The excavated materials at suitable water contents may be reused as trench backfill provided they are free of significant amounts of topsoil, organics or other deleterious material, and are placed and compacted as outlined below. It should also be noted that due to the predominantly fine-grained, clayey/silty nature of the majority of the native soils, some difficulty would be expected in achieving adequate compaction during wet weather.

The backfill should be placed in maximum 300 mm thick layers at or near (±2 %) their optimum moisture content and each layer should be compacted to at least 95 % SPMDD. Unsuitable materials such as organic soils, boulders, cobbles, frozen soils, etc. should not be used for backfilling.

It should be noted that if the soils for trench backfilling were placed and compacted at wet of their optimum water content, we would expect pumping and rolling conditions which would require mitigating measures in order to construct roads and utilities. This might include significant extra thickness of granular base, base reinforcement using geogrids or importing of better quality common fill.

Trench backfilling shall comply with Mississauga City's Engineering Policy Statement in the Development Requirements manual (Section 4.02.06). Where the excavated inorganic native subsoil is used for trench backfilling, the backfilling should be placed in maximum 300 mm think layers and compacted to a minimum of 95% SPMDD within 2% of optimum moisture content. The top 1000 mm of subgrade is to be compacted to a minimum of 98% SPMDD within 2% to 3% direr than optimum moisture content.

Normal post-construction settlement of the compacted trench backfill should be anticipated, with the majority of such settlement taking place within about 6 months following the completion of trench backfilling operations. This settlement may be compensated for, where necessary, by placing additional granular material prior to asphalt paving. Alternatively, if the asphalt binder course is placed shortly following the completion of trench backfilling operations in these areas, any settlement that may be reflected by subsidence of the surface of the binder asphalt should be compensated for by placing an additional thickness of binder asphalt or by padding.

5. CLOSURE

We trust that the information contained in this report is satisfactory. Should you have any questions, please do not hesitate to contact this office.

Yours truly,

SPL CONSULTANTS LIMITED

Tianjiao (Sarah) Li, M.Sc, B. Eng

Siamak Gholamin, B. Sc.
Pavement Design Assistant

Ramon Miranda, BA.Sc., P. Eng
Principal Pavement & Geotechnical Engineer

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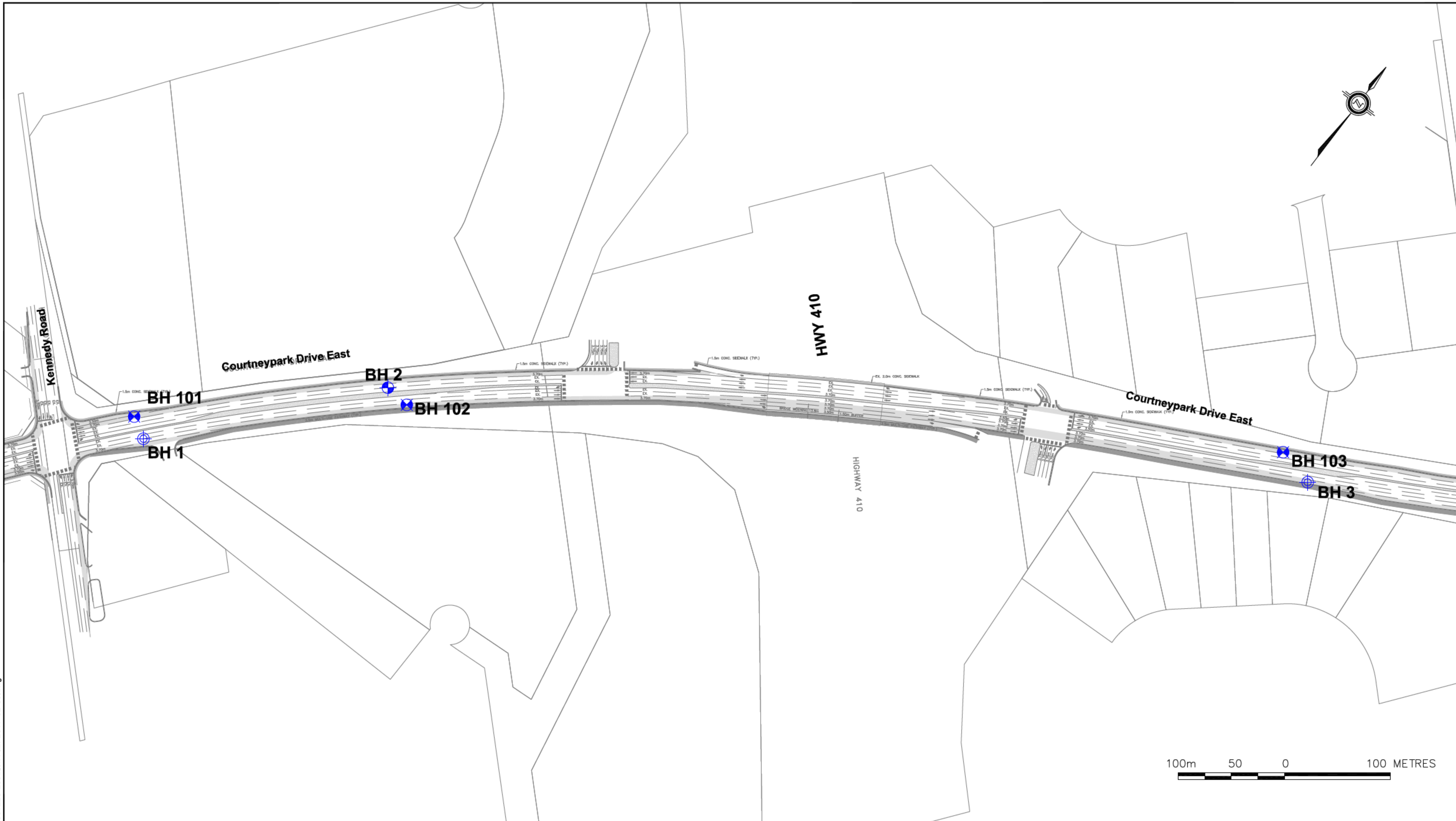
DRAWINGS



Approximate Boreholes Location - Boreholes on Existing Pavement (1.5m)

Approximate Boreholes Location - Boreholes on Existing Pavement with Corehole (1.5m)

Approximate Boreholes Location - Boreholes on Proposed Widening Area off the Pavement (6.5m)

Client:	Stantec			Project No.:	10001223	Drawing No.:	1
Drawn:	LWS	Approved:	DL	Title:	Borehole Location Plan		
Date:	Dec. 16, 2014	Scale:	As shown	Project:	Preliminary Geotechnical and Pavement Investigation for Class EA and Preliminary Design Courtneypark Dr East, Mississauga, Ontario		
Original Size:	Tabloid	Rev:	N/A		SPL Consultants Limited Geotechnical • Environmental • Materials • Hydrogeology		

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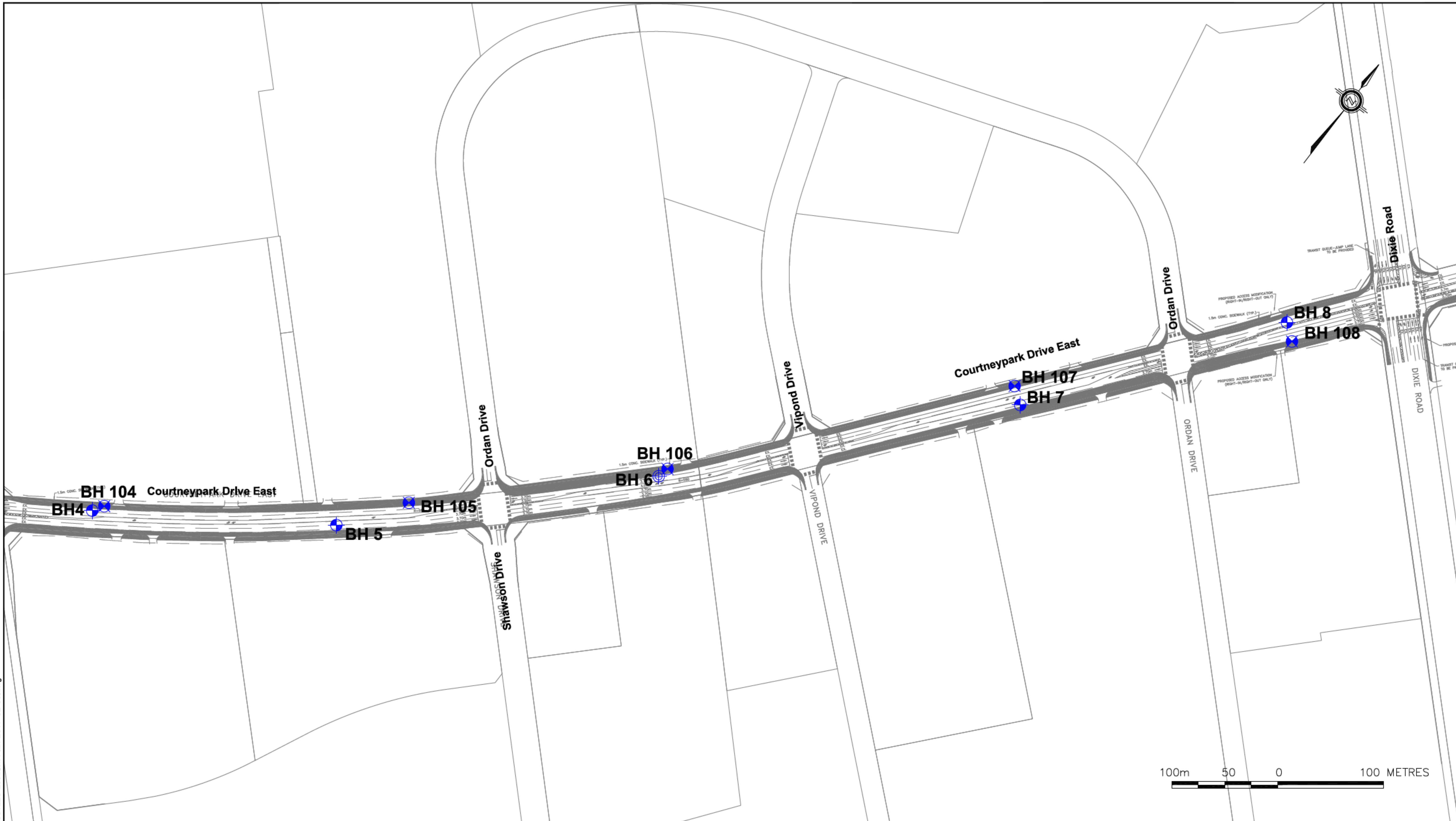

Approximate Boreholes Location - Boreholes on Existing Pavement (1.5m)

Approximate Boreholes Location - Boreholes on Existing Pavement with Corehole (1.5m)

Approximate Boreholes Location - Boreholes on Proposed Widening Area off the Pavement (6.5m)

Client:	Stantec			Project No.: 10001223	Drawing No.: 2
Drawn:	LWS	Approved:	DL	Title:	Borehole Location Plan
Date:	Dec. 16, 2014	Scale:	As shown	Project:	Preliminary Geotechnical and Pavement Investigation for Class EA and Preliminary Design Courtneypark Dr East, Mississauga, Ontario
Original Size:	Tabloid	Rev:	N/A		SPL Consultants Limited Geotechnical • Environmental • Materials • Hydrogeology

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ENCLOSURES

Enclosure 1-A: Notes on Sample Descriptions

1. All sample descriptions included in this report generally follow the Unified Soil Classification. Laboratory grain size analyses provided by SPL also follow the same system. Different classification systems may be used by others, such as the system by the International Society for Soil Mechanics and Foundation Engineering (ISSMFE). Please note that, with the exception of those samples where a grain size analysis and/or Atterberg Limits testing have been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

2. Fill: Where fill is designated on the borehole log it is defined as indicated by the sample recovered during the boring process. The reader is cautioned that fills are heterogeneous in nature and variable in density or degree of compaction. The borehole description may therefore not be applicable as a general description of site fill materials. All fills should be expected to contain obstruction such as wood, large concrete pieces or subsurface basements, floors, tanks, etc., none of these may have been encountered in the boreholes. Since boreholes cannot accurately define the contents of the fill, test pits are recommended to provide supplementary information. Despite the use of test pits, the heterogeneous nature of fill will leave some ambiguity as to the exact composition of the fill. Most fills contain pockets, seams, or layers of organically contaminated soil. This organic material can result in the generation of methane gas and/or significant ongoing and future settlements. Fill at this site may have been monitored for the presence of methane gas and, if so, the results are given on the borehole logs. The monitoring process does not indicate the volume of gas that can be potentially generated nor does it pinpoint the source of the gas. These readings are to advise of the presence of gas only, and a detailed study is recommended for sites where any explosive gas/methane is detected. Some fill material may be contaminated by toxic/hazardous waste that renders it unacceptable for deposition in any but designated land fill sites; unless specifically stated the fill on this site has not been tested for contaminants that may be considered toxic or hazardous. This testing and a potential hazard study can be undertaken if requested. In most residential/commercial areas undergoing reconstruction, buried oil tanks are common and are generally not detected in a conventional preliminary geotechnical site investigation.

3. Till: The term till on the borehole logs indicates that the material originates from a geological process associated with glaciation. Because of this geological process the till must be considered heterogeneous in composition and as such may contain pockets and/or seams of material such as sand, gravel, silt or clay. Till often contains cobbles (60 to 200 mm) or boulders (over 200 mm). Contractors may therefore encounter cobbles and boulders during excavation, even if they are not indicated by the borings. It should be appreciated that normal sampling equipment cannot differentiate the size or type of any obstruction. Because of the horizontal and vertical variability of till, the sample description may be applicable to a very limited zone; caution is therefore essential when dealing with sensitive excavations or dewatering programs in till materials.

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Enclosure 1-B: Explanation of Terms Used in the Record of Borehole

Sample Type

AS	Auger sample
BS	Block sample
CS	Chunk sample
DO	Drive open
DS	Dimension type sample
FS	Foil sample
NR	No recovery
RC	Rock core
SC	Soil core
SS	Spoon sample
SH	Shelby tube sample
ST	Slotted tube
TO	Thin-walled, open
TP	Thin-walled, piston
WS	Wash sample

Penetration Resistance

Standard Penetration Resistance (SPT), N:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) required to drive a 50 mm (2 in) drive open sampler for a distance of 300 mm (12 in).

WH – Samples sinks under "weight of hammer"

Dynamic Cone Penetration Resistance, N_d:

The number of blows by a 63.5 kg (140 lb) hammer dropped 760 mm (30 in) to drive uncased a 50 mm (2 in) diameter, 60° cone attached to "A" size drill rods for a distance of 300 mm (12 in).

Textural Classification of Soils (ASTM D2487-10)

Classification	Particle Size
Boulders	> 300 mm
Cobbles	75 mm - 300 mm
Gravel	4.75 mm - 75 mm
Sand	0.075 mm - 4.75 mm
Silt	0.002 mm - 0.075 mm
Clay	<0.002 mm(*)

(*) Canadian Foundation Engineering Manual (4th Edition)

Coarse Grain Soil Description (50% greater than 0.075 mm)

Terminology	Proportion
Trace	0-10%
Some	10-20%
Adjective (e.g. silty or sandy)	20-35%
And (e.g. sand and gravel)	> 35%

Soil Description

a) Cohesive Soils(*)

Consistency	Undrained Shear Strength (kPa)	SPT "N" Value
Very soft	<12	0-2
Soft	12-25	2-4
Firm	25-50	4-8
Stiff	50-100	8-15
Very stiff	100-200	15-30
Hard	>200	>30

(*) Hierarchy of Shear Strength prediction

1. Lab triaxial test
2. Field vane shear test
3. Lab. vane shear test
4. SPT "N" value
5. Pocket penetrometer

b) Cohesionless Soils

Density Index (Relative Density)	SPT "N" Value
Very loose	<4
Loose	4-10
Compact	10-30
Dense	30-50
Very dense	>50

Soil Tests

w	Water content
w_p	Plastic limit
w_l	Liquid limit
C	Consolidation (oedometer) test
CID	Consolidated isotropically drained triaxial test
CIU	consolidated isotropically undrained triaxial test with porewater pressure measurement
D_R	Relative density (specific gravity, Gs)
DS	Direct shear test
ENV	Environmental/ chemical analysis
M	Sieve analysis for particle size
MH	Combined sieve and hydrometer (H) analysis
MPC	Modified proctor compaction test
SPC	Standard proctor compaction test
OC	Organic content test
U	Unconsolidated Undrained Triaxial Test
V	Field vane (LV-laboratory vane test)
γ	Unit weight

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Geotechnical Environmental Materials Hydrogeology

LOG OF BOREHOLE BH1

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 2

(m) ELEV DEP H	SO L PROF LE DESCR PT ON	S RA A PLO	SAMPLES NUMBER	YPE	"N" BLOWS 0 3 m	GROUND WA ER COND ONS	ELEVA ON	DYNAM C CONE PENE RA ON RES S ANCE PLO 20 40 60 80 100 / SHEAR STRENGTH (kPa) O UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L WA ER CON EN (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m^3)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
193 0												
192 9 0 0	**ASPHALT** (150mm)		1A	AS					o			
0 2	**GRANULAR BASE** (200mm) **GRANULAR SUBBASE** (250mm)		1B	AS								
192 4 0 6	**FILL:** clayey silt trace gravel some sand brown moist		2	AS			192		o			
191 5 1 5	**END OF BOREHOLE** Notes 1) Water was at a depth of 1 5 m below existing ground surface (bgs) upon completion of drilling 2) Borehole was open upon completion of drilling											

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▼ ▼

GRAPH NO ES + 3 × 3 Numbers re er to Sensitivity O ε=3% Strain at Failure

LOG OF BOREHOLE BH2

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/15/2014

REF NO 10001223
ENCL NO 3

ELEV (m) DEP H	SO L PROF LE DESCR PT ON	S RA A PLO	SAMPLES NUMBER	YPE	"N" BLOWS 0 3 m	GROUND WA ER COND ONS	ELEVA ON	DYNAM C CONE PENE RA ON RES S ANCE PLO (20 40 60 80 100) / SHEAR STRENGTH (kPa)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WA ER CON EN (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m^3)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
193 0												
192 8 / 0 0	**ASPHALT** (200mm)		1	AS					o			33 54 (13)
0 2	**GRANULAR BASE** (160mm) **GRANULAR SUBBASE** (400mm)		2	AS					o			31 56 (13)
192 2 / 0 8	**FILL:** clayey silt some gravel some sand containing cobbles grey moist		3	AS			192		o			
191 5 / 1 5	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling											

Legend: O UNCONF NED; + FIELD VANE & Sensitivity; ● QU CK R AX AL; × LAB VANE

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▽ ▼

GRAPH NO ES: $+^3$ $\times^3$ Numbers re er to Sensitivity; O ε=3% Strain at Failure

LOG OF BOREHOLE BH3

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 4

(m) ELEV DEP H	SO L PROF LE DESCR PT ON	S RA A PLO	SAMPLES NUMBER	YPE	"N" BLOWS 0 3 m	GROUND WA ER COND ONS	ELEVA ON	DYNAM C CONE PENE RA ON RES S ANCE PLO / SHEAR STRENGTH (kPa)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WA ER CON EN (%)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m³)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
181 5												
180 0 / 0 1	**ASPHALT** (120mm) **GRANULAR BASE** (130mm)		1	AS								
181 0	**GRANULAR SUBBASE** (250mm)		2	AS								
0 5	**FILL:** silty sand some gravel grey moist		3	AS			181					
180 0 / 1 5	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling						180					

Dynamic cone scale: 20 40 60 80 100
Shear strength: O UNCONF NED; + FIELD VANE & Sensitivity; ● QU CK R AX AL; × LAB VANE — 20 40 60 80 100
Water content scale: 10 20 30

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▼ ▼

GRAPH NO ES +3 ×3 Numbers re er to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH4

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/15/2014

REF NO 10001223
ENCL NO 5

ELEV (m) / DEP H	DESCR PT ON	SAMPLE NUMBER	SAMPLE YPE	"N" BLOWS / 0 3 m	ELEVA ON	WA ER CON EN (%)
179 0						
178 8 / 0 0	**ASPHALT** (210mm)	1	AS			o
0 2	**GRANULAR BASE** (190mm) **GRANULAR SUBBASE** (200mm)	2	AS			o
178 4 / 0 6	**FILL:** clayey silt trace gravel some sand grey moist	3	AS		178	o
177 5 / 1 5	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling					

Column headings: SO L PROF LE (ELEV DEP H (m), DESCR PT ON, S RA A PLO); SAMPLES (NUMBER, YPE, "N" BLOWS 0 3 m); GROUND WA ER COND ONS; ELEVA ON; DYNAM C CONE PENE RA ON RES S ANCE PLO 20 40 60 80 100; SHEAR STRENGTH (kPa) O UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE 20 40 60 80 100; PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT w LIQUID LIMIT W_L WA ER CON EN (%) 10 20 30; POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (Mg/m^3); REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▼ ▼

GRAPH NO ES $+^3$ $\times^3$ Numbers re er to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH5

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 6

ELEV (m) DEP H	DESCR PT ON	S RA A PLO	SAMPLES NUMBER	YPE	"N" BLOWS 0 3 m	GROUND WA ER COND ONS	ELEVA ON	DYNAM C CONE PENE RA ON RES S ANCE PLO (20 40 60 80 100) / SHEAR STRENGTH (kPa)	PLASTIC LIMIT W_P / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WA ER CON EN (%) (10 20 30)	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m³)	REMARKS AND GRA N S ZE DS R BU ON (%) GR SA S CL
178 0 / 0 0	**ASPHALT** (220mm)		1	AS					o			
177 8 / 0 2	**GRANULAR BASE** (180mm) **GRANULAR SUBBASE** (280mm)		2	AS					o			
177 3 / 0 7	**FILL:** sandy silt trace to some gravel trace clay brown moist		3	AS			177		o			
176 5 / 1 5	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling											

SHEAR STRENGTH legend: O UNCONF NED; + FIELD VANE & Sensitivity; ● QU CK R AX AL; × LAB VANE

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▽ ▼

GRAPH NO ES: $+^3$ $\times^3$ Numbers re er to Sensitivity; O ε=3% Strain at Failure

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

LOG OF BOREHOLE BH6

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 7

ELEV (m) DEP H	DESCR PT ON	NUMBER	YPE	"N" BLOWS 0 3 m	GROUND WA ER COND ONS	ELEVA ON	WA ER CON EN (%)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
177 0								
176 8 / 0 0	**ASPHALT** (170mm)	1	AS				○	43 48 (9)
0 2	**GRANULAR BASE** (180mm)							
	GRANULAR SUBBASE (250mm)	2	AS				○	25 55 (20)
176 4 / 0 6	**FILL:** silty clay brown moist	3	AS			176	○	
175 5 / 1 5	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling							

DYNAM C CONE PENE RA ON RES S ANCE PLO 20 40 60 80 100
SHEAR STRENGTH (kPa) ○ UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE 20 40 60 80 100
PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L 10 20 30
POCKET PEN. (Cu) (kPa) NATURAL UNIT WT (Mg/m^3)

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation Deep/Dual nstallation

GRAPH NO ES $+^3$ $\times^3$ Numbers re er to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH7

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 8

(m) ELEV DEP H	DESCR PT ON	S RA A PLO	NUMBER	YPE	"N" BLOWS 0 3 m	GROUND WA ER COND ONS	ELEVA ON	DYNAM C CONE PENE RA ON RES S ANCE PLO / SHEAR STRENGTH (kPa)	PLASTIC LIMIT / NATURAL MOISTURE CONTENT / LIQUID LIMIT (WA ER CON EN (%))	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m^3)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
175 0 / 0 0	**ASPHALT** (220mm)		1	AS								
174 8 / 0 2	**GRANULAR BASE** (180mm) **GRANULAR SUBBASE** (200mm)		2	AS								
174 4 / 0 6	**FILL:** clayey silt brown moist		3	AS			174					
173 5 / 1 5	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling											

SHEAR STRENGTH legend: O UNCONF NED; + FIELD VANE & Sensitivity; ● QU CK R AX AL; × LAB VANE

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation
Deep/Dual nstallation

GRAPH NO ES: $+^3$ $\times^3$ Numbers re er to Sensitivity; O ε=3% Strain at Failure

LOG OF BOREHOLE BH8

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 9

SO L PROF LE (m) ELEV DEP H	DESCR PT ON	S RA A PLO	SAMPLES NUMBER	YPE	"N" BLOWS 0 3 m	GROUND WA ER COND ONS	ELEVA ON	DYNAM C CONE PENE RA ON RES S ANCE PLO 20 40 60 80 100 / SHEAR STRENGTH (kPa) O UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT w LIQUID LIMIT W_L WA ER CON EN (%) 10 20 30	POCKET PEN. (Cu) (kPa)	NATURAL UNIT WT (Mg/m^3)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
174 0												
0 0	**ASPHALT** (250mm)		1	AS					o			
173 8 0 3	**GRANULAR BASE** (200mm) **GRANULAR SUBBASE** (250mm)		2	AS					o			
173 3 0 7	**FILL:** silty sand trace to some gravel brown moist		3	AS			173		o			
172 5 1 5	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling											

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▽ ▼

GRAPH NO ES $+^3$ $\times^3$ Numbers re er to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH101

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/15/2014

REF NO 10001223
ENCL NO 10

ELEV (m) / DEP H	DESCR PT ON	NUMBER	YPE	"N" BLOWS / 0 3 m	ELEVA ON	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
193 0						
192 9 / 0 1	**TOPSOIL** (100mm)					
	FILL: sand and gravel trace organic trace to some silt brown moist loose	1	SS	6		
192 1 / 0 9		2A	SS			
	FILL: clayey silt trace gravel trace sand trace wood pieces topsoil inclusion grey moist loose	2B	SS	8	192	
191 6 / 1 4	**SILTY CLAY TILL TO CLAYEY SILT TILL :** trace gravel some sand to sandy trace sand seams trace clay pockets brown to grey moist stiff to hard	3	SS	32	191	
		4	SS	26		7 28 38 27
		5	SS	27	190	
					189	
		6A	SS			
		6B	SS	21	188	
					187	
		7	SS	15		
186 4 / 6 6	**END OF BOREHOLE**					

Notes
1) Borehole was open and dry upon completion of drilling

DYNAM C CONE PENE RA ON RES S ANCE PLO 20 40 60 80 100
SHEAR STRENGTH (kPa) ○ UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE 20 40 60 80 100
PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L
WA ER CON EN (%) 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (Mg/m³)
GROUND WA ER COND ONS
S RA A PLO

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▽ ▼

GRAPH NO ES: $+^3$ $\times^3$ Numbers re er to Sensitivity ○ ε=3% Strain at Failure

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

LOG OF BOREHOLE BH102

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 11

ELEV (m) DEP H	DESCR PT ON	NUMBER	YPE	"N" BLOWS 0 3 m	ELEVA ON	WA ER CON EN (%)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
193 2							
193 0 0 0	**CONCRETE** (150mm)						
0 2	**FILL:** gravel some sand trace to some silt some clay brown moist to wet loose	1A	AS		193		
		1B	AS				
		2	SS	8	192		57 18 13 12
191 7 1 5	**SILTY CLAY TILL TO CLAYEY SILT TILL:** trace gravel some sand to sandy containing cobbles brown to grey moist to wet stiff to very stiff						
		3	SS	15	191		
		4	SS	30			
		5	SS	32	190		
					189		
		6	SS	13	188		
					187		
		7	SS	86/11"			
186 5 6 7	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling						

DYNAM C CONE PENE RA ON RES S ANCE PLO: 20 40 60 80 100
SHEAR STRENGTH (kPa): ○ UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE 20 40 60 80 100
PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L; WA ER CON EN (%) 10 20 30
POCKET PEN. (Cu) (kPa) NATURAL UNIT WT (Mg/m^3)

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation Deep/Dual nstallation

GRAPH NO ES: $+^3$ $\times^3$ Numbers re er to Sensitivity ○ ε=3% Strain at Failure

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/15/2014

REF NO 10001223
ENCL NO 12

ELEV (m) / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	"N" BLOWS / 0.3 m	ELEVATION	WATER CONTENT (%)
182 0						
181 9 / 0 1	**TOPSOIL** (100mm)					
	FILL: sand and gravel trace to some silt brown moist loose	1	SS	10		o
181 3 / 0 7	**FILL:** silty sand some gravel containing cobbles and boulders grey moist compact	2	SS	56/8"	181	o
		3	SS	12		o
179 9 / 2 1	**SILTY CLAY TILL TO CLAYEY SILT TILL:** trace gravel some sand to sandy containing cobbles brown to grey moist very stiff to hard				180	
		4	SS	21		o
					179	
		5	SS	37		o
					178	
		6	SS	40	177	o
					176	
		7	SS	60		o
175 4 / 6 6	**END OF BOREHOLE**					

Notes
1) Borehole was open upon completion of drilling
2) Water encountered at a depth of 0 5 m during drilling
3) Water was at 3 0 m below ground surface upon completion of drilling

Column headings: SO L PROF LE; SAMPLES; GROUND WA ER COND ONS; ELEVA ON; DYNAM C CONE PENE RA ON RES S ANCE PLO (20 40 60 80 100); SHEAR STRENGTH (kPa) — O UNCONF NED, + FIELD VANE & Sensitivity, ● QU CK R AX AL, × LAB VANE (20 40 60 80 100); PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT W, LIQUID LIMIT W_L, WA ER CON EN (%) (10 20 30); POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (Mg/m^3); REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation Deep/Dual nstallation

GRAPH NO ES: $+^3$ $\times^3$ Numbers re er to Sensitivity; O ε=3% Strain at Failure

LOG OF BOREHOLE BH104

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/15/2014

REF NO 10001223
ENCL NO 13

ELEV (m) / DEPTH	DESCRIPTION	SAMPLE NUMBER	TYPE	"N" BLOWS / 0 3 m	ELEVATION	WATER CONTENT (%)
179 2						
179 0 / 0 0	**CONCRETE** (150mm)					
0 2	**FILL** sandy silt trace gravel brown moist				179	
178 8 / 0 4	**SILTY CLAY TILL TO CLAYEY SILT TILL:** trace gravel some sand to sandy containing cobbles brown to grey moist stiff to hard	1	SS	9		~23
		2	SS	22	178	~13
		3	SS	25	177	~14
		4	SS	29	176	~12
		5	SS	45	175	~10
		6	SS	22	174	~10
172 5 / 6 7		7	SS	32	173	~10

END OF BOREHOLE
Notes
1) Water encountered at a depth of 0 3 m during drilling
2) Borehole was open upon completion of drilling
3) Water was at 1 5 m below ground surface upon completion of drilling

Column headings also printed: DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100); SHEAR STRENGTH (kPa): ○ UNCONFINED, + FIELD VANE & Sensitivity, ● QUICK TRIAXIAL, × LAB VANE (20 40 60 80 100); PLASTIC LIMIT W_P, NATURAL MOISTURE CONTENT W, LIQUID LIMIT W_L; WATER CONTENT (%) 10 20 30; POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (Mg/m^3); REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL; GROUND WATER CONDITIONS; STRATA PLOT.

GROUNDWATER ELEVATIONS
Shallow/ Single Installation ▽ ▼ Deep/Dual Installation ▼ ▼

GRAPH NOTES $+^3$ $\times^3$ Numbers refer to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH105

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 14

ELEV DEP H (m)	DESCR PT ON	SAMPLE NUMBER	YPE	"N" BLOWS 0 3 m	ELEVA ON	WA ER CON EN (%)	GR SA S CL
178 0							
177 9 / 0 0	**TOPSOIL** (150mm)						
0 2	**FILL:** sand some gravel trace to some silt brown moist	1A	AS				
177 5 / 0 5	**SILTY CLAY TILL TO CLAYEY SILT TILL:** some gravel sandy brownto grey soft to dense	1B	AS				
		2	SS	4	177		9 23 41 27
		3	SS	4	176		
		4	SS	10	175		
		5	SS	21	174		
		6	SS	16	173		
					172		
171 4		7	SS	38			
6 6	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling						

Column headings: SO L PROF LE; SAMPLES; GROUND WA ER COND ONS; ELEVA ON; DYNAM C CONE PENE RA ON RES S ANCE PLO (20 40 60 80 100); SHEAR STRENGTH (kPa) ○ UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE (20 40 60 80 100); PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L WA ER CON EN (%) (10 20 30); POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (Mg/m^3); REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▼ ▽

GRAPH NO ES $+^3$ $\times^3$ Numbers re er to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH106

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 15

ELEV (m) / DEP H	SOIL PROFILE DESCRIPTION	SAMPLE NUMBER	TYPE	"N" BLOWS/0.3 m	NATURAL MOISTURE CONTENT
177 2					
177 0 / 0 0	**CONCRETE** (170mm)				
0 2	**FILL:**silty clay topsoil inclusion brown moist to wet firm	1	SS	6	○
		2A	SS	6	○
		2B	SS		○
175 8 / 1 4	**SILTY CLAY TILL TO CLAYEY SILT TILL:** trace gravel some sand to sandy containing cobbles interbeded with silty clay brown moist very stiff to dense				
		3	SS	18	○
		4	SS	24	○
		5	SS	35	○
		6	SS	15	○
		7	SS	7	○
170 5 / 6 7	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling				

Column headings: SOIL PROFILE; (m) ELEV DEPTH; DESCRIPTION; STRATA PLOT; SAMPLES: NUMBER, TYPE, "N" BLOWS 0.3 m; GROUND WATER CONDITIONS; ELEVATION (177, 176, 175, 174, 173, 172, 171); DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100; SHEAR STRENGTH (kPa) ○ UNCONFINED + FIELD VANE & Sensitivity ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100; PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L WATER CONTENT (%) 10 20 30; POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (Mg/m^3); REMARKS AND GRAIN SIZE DISTRIBUTION (%) GR SA SI CL

GROUNDWATER ELEVATIONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▽ ▼

GRAPH NOTES $+^3$ $\times^3$ Numbers refer to Sensitivity ○ ε=3% Strain at Failure

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Geotechnical Environmental Materials Hydrogeology

LOG OF BOREHOLE BH107

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014

REF NO 10001223
ENCL NO 16

ELEV (m) / DEP H	DESCR PT ON	NUMBER	YPE	"N" BLOWS / 0 3 m	GROUND WA ER COND ONS	ELEVA ON	NATURAL MOISTURE CONTENT W (%)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
175 2								
175 0 / 0 1	**TOPSOIL** (100mm)							
	FILL: sandy silt trace roots brown moist loose to compact	1	SS	8		175	○	
174 1 / 1 1		2	SS	22			○	
	SILTY CLAY TILL TO CLAYEY SILT TILL: trace gravel some sand to sandy interbeded with silty clay brown to grey moist stiff to dense					174		
		3	SS	21			○	
						173		
		4	SS	36			○	
						172		
		5	SS	19			○	
						171		
		6	SS	19			○	
						170		
						169		
		7	SS	15			○	
168 6 / 6 6	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling							

DYNAM C CONE PENE RA ON RES S ANCE PLO 20 40 60 80 100
SHEAR STRENGTH (kPa) ○ UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE 20 40 60 80 100
PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L
WA ER CON EN (%) 10 20 30
POCKET PEN. (Cu) (kPa)
NATURAL UNIT WT (Mg/m^3)

SPL SO L LOG 10001223-COUR NEYPARK DR E-20150427 - W H ELEVA ON GPJ SPL GD 4/27/15

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▼ ▼

GRAPH NO ES $+^3$ $\times^3$ Numbers re er to Sensitivity ○ ε=3% Strain at Failure

LOG OF BOREHOLE BH108

PROJECT Preliminary Geotechnical nvestigation for Class EA
CL ENT Stantec
PROJECT LOCAT ON Courtneypark Dr E Mississauga ON
DATUM
BH LOCAT ON See Borehole Location Plan

DRILLING DATA
Method Soild Stem Auger
Diameter 115 mm
Date Dec/12/2014
REF NO 10001223
ENCL NO 17

ELEV (m) / DEP H	DESCR PT ON	SAMPLE NUMBER	YPE	"N" BLOWS / 0 3 m	ELEVA ON	WA ER CON EN (%)	REMARKS AND GRA N S ZE D S R BU ON (%) GR SA S CL
174 2							
174 0 / 0 1	**TOPSOIL** (100mm)						
	FILL: sandy silt trace roots brown moist loose	1	SS	7	174		
173 4 / 0 8	**SILTY CLAY TILL TO CLAYEY SILT TILL:** trace gravel some sand to sandy brown to grey moist stiff to very stiff	2	SS	11	173		
		3	SS	20	172		
		4	SS	30			
		5	SS	15	171		9 22 37 32
					170		
		6	SS	10	169		
168 6 / 5 6	**SILTY CLAY:** trace gravel some sand grey moist firm				168		
		7	SS	7			2 13 39 46
167 6 / 6 6	**END OF BOREHOLE** Notes 1) Borehole was open and dry upon completion of drilling						

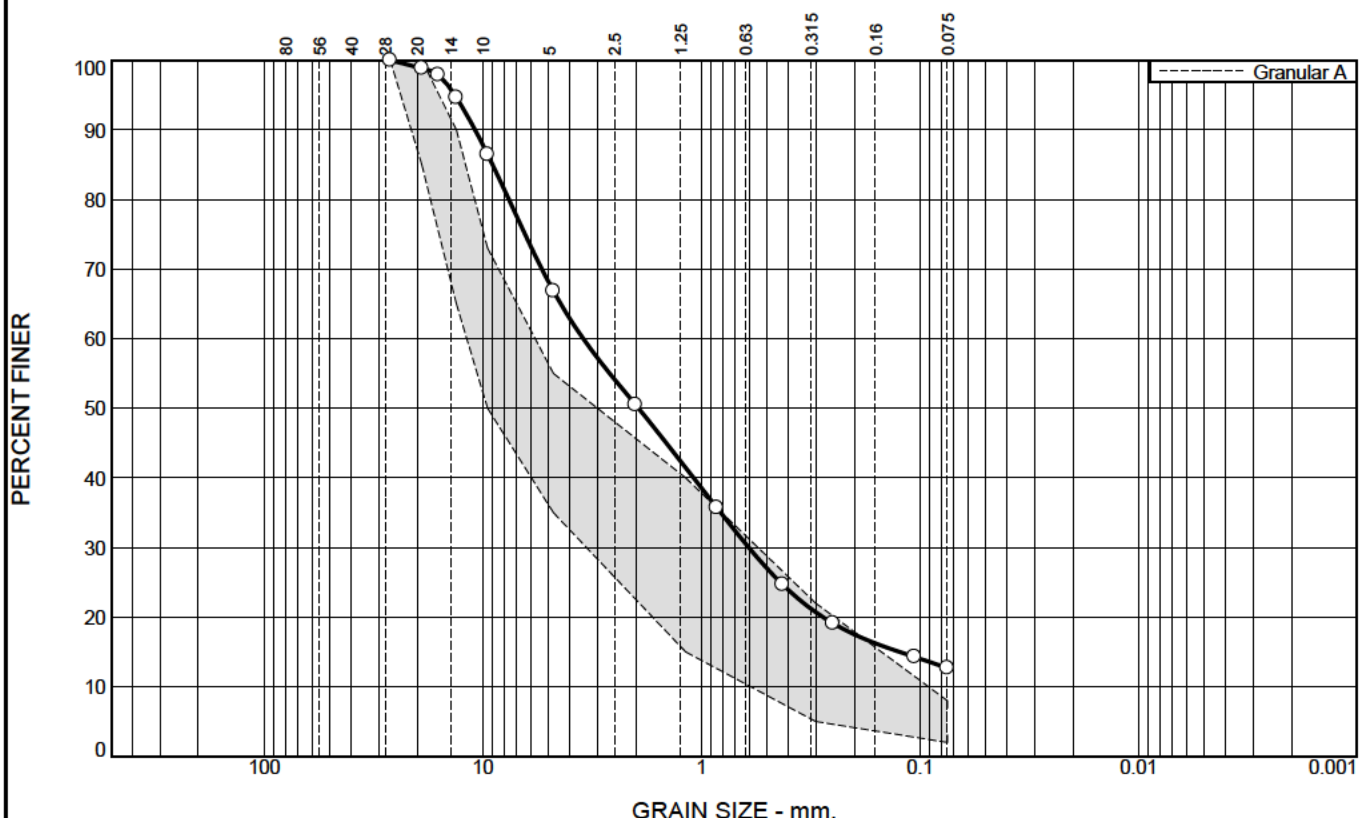
Column headers also include: S RA A PLO; GROUND WA ER COND ONS; DYNAM C CONE PENE RA ON RES S ANCE PLO (20 40 60 80 100); SHEAR STRENGTH (kPa) ○ UNCONF NED + FIELD VANE & Sensitivity ● QU CK R AX AL × LAB VANE (20 40 60 80 100); PLASTIC LIMIT W_P NATURAL MOISTURE CONTENT W LIQUID LIMIT W_L (10 20 30); POCKET PEN. (Cu) (kPa); NATURAL UNIT WT (Mg/m^3)

GROUNDWA ER ELEVA ONS
Shallow/ Single nstallation ▽ ▼ Deep/Dual nstallation ▼ ▼

GRAPH NO ES: $+^3$ $\times^3$ Numbers re er to Sensitivity; ○ ε=3% Strain at Failure

FIGURES

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.1	32.1	16.3	25.8	12.0	12.7	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
26.5mm	100.0	100.0	
19mm	98.9	85.0 - 100.0	
16mm	97.9		
13.2mm	94.7	65.0 - 90.0	X
9.5mm	86.5	50.0 - 73.0	X
4.75mm	66.8	35.0 - 55.0	X
2.00mm	50.5		
0.850mm	35.7		
0.425mm	24.7		
0.250mm	19.1		
0.106mm	14.3		
0.075mm	12.7	2.0 - 8.0	X

* Granular A

Soil Description

Sand & Gravel, some silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 10.8430 D_{85}= 9.0200 D_{60}= 3.4703
D_{50}= 1.9395 D_{30}= 0.6072 D_{15}= 0.1240
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

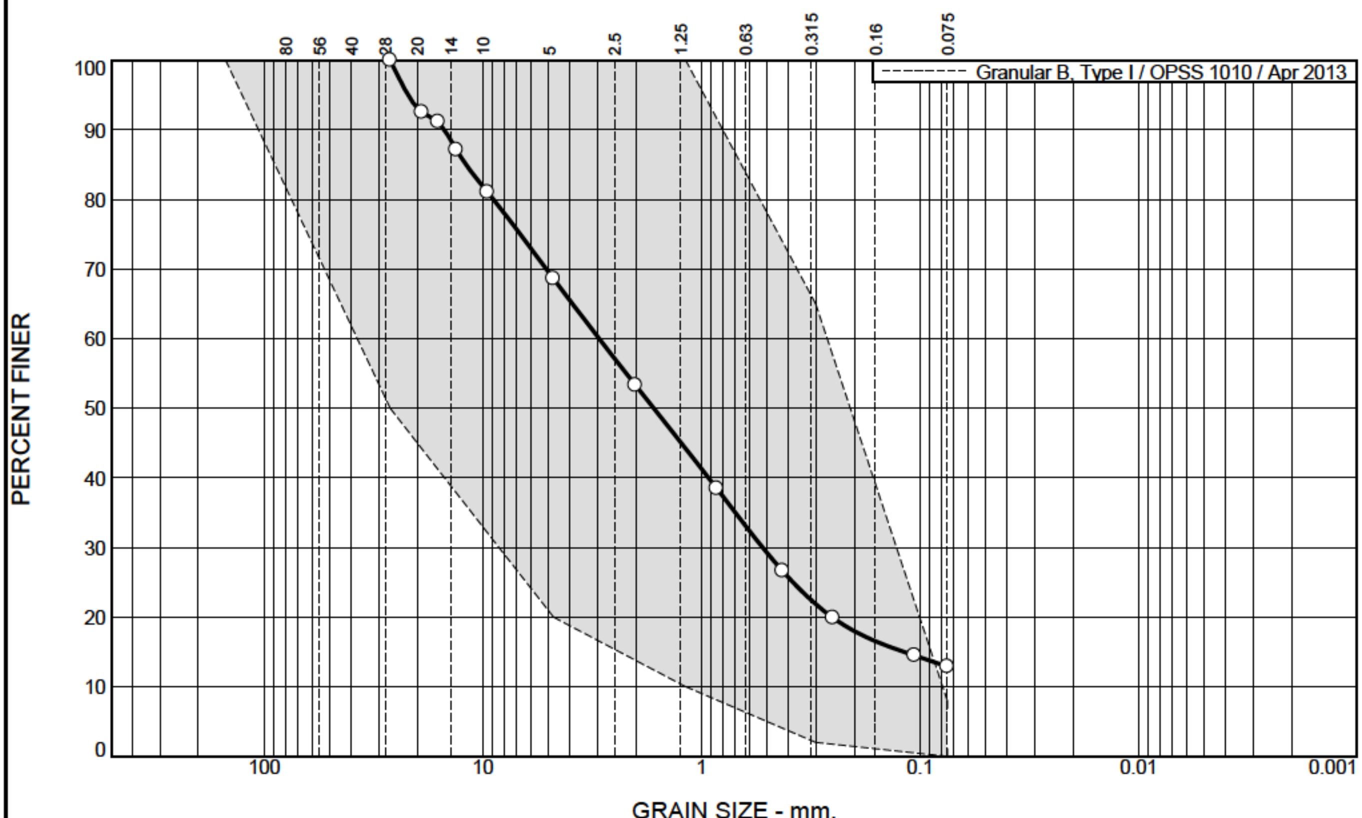
Sampled by Sarah

Location: BH2 AS1
Sample Number: MM-1453 **Date:**

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 1

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	7.5	23.9	15.3	26.7	13.7	12.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
26.5	100.0	50.0 - 100.0	
19mm	92.5		
16mm	91.1		
13.2mm	87.1		
9.5mm	81.0		
4.75mm	68.6	20.0 - 100.0	
2.00mm	53.3		
0.850mm	38.5		
0.425mm	26.6		
0.250mm	19.9		
0.106mm	14.5		
0.075mm	12.9	0.0 - 8.0	X

* Granular B, Type I / OPSS 1010 / Apr 2013

Soil Description

Sand & Gravel, some silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 14.9660 D_{85}= 11.9208 D_{60}= 2.9333
D_{50}= 1.6508 D_{30}= 0.5243 D_{15}= 0.1184
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

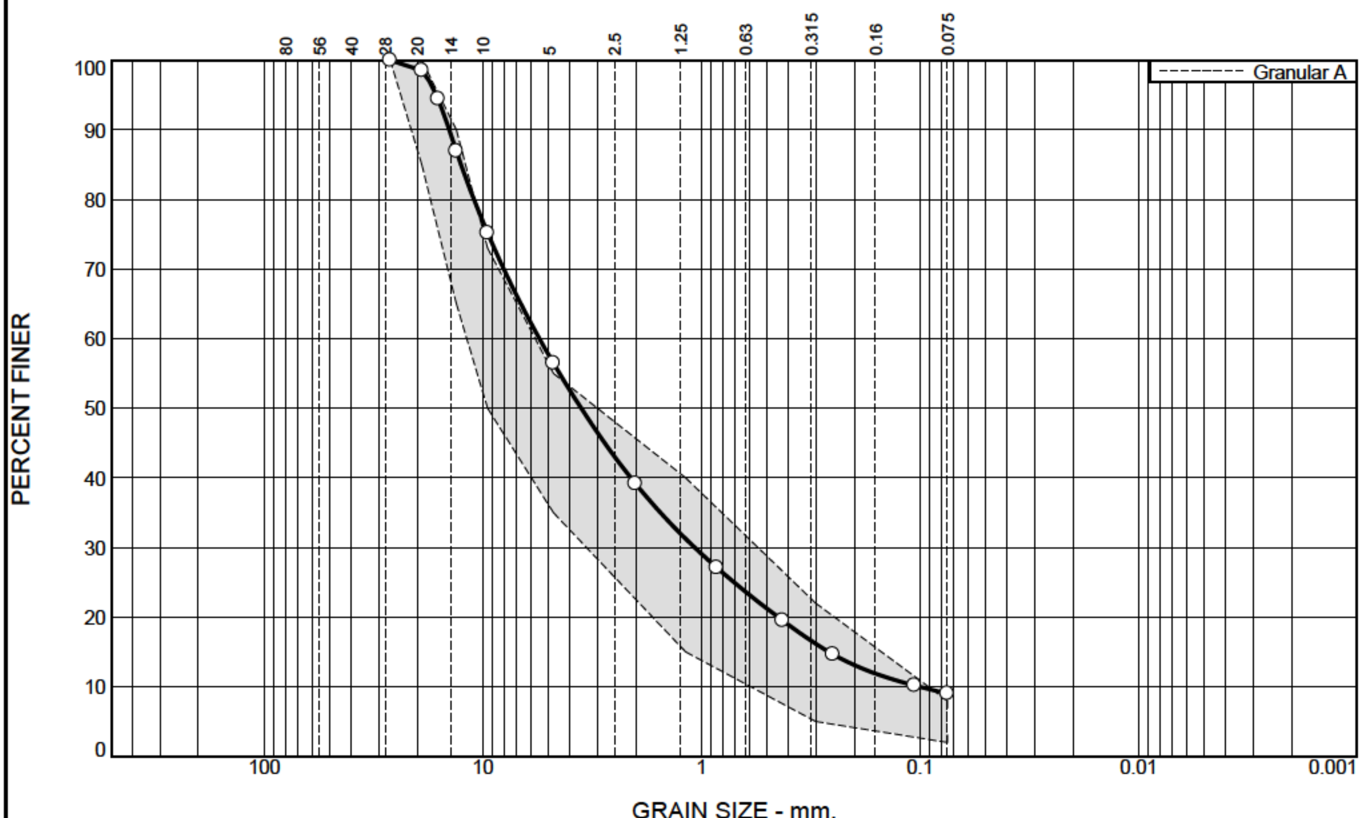
Sampled by Sarah

Location: BH2 AS2
Sample Number: MM-1454
Date:

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 2

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	1.5	42.0	17.3	19.7	10.5	9.0	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
26.5mm	100.0	100.0	
19mm	98.5	85.0 - 100.0	
16mm	94.4		
13.2mm	86.9	65.0 - 90.0	
9.5mm	75.2	50.0 - 73.0	X
4.75mm	56.5	35.0 - 55.0	X
2.00mm	39.2		
0.850mm	27.1		
0.425mm	19.5		
0.250mm	14.6		
0.106mm	10.2		
0.075mm	9.0	2.0 - 8.0	X

* Granular A

Soil Description

Sand & Gravel, trace silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 14.2222 D_{85}= 12.5679 D_{60}= 5.5036
D_{50}= 3.5442 D_{30}= 1.0729 D_{15}= 0.2614
D_{10}= 0.1007 C_u= 54.65 C_c= 2.08

Classification

USCS= AASHTO=

Remarks

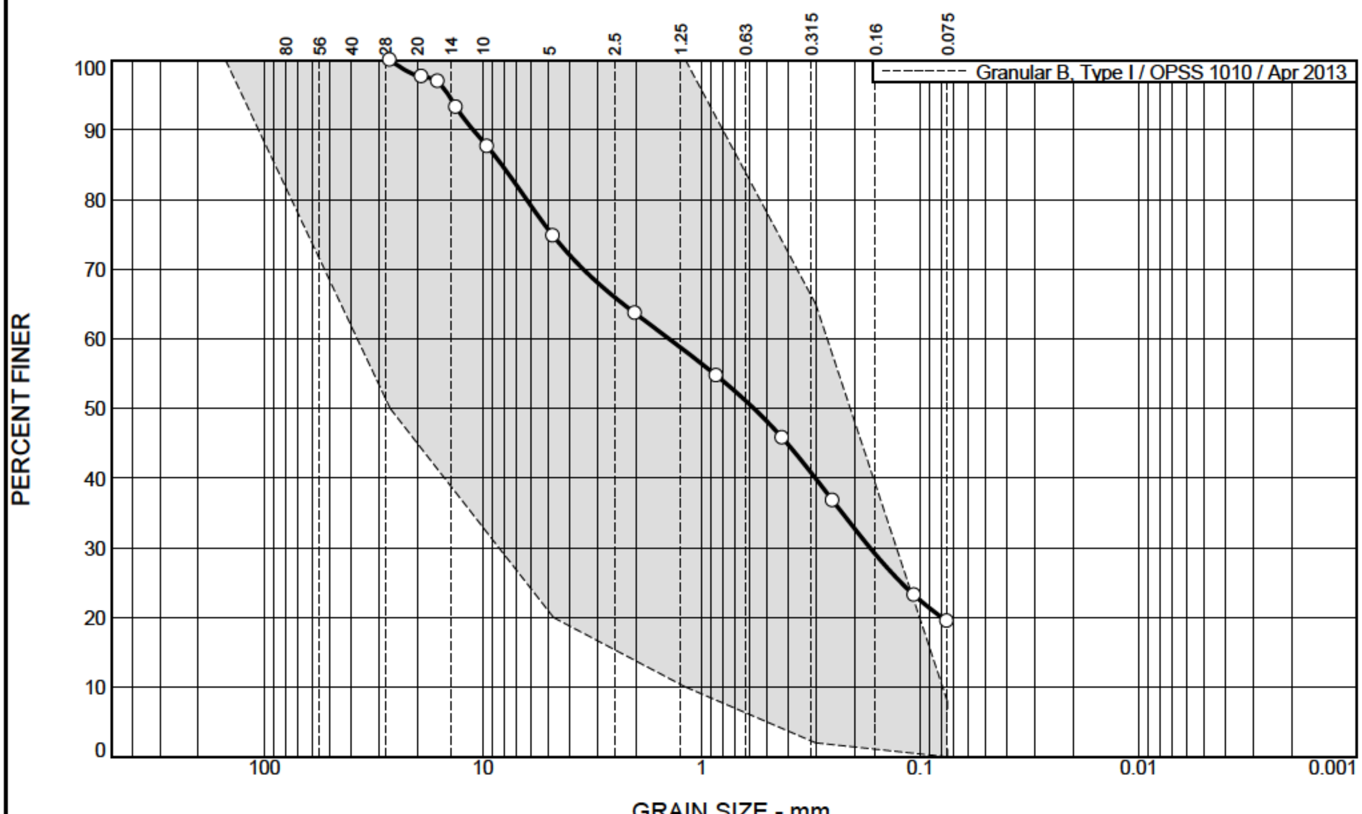
Sampled by Sarah

Location: BH6 AS1
Sample Number: MM-1455 **Date:**

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 3

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	2.4	22.8	11.2	17.9	26.3	19.4	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
26.5mm	100.0	50.0 - 100.0	
19mm	97.6		
16mm	96.9		
13.2mm	93.2		
9.5mm	87.6		
4.75mm	74.8	20.0 - 100.0	
2.00mm	63.6		
0.850mm	54.7		
0.425mm	45.7		
0.250mm	36.7		
0.106mm	23.2		
0.075mm	19.4	0.0 - 8.0	X

* Granular B, Type I / OPSS 1010 / Apr 2013

Soil Description

Sand, some gravel, some silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 11.0644 D_{85}= 8.1874 D_{60}= 1.4051
D_{50}= 0.5744 D_{30}= 0.1692 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

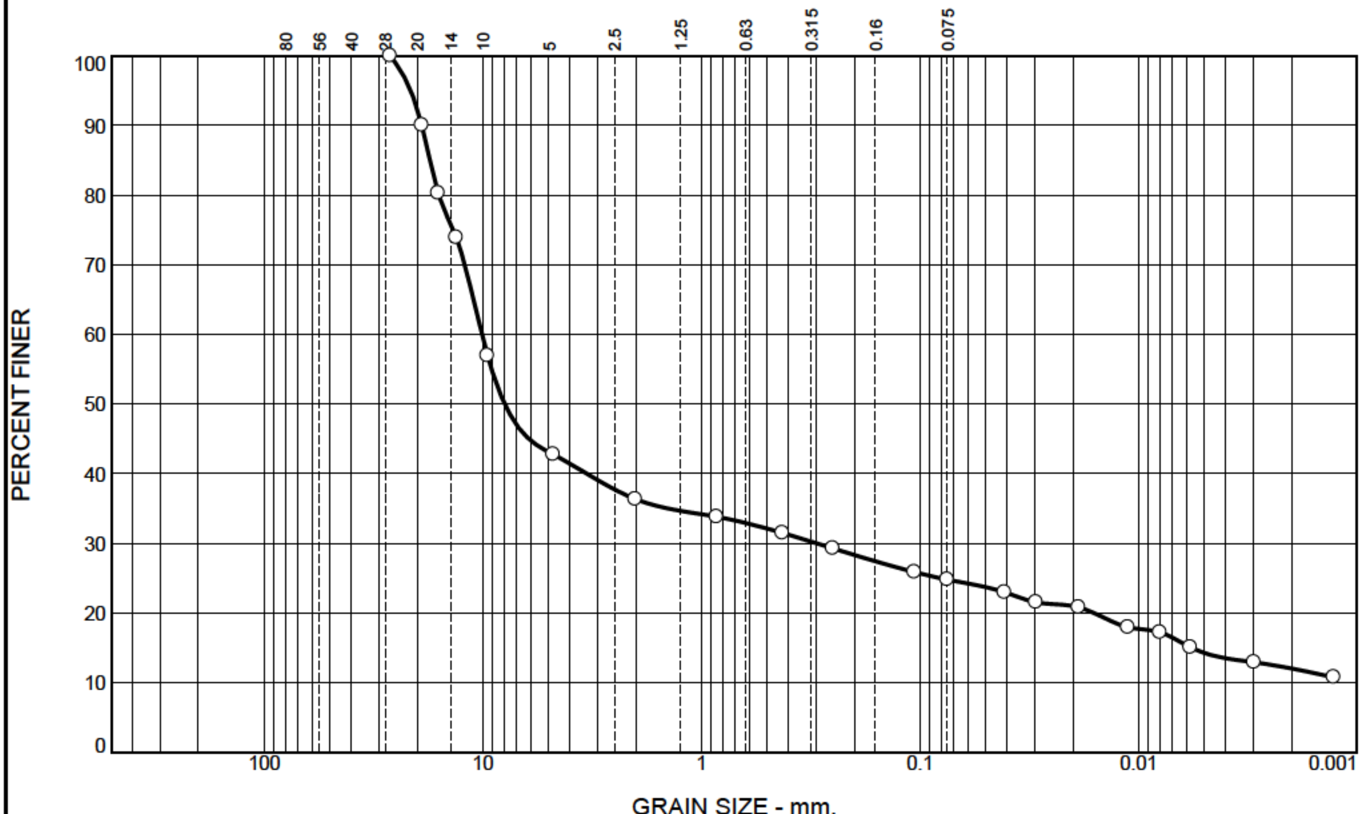
Sampled by Sarah

Location: BH6 AS2
Sample Number: MM-1456
Date:

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 4

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	9.8	47.4	6.5	4.8	6.7	12.8	12.0

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
26 5mm	100 0		
19mm	90 0		
16mm	80 3		
13 2mm	73 9		
9 5mm	56 9		
4 75mm	42 8		
2 00mm	36 3		
0 850mm	33 8		
0 425mm	31 5		
0 250mm	29 3		
0 106mm	25 9		
0 075mm	24 8		
0 0410 mm	23 0		
0 0295 mm	21 5		
0 0188 mm	20 8		
0 0112 mm	17 9		
0 0080 mm	17 2		
0 0058 mm	15 1		
0 0030 mm	12 9		
0 0013 mm	10 8		

* (no specification provided)

Soil Description

Gravel, some sand, some silt, some clay

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 18.9852 D_{85}= 17.4338 D_{60}= 10.0782
D_{50}= 7.9356 D_{30}= 0.2969 D_{15}= 0.0057
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

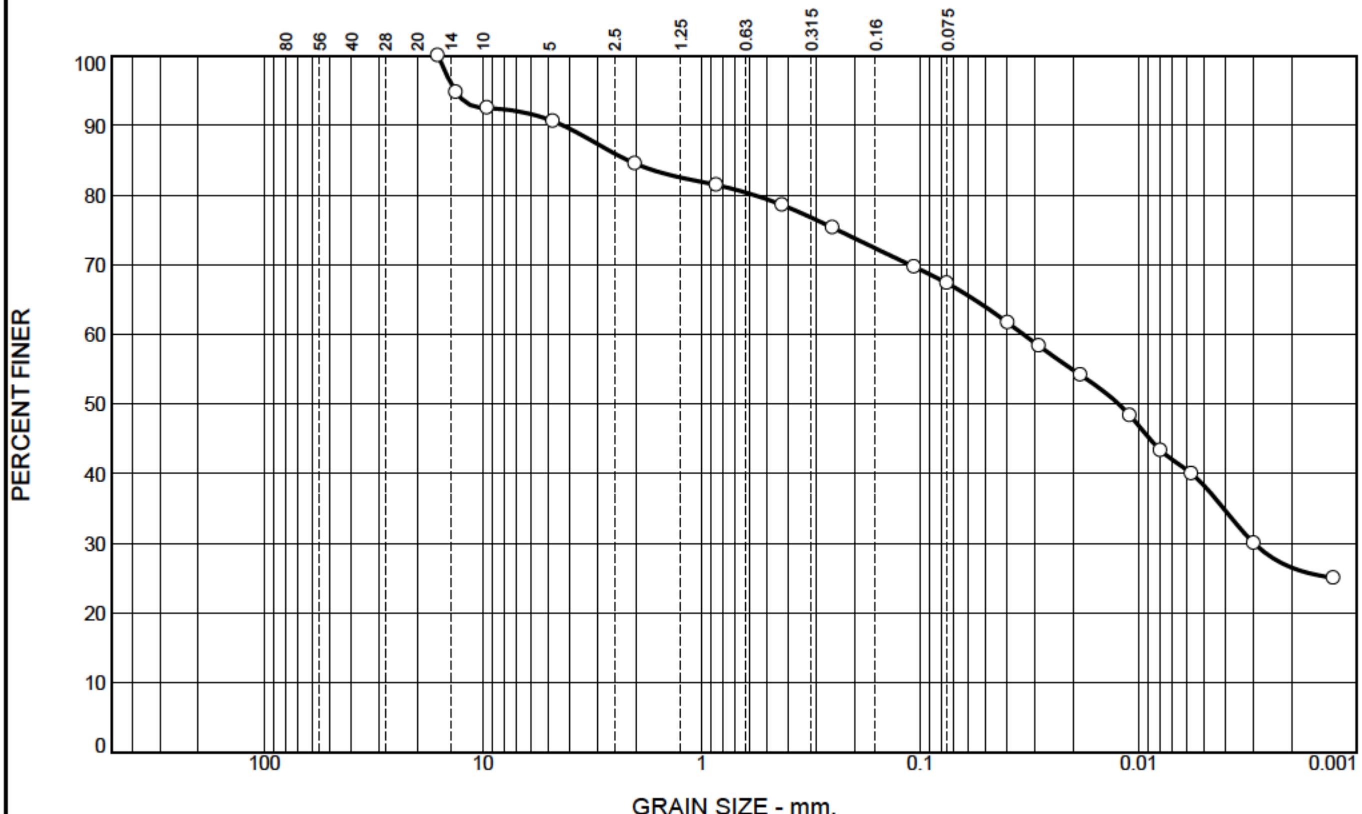
Sampled by Sarah

Location: BH102 SS2
Sample Number: MM-1450 **Date:**

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 5

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.4	6.1	5.9	11.3	40.8	26.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100 0		
13 2mm	94 7		
9 5mm	92 5		
4 75mm	90 6		
2 00mm	84 5		
0 850mm	81 4		
0 425mm	78 6		
0 250mm	75 3		
0 106mm	69 7		
0 075mm	67 3		
0 0396 mm	61 6		
0 0285 mm	58 3		
0 0184 mm	54 1		
0 0109 mm	48 3		
0 0079 mm	43 3		
0 0057 mm	40 0		
0 0030 mm	30 0		
0 0013 mm	25 0		

* (no specification provided)

Soil Description

Clayey silt till, sandy, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 4.3002 D_{85}= 2.1696 D_{60}= 0.0337
D_{50}= 0.0123 D_{30}= 0.0030 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

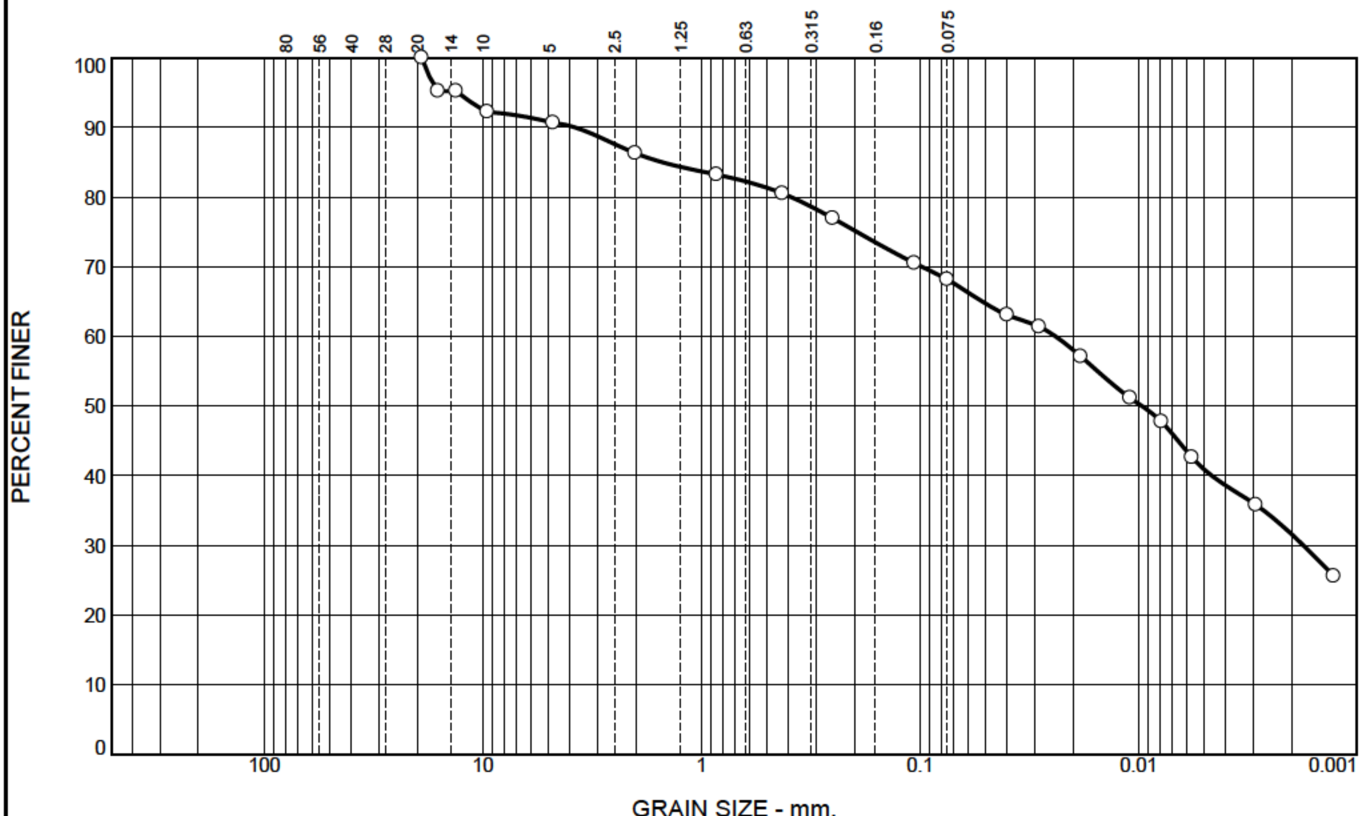
Sampled by Sarah

Location: BH105 SS2
Sample Number: MM-1451
Date:

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 6

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	9.4	4.3	5.8	12.3	36.6	31.6

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
19mm	100 0		
16mm	95 2		
13 2mm	95 2		
9 5mm	92 2		
4 75mm	90 6		
2 00mm	86 3		
0 850mm	83 2		
0 425mm	80 5		
0 250mm	76 9		
0 106mm	70 5		
0 075mm	68 2		
0 0398 mm	63 1		
0 0284 mm	61 4		
0 0184 mm	57 1		
0 0109 mm	51 1		
0 0078 mm	47 7		
0 0057 mm	42 6		
0 0029 mm	35 8		
0 0013 mm	25 6		

* (no specification provided)

Soil Description

Silty clay till, sandy, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.7810 D_{85}= 1.5091 D_{60}= 0.0240
D_{50}= 0.0097 D_{30}= 0.0018 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

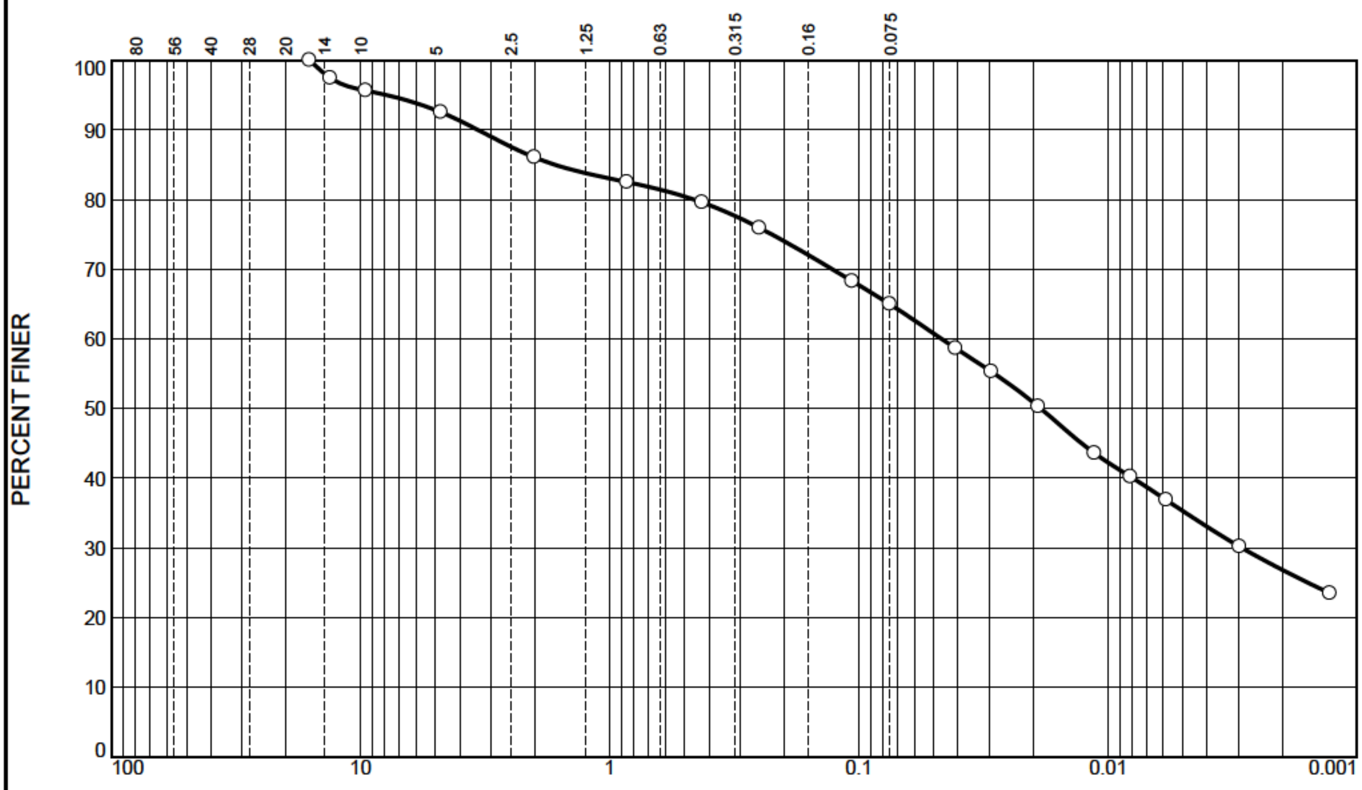
Sampled by Sarah

Location: BH108 SS5
Sample Number: MM-1452
Date:

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 7

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	7.5	6.5	6.4	14.6	38.2	26.8

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
16mm	100 0		
13 2mm	97 4		
9 5mm	95 6		
4 75mm	92 5		
2 00mm	86 0		
0 850mm	82 5		
0 425mm	79 6		
0 250mm	75 9		
0 106mm	68 3		
0 075mm	65 0		
0 0408 mm	58 6		
0 0293 mm	55 3		
0 0190 mm	50 3		
0 0113 mm	43 6		
0 0081 mm	40 2		
0 0058 mm	36 9		
0 0030 mm	30 2		
0 0013 mm	23 5		

* (no specification provided)

Soil Description

Clayey silt till, Sandy, trace gravel

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 3.3760 D_{85}= 1.6581 D_{60}= 0.0465
D_{50}= 0.0186 D_{30}= 0.0029 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO=

Remarks

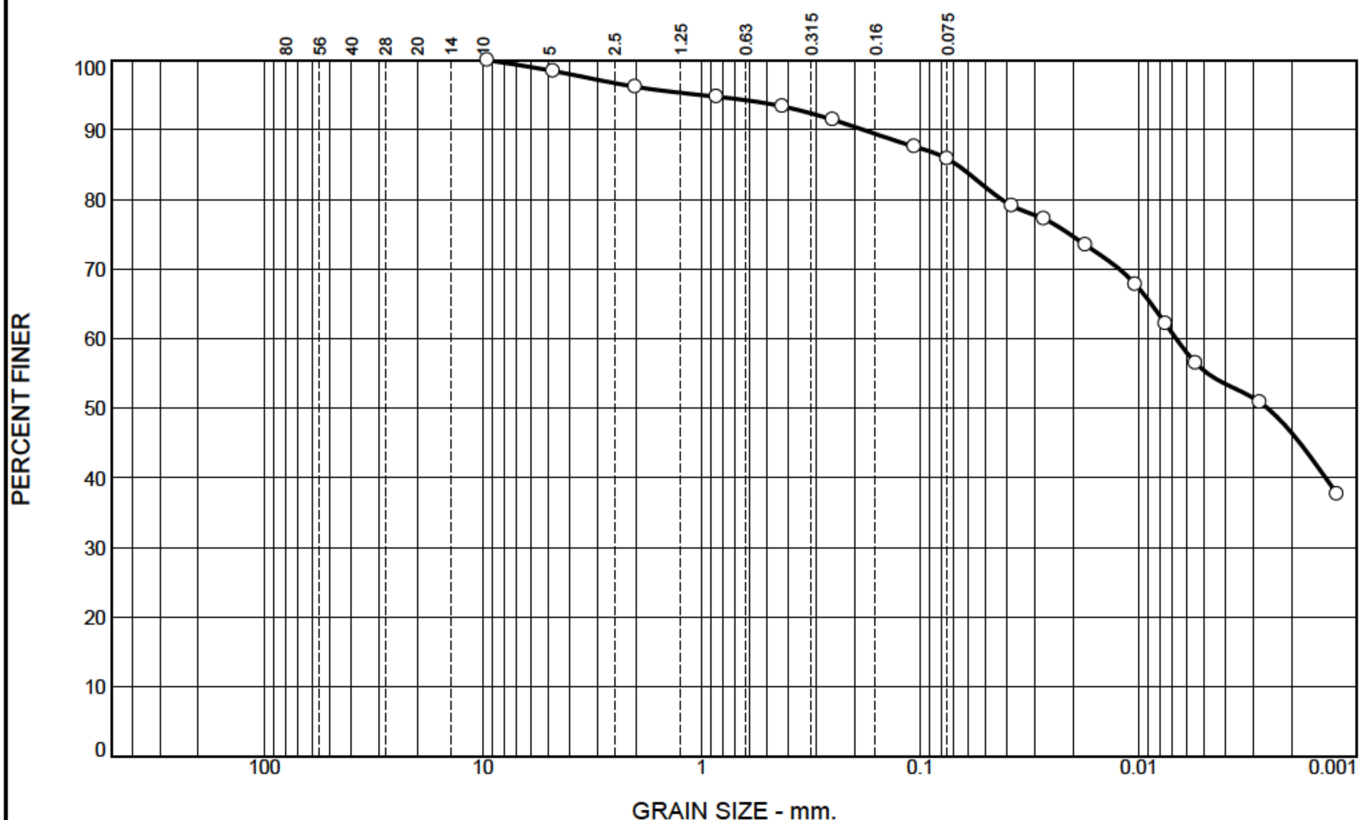
Sampled by Sarah
F.M.=1.11

Location: BH101 SS4
Sample Number: MM-1449
Date:

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 8

Particle Size Distribution Report



% +3"	% Gravel		% Sand			% Fines	
	Coarse	Fine	Coarse	Medium	Fine	Silt	Clay
0.0	0.0	1.6	2.2	2.8	7.6	39.3	46.5

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
9.5mm	100.0		
4.75mm	98.4		
2.00mm	96.2		
0.850mm	94.8		
0.425mm	93.4		
0.250mm	91.4		
0.106mm	87.6		
0.075mm	85.8		
0.0379 mm.	79.1		
0.0271 mm.	77.2		
0.0174 mm.	73.4		
0.0103 mm.	67.8		
0.0075 mm.	62.1		
0.0055 mm.	56.5		
0.0028 mm.	50.8		
0.0012 mm.	37.7		

* (no specification provided)

Soil Description

Silty clay, some sand, trace gravel

Atterberg Limits

PL= 16 LL= 31 PI= 15

Coefficients

D_{90}= 0.1814 D_{85}= 0.0679 D_{60}= 0.0067
D_{50}= 0.0026 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= CL AASHTO= A-6(11)

Remarks

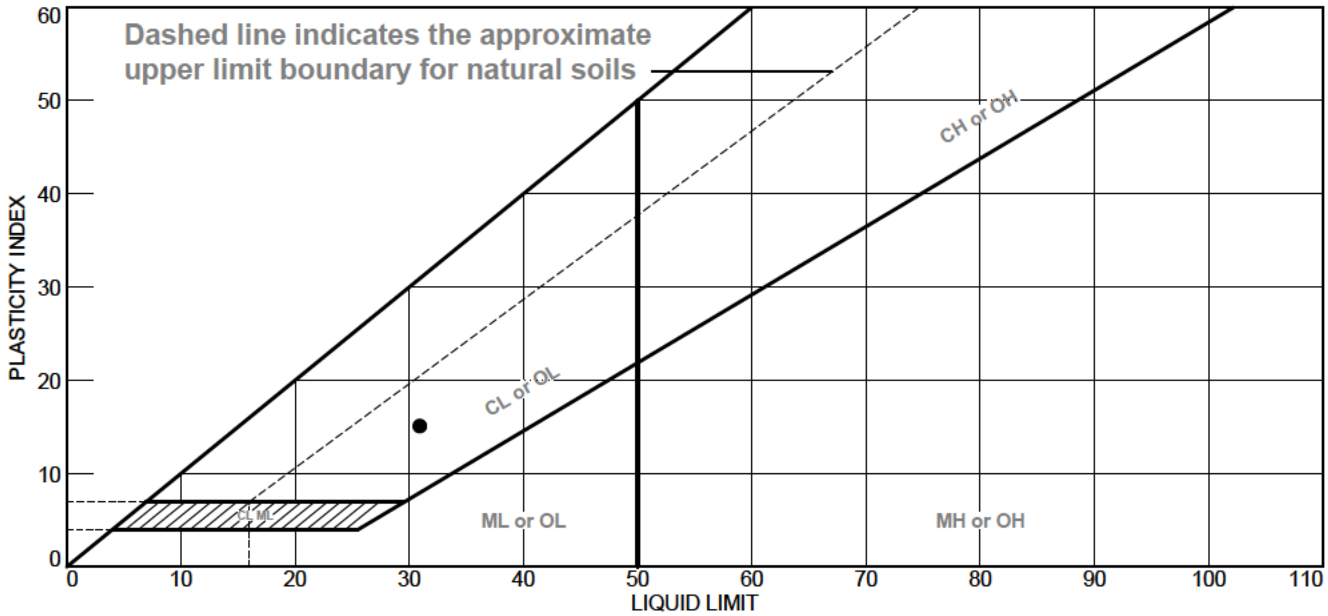
Sampled by Sarah

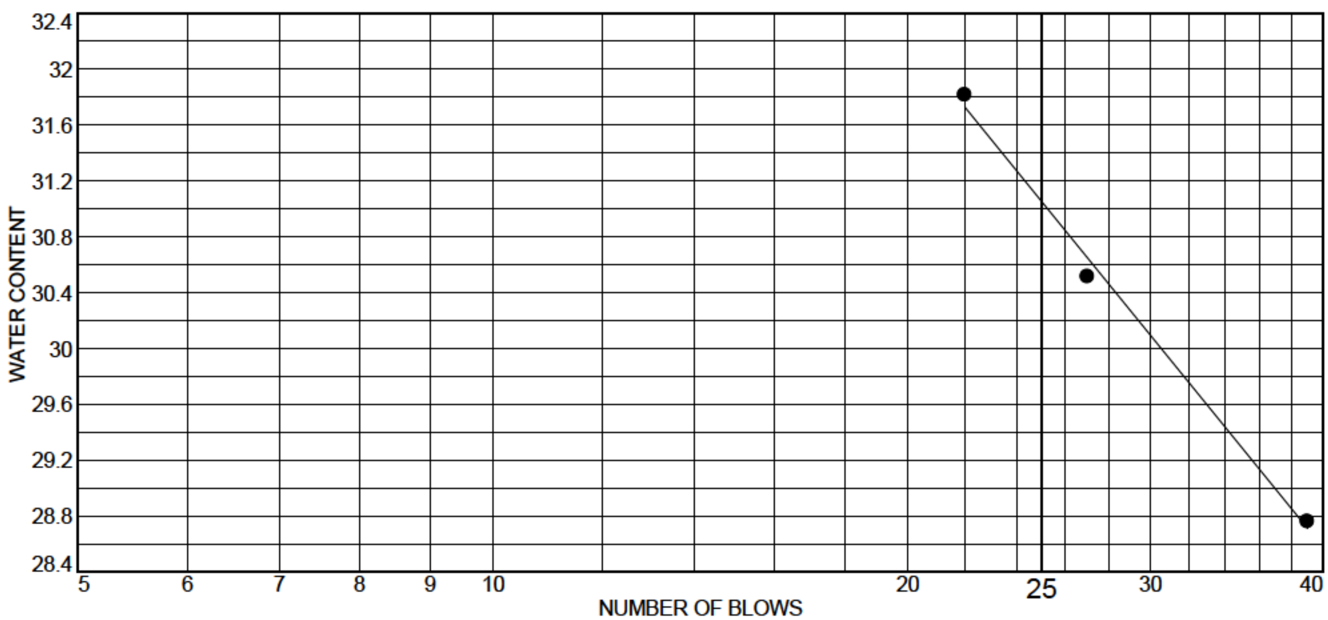
Location: BH108 SS7
Sample Number: MM-1457
Date:

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Client: Stantec
Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario
Project No: 10001223 **Figure** 9

LIQUID AND PLASTIC LIMITS TEST REPORT





	MATERIAL DESCRIPTION	LL	PL	PI	%<#40	%<#200	USCS
●	Silty clay, some sand, trace gravel	31	16	15	93.4	85.8	CL

Project No. 10001223 **Client:** Stantec

Project: Geotechnical Investigation for Class EA & Preliminary Design for Courtneypark Dr. Mississauga, Ontario

Location: BH108 SS7

Sample Number: MM-1457

Remarks:

SPL Consultants Limited
Geotechnical Environmental Materials Hydrogeology

Figure 10

APPENDIX A

PHOTOGRAPHS OF ASPHALT CORES

(Photographs 1-3)

Photo 1, BH1

Photo 2, BH3

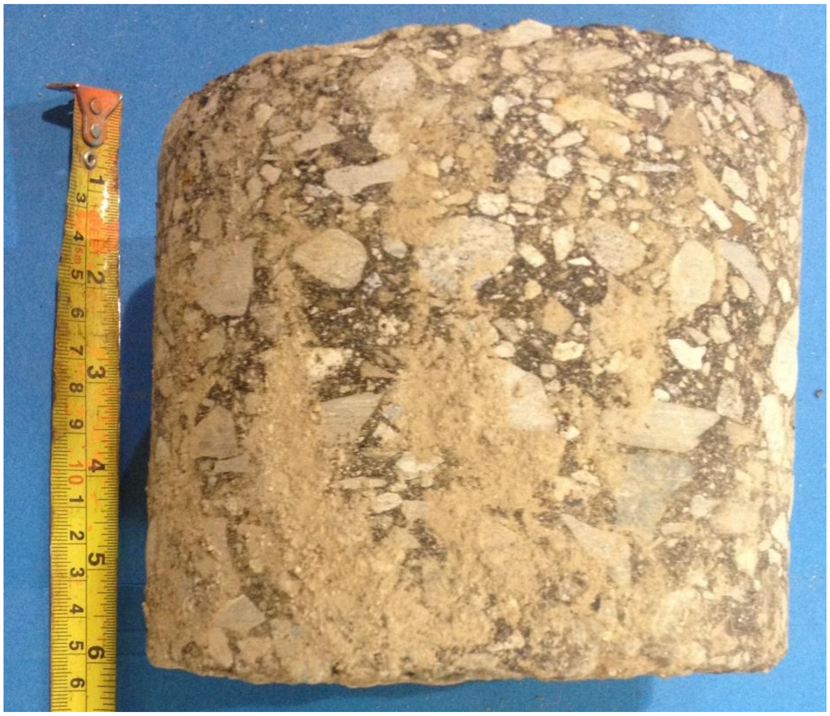


Photo 3, BH 6

APPENDIX B

PHOTOGRAPHS OF EXISTING PAVEMENT

(Photographs were taken on November 19, 2014)

- Courtneypark Drive East – Looking east.

  - Good to fair condition with slight edge cracking and transverse cracking.

- Courtneypark Drive East – Looking west.

  - Fair condition. Moderate to slight transverse and longitudinal cracking.

- Courtneypark Drive East – Looking east.

  - Fair Condition with slight to moderate transverse cracking and map crack.

- Courtneypark Drive East – Looking north.

  - Fair condition with slight to moderate transverse and longitudinal cracking and slight loss of aggregates.

- Courtneypark Drive East – Looking south.

  - Fair condition with slight to moderate loss aggregate, longitudinal cracking and transverse cracking.

- Courtneypark Drive East – Looking east.

  - Fair condition with moderate to severe edge cracking, loss aggregate and alligator crack.

- Courtneypark Drive East – Looking west.

  - Fair condition with moderate edge cracking and pavement distortion.

- Courtneypark Drive East – Looking west.

  - Fair condition with moderate longitudinal cracking, slight loss aggregate, moderate edge crack and alligator crack.

- Courtneypark Drive East – Looking west.

  - Poor condition with severe rutting, moderate edge cracking and pavement distortion.

- Courtneypark Drive East – Looking west.

  - Poor condition with transverse cracking, slight loss aggregate, moderate to severe edge crack and rutting.