

**FOUNDATION INVESTIGATION AND DESIGN REPORT
NOISE BARRIER WALLS
HIGHWAY 401 WESTBOUND COLLECTOR
REHABILITATION
FROM BAYVIEW AVENUE TO JANE STREET
TORONTO, ONTARIO
MTO GWP 2074-13-00**

GEOCRES No. 30M11-259

Report to

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Each of Appendices A to F includes:

- Record of Borehole Sheets
- Laboratory Test Results
- Drawings titled “Borehole Locations”

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PART 1: FACTUAL INFORMATION

1 INTRODUCTION

This report presents the factual findings obtained from a foundation investigation conducted for the detailed design of noise barrier walls adjacent to the Highway 401 Westbound Collector Lane, from Bayview Avenue to Jane Street in Toronto, Ontario. Seven noise barrier wall segments are proposed along the indicated section of the Highway 401. A substantial length of these proposed walls is to replace existing noise barrier walls as part of the rehabilitation project of Highway 401 Westbound Collector Lanes which involves rehabilitation of westbound collector pavement, structural rehabilitation of bridges and associated retaining walls.

The purpose of this investigation was to explore the subsurface conditions near the alignment of each noise barrier wall and, based on the data obtained, to provide borehole location plans, records of boreholes, laboratory test results and written descriptions of the subsurface conditions.

Thurber was retained by MMM Group Limited (MMM) to carry out the foundation investigation at this site on behalf of the Ministry of Transportation Ontario (MTO) under Purchase Order No. 2013-E-0045.

During the preparation of this report and in addition to the boreholes drilled, reference has been made to information on subsurface conditions contained in previous foundation reports for these sites. The titles of these reports are listed as follows:

- Foundation Investigation for Proposed Extension of Bridge at Black Creek and Highway 401, North York, County of York, District # 6, W.J. 61-F-113, W.P. 85-59-3, GEOCRES No. 30M11-134, dated January 19, 1962. (Reference 1). *Noise barrier wall, Segment 1*
- Foundation Investigation for Proposed Basket Weave Structure at Privet Road and Highway 401, Toronto, District # 6, W.J. 62-F-85, W.P. 105-62, GEOCRES No. 30M11-086, dated August 10, 1962. (Reference 2). *Noise barrier wall, Segment 1*

- D.H.O. Foundation Investigation Spadina Bridge #1, Proposed Retaining Wall, Adjacent to Ramp from Highway 401 to Dufferin Street, South, Highway 401, Toronto By-Pass, District # 6, W.P. 233-62-2-1, W.J. 63-F-24, GEOCREs No. 30M11-081, dated July 9, 1963. (Reference 3). *Noise barrier wall, Segment 2*
- Report to Department of Highways, Ontario on Soil Conditions and Foundations, Proposed Widening Highway 401, Bathurst Street and Avenue Road, W.P. 146-58, District # 6, Downsview, Ontario, GEOCREs No. 30M11-080, dated May 24, 1962. (Reference 4). *Noise barrier wall, Segments 3 and 4*
- Foundation Investigation Report for Proposed Retaining Walls on the North and South Sides of Highway 401 between Yonge Street and Bayview Avenue, Toronto, W.J. 64-F-0, W.P. 252-61-2, District No. 6, GEOCREs 30M14-126, dated July 22, 1964. (Reference 5). *Noise barrier wall, Segments 5 and 6*
- Foundation Investigation Report for Retaining Walls on Highway 401 near Leslie Street, Lots 14 and 15, Cons. II E.Y.S., County of York, Twp. of North York, District No. 6, W.J. 64-F-8, W.P. 252-61-3, GEOCREs 30M14-095, dated March 6, 1964. (Reference 6). *Noise barrier wall, Segment 7*

2 PROJECT AND SITE DESCRIPTION

The proposed noise barrier walls are located along the Highway 401 Westbound collector lane, from Bayview Avenue to Jane Street. Seven segments of the noise barrier walls are planned as described below:

Noise Barrier Wall Segment	Location	Approximate Length (m)
1	East of Jane Street	1400
2	West of Dufferin Street	900
3	East of Bathurst Street Off Ramp West of Bathurst Street Off Ramp	300 800
4	West of Avenue Road	350
5 & 6	West of Bayview	1,250
7	East of Bayview	85

The sites are located along the north side of the Highway 401 corridor within areas of residential and commercial developments. The terrain along the wall alignments involves minor undulations.

According to the Physiography of Southern Ontario by L.J. Chapman and D.F. Putnam, 1984, the project sites are located within the physiographic region known as the South Slope. The South

Slope is a smooth and drumlinized till plain that has formed as a result of glacial action and deposition of till materials just south of the Oak Ridges Moraine. The South Slope contains a variety of soils that have been deposited over till. The depth of overburden is generally more than 50 m.

3 SITE INVESTIGATION AND FIELD TESTING

Details of the site investigation and field testing for each project component are presented in Table 3.1.

Table 3.1 – Borehole Designations and Details

Noise Barrier Segment	Date	Borehole	Sampled borehole termination depth* (m)	Sampled borehole termination elevation* (m)	Appendix
1	September 14, 21 to 23, 2015	15-01 to 15-08	9.8	123.1 to 145.5	A
2	September 24, 29, 30 and October 1, 2015	15-09 to 15-14	9.8	176.0 to 182.9	B
3	September 15 to 17, 2015	15-15 to 15-19	9.8	174.4 to 180.8	C
4	August 25, 2015	15-20	9.8	170.4	D
5 & 6	August 23 and 24, 2015	15-21 to 15-24	9.8	157.5 to 161.7	E
7	August 25, 2015	15-25	9.8	161.0	F

The approximate locations of the boreholes drilled during the investigation are shown on the attached Borehole Locations Drawings in Appendices A to F. The coordinates and elevations of the boreholes are given on the drawings and on the individual Record of Borehole Sheets in Appendices A to F. Most of the new boreholes were drilled from the shoulder grade of the Highway 401 Westbound Collector. Boreholes drilled during the previous investigations (References 1 to 6) are also shown on the drawings. It is important to note, however, that many of those previous boreholes had been drilled several decades ago, and that substantial changes to the subsurface conditions due to subsequent construction activities could have occurred.

The borehole locations were marked in the field and utility clearances were obtained prior to drilling.

During this investigation, truck mounted D90, CME55 and CME75 drill rigs were used at this site. Solid stem augers were used to advance the boreholes. Soil samples were obtained at selected depth intervals using a split spoon sampler in conjunction with the Standard Penetration Testing (SPT).

The drilling and sampling operations were supervised on a full time basis by a member of Thurber's technical staff. The supervisor logged the boreholes and processed the recovered soil samples for transport to Thurber's laboratory for further examination and testing.

Groundwater conditions were observed in the open boreholes during and upon completion of the drilling operations. Standpipe piezometers consisting of a 19 mm diameter Schedule 40 PVC pipe with a 3.0 m long slotted screen, were installed and embedded in filter sand in selected boreholes to permit longer term groundwater level monitoring. The completion details of the piezometers and boreholes are summarized in Table 3.2.

Table 3.2 – Piezometer and Borehole Completion Details

Noise Barrier Wall Segment	Borehole Number	Piezometer Tip Depth / Elevation (m)	Completion Details
1	1	9.1/123.8	Backfilled with filter sand from 9.8 to 4.9 m, bentonite holeplug from 4.9 m to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
	2	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface.
	3	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface.
	4	9.1/131.5	Backfilled with filter sand from 9.8 to 4.9 m, bentonite holeplug from 4.9 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
	5	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface.
	6	9.1/140.6	Backfilled with filter sand from 9.8 m to 4.9 m, bentonite holeplug from 4.9 m to 0.6 m, sand from 0.6 m to 0.3 m, then grout to ground surface.
	7	None installed	Backfilled with holeplug and auger cuttings to 0.3 m, sand from 0.3 m to 0.2 m, then asphalt coldpatch to surface.
	8	9.1/146.2	Backfilled with filter sand from 9.8 to 5.5 m, bentonite holeplug from 5.5 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
2	9	9.1/176.7	Backfilled with filter sand from 9.8 to 4.9 m, bentonite holeplug from 4.9 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
	10	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface.
	11	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface

Noise Barrier Wall Segment	Borehole Number	Piezometer Tip Depth / Elevation (m)	Completion Details
2	12	9.1/179.9	Backfilled with filter sand from 9.8 to 4.9 m, bentonite holeplug from 4.9 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
	13	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface.
	14	9.1/183.6	Backfilled with filter sand from 9.8 m to 4.9 m, bentonite holeplug from 4.9 m to 0.6 m, sand from 0.6 m to 0.3 m, then grout to ground surface.
3	15	9.1/181.5	Backfilled with filter sand from 9.8 to 5.5 m, bentonite holeplug from 5.5 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
	16	None installed	Backfilled with holeplug and auger cuttings to 0.6 m, sand from 0.6 to 0.3 m, then asphalt coldpatch to surface.
	17	9.1/175.3	Backfilled with filter sand from 9.8 to 5.5 m, bentonite holeplug from 5.5 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
	18	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface
	19	9.1/175.2	Backfilled with filter sand from 9.7 to 5.5 m, bentonite holeplug from 5.5 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
4	20	9.1/171.1	Backfilled with filter sand from 9.8 to 5.5 m, bentonite holeplug from 5.5 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
5 and 6	21	9.1/158.1	Backfilled with filter sand from 9.8 to 5.5 m, bentonite holeplug from 5.5 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.
	22	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface
	23	None installed	Backfilled with bentonite holeplug and auger cuttings to ground surface
	24	9.1/160.8	Backfilled with filter sand from 9.8 to 5.5 m, bentonite holeplug from 5.5 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.

Noise Barrier Wall Segment	Borehole Number	Piezometer Tip Depth / Elevation (m)	Completion Details
7	25	9.1/161.7	Backfilled with filter sand from 9.8 to 5.5 m, bentonite holeplug from 5.5 to 0.6 m, sand from 0.6 to 0.3 m, then grout to ground surface.

Once groundwater monitoring is completed, all piezometer installations will be decommissioned in general accordance with Ministry of the Environment Regulation 903 and its Amendments (the water well regulation under the OWRA).

4 LABORATORY TESTING

All recovered soil samples were subjected to visual identification and to natural moisture content determination. At least 25% of the recovered soil samples were subjected to grain size distribution analysis. Atterberg Limits tests were carried out on selected samples of native cohesive soils to determine the plasticity characteristics. The results of the laboratory testing are summarized on the Record of Borehole sheets and are also presented on the figures included in Appendices A to F.

5 DESCRIPTION OF SUBSURFACE CONDITIONS

Reference is made to the Record of Borehole sheets included in Appendices A to F. Details of the encountered soil stratigraphy are presented in these appendices. Approximate borehole locations are shown on "Borehole Locations" plans included in Appendices A to F. An overall description of the stratigraphy for each noise barrier wall segment is given in the following paragraphs. However, the factual data presented in the Record of Borehole Sheets governs any interpretation of the site conditions.

In general, the subsurface stratigraphy at the boreholes consists of pavement structure (asphalt, concrete and granular road base) overlying firm to hard silty clay fill. Native stiff to hard silty clay till were encountered below the pavement fill and silty clay fill. A deposit of firm to stiff silty clay or layers of compact to very dense sands and silts underlie the cohesive till at some locations. The groundwater levels are noted on the records of boreholes.

5.1 Noise Barrier Wall, Segment 1, East of Jane Boreholes 15-01 to 15-08 (Current investigation) Boreholes 2, 5, 7 (Previous investigation)

A total of eight boreholes, numbered 15-01 to 15-08, were drilled along the alignment of Segment 1 of the proposed noise barrier wall. Reference had also been made to Boreholes 2, 5 and 17, drilled during the previous investigation (References 1 and 2). Records of

boreholes sheets, laboratory testing results and a borehole location drawing are included in Appendix A.

5.1.1 Pavement Structure

Boreholes 15-01 to 15-08, were drilled through the paved surface of Highway 401 Westbound Lane (WBL) Collector. The pavement structure revealed in the boreholes consisted of 100 to 275 mm of asphalt over a layer of granular road base, which consisted of sand, gravelly sand, and sand and gravel with some silt and clay. The thickness of the granular road base ranged from 500 to 900 mm. Moisture contents measured in samples of the granular road base ranged from 2% to 7%.

A sample of the sand and gravel fill was subjected to gradation analysis. Grain size distribution results are presented on the Record of Borehole sheets and on Figure A1 of Appendix A. These results are summarized as follows:

Soil Particles	Percentage (%)
Gravel	42
Sand	39
Silt and Clay	19

5.1.2 Silty Clay Fill

Fill was contacted below the pavement structure in all the boreholes. The fill consisted of brown silty clay with sand to trace sand, and trace gravel. Occasional roots and rootlets were encountered within the silty clay fill. The thickness of the silty clay fill ranged from 2.1 to 3.3 m in Boreholes 15-02 to 15-08, and 4.8 m in Borehole 15-01. The depth to the base of the silty clay fill ranged from 2.9 to 4.1 m (Elevations 131.3 to 151.5 m) in Boreholes 15-02 to 15-08 and was at 5.6 m (Elevation 127.3 m) in Borehole 15-01.

SPT 'N' values measured in the silty clay fill typically ranged from 9 to 25 blows per 0.3 m of penetration, indicating a stiff to very stiff consistency. An SPT 'N' value of 52 blows per 0.3 m of penetration, indicating a hard consistency, was measured at shallow depth in Borehole 15-02. Measured moisture contents ranged from 6% to 26%.

Samples of silty clay fill were subjected to gradation analysis. Grain size distribution curves for samples of the silty clay fill are presented on the Record of Borehole sheets and on Figure A2 in Appendix A. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0 to 3
Sand	14 to 33
Silt	44 to 46

Clay	18 to 42
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5.1.3 Silty Clay Till

Brown to grey silty clay till with sand to some sand, and trace gravel was contacted below the fill at depths ranging from 2.9 to 4.1 m in Boreholes 15-02 to 15-08 and at 5.6 m (Elevation 127.3 m) in Borehole 15-01. The thickness of the silty clay till ranged from 1.8 to 5.8 m. The depth to the base of the silty clay till varied from 4.8 to 8.8 m (Elevations 124.3 to 146.5 m).

SPT 'N' values measured in the silty clay till ranged from 6 to 44 blows per 0.3 m of penetration, indicating a firm to hard consistency. Measured moisture contents of samples of the silty clay till ranged from 10% to 38%.

Samples of silty clay till were subjected to gradation analysis and Atterberg Limits testing. Grain size distribution curves for samples of silty clay till are presented on the Record of Borehole sheets and on Figures A3 and A4 in Appendix A. Atterberg Limit test results are presented on Figure A7 of Appendix A. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0 to 2
Sand	12 to 36
Silt	34 to 51
Clay	21 to 54

Soil Particles	Percentage (%)
Liquid Limit	23 to 33
Plasticity Index	9 to 15

The results indicate that the silty clay till typically has low plasticity (CL).

Glacial tills inherently contain cobbles and boulders.

5.1.4 Silty clay

Brown to grey silty clay was contacted below the silty clay till in Boreholes 15-01 to 15-07 at depths ranging from 4.8 to 8.7 m. Boreholes 15-01 to 15-07 were terminated within the silty clay at 9.8 m depth (Elevations 123.1 to 141.9 m).

SPT 'N' values in the silty clay varied between 5 and 14 blows per 0.3 m of penetration, indicating a firm to stiff consistency. SPT 'N' values of 24 and 43 blows per 0.3 m of

penetration were measured in Borehole 15-06 indicating very stiff to hard consistency. Moisture contents measured in the silty clay ranged from 21% to 39%.

Samples of silty clay were subjected to gradation analysis and Atterberg Limits testing. Grain size distribution curves for samples of silty clay are presented on the Record of Borehole sheets and on Figure A5 in Appendix A. Atterberg Limit test results are presented on Figure A8 of Appendix A. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0
Sand	0
Silt	45 to 59
Clay	41 to 55

Soil Particles	Percentage (%)
Liquid Limit	33 to 37
Plasticity Index	14 to 17

The results indicate that one sample of the silty clay has low (CL) to medium (CI) plasticity.

5.1.5 Sand and Silt Till

Grey sand and silt till containing some clay and trace gravel was encountered at 8.8 m depth in Borehole 15-08, which was terminated within the sand and silt till at 9.8 m depth (Elevation 145.5 m).

An SPT 'N' value measured in the sand and silt till was 65 blows per 0.3 m of penetration, indicating a very dense condition. The moisture content in the sand and silt till was 12%.

A sample of the sand and silt till was subjected to gradation analysis. The grain size distribution curve for this sample is presented on the Record of Borehole sheets and on Figure A6 in Appendix A. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	5
Sand	44
Silt	36
Clay	15

5.1.6 Groundwater Levels

Free standing water was observed in some open boreholes upon completion of drilling operations. Standpipe piezometers were installed in four boreholes (Boreholes 15-01, 15-04, 15-06 and 15-08) to monitor water levels after completion of drilling. The water levels measured in the open boreholes upon completion of drilling and water levels reported in Boreholes 5 and 7 (previous investigation) are included in Table 5.1. The piezometric levels in Boreholes 15-01, 15-04, 15-06 and 15-08 will be measured in the next round of monitoring and provided in the final report.

Table 5.1 – Water Level Measurements

Borehole Number	Date	Water Levels		Comment
		Depth (m)	Elevation (m)	
15-01	September 23, 2015 October 26, 2015	Dry 5.7	- 127.2	Piezometer
15-04	September 22, 2015 October 26, 2015	Dry 6.0	- 134.6	Piezometer
15-06	September 21, 2015 October 26, 2015	Dry 6.5	- 143.2	Piezometer
15-08	September 14, 2015 October 26, 2015	5.1 4.7	150.2 150.6	Piezometer
15-02	September 23, 2015	5.5	128.7	Open borehole
5*	March 13, 1963	3.1	121.2	Open borehole
7*	October 4, 1962	4.9	139.1	Open borehole

* Previous investigation

All groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

5.2 Noise Barrier Wall, Segment 2, West of Dufferin Street Boreholes 15-09 to 15-14 (Current investigation) Boreholes 1C, 2A (Previous investigation)

A total of six boreholes, numbered 15-09 to 15-14, were drilled along the alignment of Segment 2 of the proposed noise barrier wall. Reference has also been made to Boreholes 1C and 2A drilled during the previous investigation (Reference 3). Record of boreholes sheets, laboratory testing results and a borehole location drawing are included in Appendix B.

5.2.1 Topsoil

Topsoil of 180 mm in thickness was encountered at ground surface in Borehole 2A drilled during the previous investigation (Reference 3).

5.2.2 Pavement Structure

Boreholes 15-09 to 15-14 were drilled through the paved surface of the Highway 401 WBL Collector. The pavement structure revealed in the boreholes consisted of 175 to 200 mm of asphalt over a layer of granular road base. Asphalt was not encountered in Borehole 15-14.

The granular road base encountered below the asphalt consisted of sand containing some silt and trace gravel. The thickness of the granular road base ranged from 0.6 to 1.2 m. Moisture contents measured on samples of the granular road base (sand fill) ranged from 3% to 11%.

5.2.3 Silty Clay Fill

Fill was contacted below the pavement structure in Boreholes 15-12 to 15-14. The fill consisted of brown silty clay with sand to trace sand, and trace gravel. Occasional cobbles were encountered within the silty clay fill in Borehole 15-14. The thickness of the silty clay fill ranged from 0.7 to 3.3 m. The depth to the base of the silty clay fill ranged from 1.5 to 4.1 m (Elevations 187.5 to 188.7 m).

A 1.4-m thick layer of fill and topsoil was contacted surficially in Borehole 1C, drilled during the previous investigation. The fill was described as brown and black and having a very stiff to hard consistency. The depth to the base of the fill was 1.4 m (Elevation 188.5m).

SPT 'N' values measured in the silty clay fill typically ranged from 20 to 34 blows per 0.3 m of penetration, indicating a very stiff to hard consistency. An SPT 'N' value of 9 blows per 0.3 m of penetration, indicating stiff consistency, was measured at approximate Elevation 189.5 m in Borehole 15-14. The moisture content ranged from 7% to 16%.

A sample of silty clay fill was subjected to gradation analysis. The grain size distribution curve for this sample is presented on the Record of Borehole sheets and on Figure B1 in Appendix B. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	3
Sand	34
Silt	43
Clay	20

5.2.4 Silty Clay Till

Brown to grey silty clay till with sand, and trace gravel was contacted below the sand fill and silty clay fill at depths ranging from 0.8 to 4.1 m (Elevations 184.4 to 188.7 m) in

Boreholes 15-09 to 15-14, which were terminated within the silty clay till at 9.8 m depth (Elevations 176.0 to 182.9 m).

In Boreholes 1C and 2A, silty clay / clayey silt till, trace to some sand and gravel was contacted below the topsoil and fill. Boreholes 1C and 2A were terminated within these tills at 6.5 and 9.6 m depth (Elevations 183.3 and 180.6 m), respectively.

SPT 'N' values measured in the silty clay till ranged from 15 to 86 blows per 0.3 m of penetration indicating a very stiff to hard consistency. The measured moisture contents of samples of the silty clay till ranged from 9% to 17%.

Samples of silty clay till were subjected to gradation analysis and Atterberg Limits testing. Grain size distribution curves for these tests are presented on the Record of Borehole sheets and on Figures B2 and B3 in Appendix B. Atterberg Limit test results are presented on Figure B4 of Appendix B. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0 to 4
Sand	25 to 37
Silt	40 to 47
Clay	20 to 30

Soil Particles	Percentage (%)
Liquid Limit	20 to 27
Plasticity Index	8 to 13

The results indicate that the silty clay till typically has low plasticity (CL).

Glacial tills inherently contain cobbles and boulders.

5.2.5 Groundwater Levels

Free standing water was observed in some open boreholes upon completion of drilling operations. Standpipe piezometers were installed in three boreholes (Boreholes 15-09, 15-12 and 15-14) to monitor water levels after completion of drilling. The water levels measured in the open boreholes upon completion of drilling and water levels reported in Boreholes 1C and 2A (previous investigation) are included in Table 5.2. The piezometric levels in Boreholes 15-09, 15-12 and 15-14 will be measured in the next round of monitoring and provided in the final report.

Table 5.2 – Water Level Measurements

Borehole Number	Date	Water Levels		Comment
		Depth (m)	Elevation (m)	

15-09	October 1, 2015 October 26, 2015	Dry 7.5	- 178.3	Piezometer
15-12	September 29, 2015 October 26, 2015	Dry 7.0	- 182.0	Piezometer
15-14	September 24, 2015 October 26, 2015	8.6 4.5	184.1 188.2	Piezometer
15-13	September 29, 2015	4.3	186.7	Open borehole
1C*	March 25, 1963	5.5	184.4	Open borehole
2A*	March 14, 1963	2.7	187.5	Open borehole

* Previous investigation

All groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

5.3 Noise Barrier Wall, Segment 3, East of Bathurst Street off Ramp and West of Bathurst Street off Ramp Boreholes 15-15 to 15-19 (Current investigation) Boreholes 16, 17, 18 (Previous investigation)

A total of five boreholes, numbered 15-15 to 15-19, were drilled along the alignment of Segment 3 of the proposed noise barrier wall. Boreholes 16 to 17, drilled during the previous investigation (Reference 4) have also been included. Records of borehole sheets, laboratory testing results and a borehole location drawing are included in Appendix C.

5.3.1 Topsoil

Topsoil was encountered at ground surface in Boreholes 17 and 18, drilled during the previous investigation (Reference 4). The topsoil thickness was 300 and 400 mm.

5.3.2 Pavement Structure

Boreholes 15-15 to 15-19, were drilled through the paved surface of the Highway 401 Westbound Lane (WBL) Collector. The pavement structure revealed in the boreholes consisted of 100 to 200 mm of asphalt over a layer of granular road base. A layer of concrete was encountered below the asphalt in Boreholes 15-15, 15-18 and 15-19. The concrete is 200 to 250 mm thick and is typical of a composite pavement.

The granular road base consisted of gravelly sand to sand with some silt and clay. The thickness of the granular road base was 300 to 600 mm. Moisture content measured in the granular road base (gravelly sand and sand) ranged from 3% to 7%.

Samples of granular road base were subjected to gradation analysis. Grain size distribution results are presented on the Record of Borehole sheets and on Figure C1 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	3 to 22
Sand	57 to 81
Silt and Clay	14 to 21

5.3.3 Silty Clay Fill

Fill was contacted below the pavement structure in Boreholes 15-15 to 15-19. The fill consisted of brown silty clay with sand to trace sand, and trace gravel. The thickness of the silty clay fill ranged from 0.6 m to 1.5 m in Boreholes 15-15 to 15-19, respectively, and 5.0 m in Borehole 15-15. The depth to the base of the silty clay fill was 1.4 to 2.3 m (Elevations 182.2 to 183.7 m) in Boreholes 15-15 to 15-19, and 5.8 m (Elevation 184.8 m) in Borehole 15-15.

SPT 'N' values measured in the silty clay fill ranged from 8 to 21 blows per 0.3 m of penetration indicating a stiff to very stiff consistency. The moisture content ranged from 10% to 19%.

In Boreholes 16 to 18 drilled during the previous investigation, a layer of brown silty till fill was contacted below the topsoil. The thickness of this fill ranged from 0.6 to 1.8 m. The silty till fill was described as loose to dense.

Samples of silty clay fill were subjected to gradation analysis and Atterberg Limits testing. Grain size distribution curves for samples of silty clay fill are presented on the Record of Borehole sheets and on Figure C2 in Appendix C. Atterberg Limit test results are presented on Figure C6 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0
Sand	32 to 36
Silt	42
Clay	22 to 26

Soil Particles	Percentage (%)
Liquid Limit	25
Plasticity Index	11

The results indicate that the silty clay fill typically has low plasticity (CL).

5.3.4 Silty clay

A 1.4-m thick layer of native grey silty clay was contacted below the fill at 5.8 m depth in Borehole 15-15. The depth to the base of the silty clay was at 7.2 m (Elevation 183.4 m).

An SPT 'N' value measured in the silty clay in Borehole 15-15 was 14 blows per 0.3 m of penetration, indicating a stiff consistency. The moisture content measured in the silty clay was 18%.

Borehole 16, drilled during the previous investigation, revealed a layer of grey silty clay at 8.2 m depth (Elevation 174.9 m). The silty clay was described as hard in consistency. Borehole 16 was terminated within the silty clay at 9.1 m depth (Elevation 173.9).

A sample of the silty clay was subjected to gradation analysis. The grain size distribution curve for this test is presented on the Record of Borehole sheets and on Figure C3 in Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0
Sand	31
Silt	42
Clay	27

5.3.5 Silty Clay Till

Brown to grey silty clay till with sand and trace gravel was contacted below the fill at depths ranging from 1.4 to 2.3 m in Boreholes 15-16 to 15-19 and below the silty clay at 7.2 m in Borehole 15-15. Occasional boulder fragments were encountered within the silty clay till in Boreholes 15-16 and 15-17. Boreholes 15-15 to 15-19 were terminated within the silty clay till at 9.8 m depth (Elevations 174.4 to 180.8 m).

Where measured, SPT 'N' values generally ranged from 20 to 95 blows per 0.3 m of penetration indicating a very stiff to hard consistency. An SPT 'N' value of 50 blows for less than 0.3 m of penetration was measured in Borehole 15-17 near Elevation 179.8 m due to boulder fragments. 'N' values of greater than 100 blows for less than 0.3 m of penetration were measured in Boreholes 15-18 and 15-19 indicating occasional hard zones. Measured moisture contents of samples of the silty clay till ranged from 6% to 16%.

Samples of silty clay till were subjected to gradation analysis and Atterberg Limits testing. Grain size distribution curves for samples of silty clay till are presented on the Record of Borehole sheets and on Figures C4 and C5 in Appendix C. Atterberg Limit test results are presented on Figure C7 of Appendix C. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0 to 3
Sand	34 to 40
Silt	40 to 44
Clay	17 to 21

Soil Particles	Percentage (%)
Liquid Limit	18 to 23
Plasticity Index	7 to 10

The results indicate that the silty clay till has typically low plasticity (CL).

Glacial tills inherently contain cobbles and boulders.

5.3.6 Silty Till

In Boreholes 16 to 18 drilled during a previous investigation, a layer of brown to grey silty till was contacted below the fill at depths ranging from 0.9 to 1.8 m. The thickness of the silty till was 6.4 m in Borehole 16. Boreholes 17 and 18 were terminated within the silty till at 6.2 and 4.7 m depth, (Elevations 177.1 and 178.6 m), respectively. The silty till had a compact to very dense condition.

5.3.7 Groundwater Levels

Free standing water was not observed in the open boreholes upon completion of drilling operations. Standpipe piezometers were installed in three boreholes (Boreholes 15-15, 15-17 and 15-19) to monitor water levels after completion of drilling. The water levels measured in the open boreholes upon completion of drilling and water levels reported in Boreholes 16, 17 and 18 (previous investigation) are included in Table 5.3. The piezometric levels in Boreholes 15-15, 15-17 and 15-19 will be measured in the next round of monitoring and provided in the final report.

Table 5.3 – Water Level Measurements

Borehole Number	Date	Water Levels		Comment
		Depth (m)	Elevation (m)	
15-15	September 17, 2015 October 26, 2015	Dry 6.9	- 183.7	Piezometer
15-17	September 17, 2015 October 26, 2015	Dry 2.7	- 181.7	Piezometer
15-19	September 15, 2015 October 26, 2015	Dry 6.9	- 177.4	Piezometer
15-16	September 16, 2015	Dry	-	Open borehole
15-18	September 15, 2015	Dry	-	Open borehole

16*	May 5, 1962	7.3	175.8	Open borehole
17*	May 5, 1962	1.3	182.1	Open borehole
18*	May 5, 1962	1.0	182.3	Open borehole

* Previous investigation

All groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

5.4 Noise Barrier Wall, Segment 4, West of Avenue Road

Borehole 15-20 (Current investigation)

Boreholes 11 to 14 (Previous investigation)

Borehole 15-20 was drilled near the alignment of Segment 4 of the noise barrier wall. Boreholes 11 to 14 drilled during the previous investigation (Reference 4) have been included in the report to address the subsurface conditions at this wall segment. Records of boreholes sheets, laboratory testing results and borehole location drawing are included in Appendix D.

5.4.1 Topsoil

Topsoil of 150 mm in thickness was encountered at ground surface in Boreholes 11 to 13 at the time of the previous investigation (Reference 4).

5.4.2 Pavement Structure

Borehole 15-20 was drilled through the paved surface of Highway 401 WBL Collector. The pavement structure consisted of 175 mm of asphalt over granular road base.

The granular road base contacted below the asphalt consisted of sand containing trace silt and gravel. The thickness of the granular road base was 500 mm. A moisture content measured in the sand fill was 3%.

5.4.3 Silty Fill

A layer of brown “silty till” fill was encountered in Boreholes 11 to 14 drilled during the previous investigation. The silty fill thickness ranged from 0.5 to 2.1 m. The depth to the base of the silty fill ranged from 0.6 to 2.1 m (Elevations 179.7 to 180.8 m). The silty fill was in a very loose to loose state.

5.4.4 Silty Clay Till

In Borehole 15-20, native brown to grey silty clay till with sand and trace gravel was contacted below the fill. Boulder fragments were encountered within the silty clay till near Elevation 174 m. The thickness of the silty clay till was 6.6 m. The depth to the base of the silty clay till was 7.3 m (Elevation 172.9 m).

In Boreholes 11 to 14 drilled during the previous investigation, a layer of brown silty till was contacted below the fill at depths ranging from 0.6 to 2.1 m. The thickness of the silty till ranged from 4.3 to 4.6 m. The depth to the base of the silty till ranged from 5.5 to 6.7m (Elevations 175.3 to 176.3 m) in Boreholes 11, 13 and 14. Borehole 12 was terminated within the silty till at 4.7 m depth (Elevation 176.4 m). This silty till was described as compact to very dense with SPT ‘N’ values varying from 23 to 96 blows per 0.3 m penetration. Based on the stratigraphy depicted in Borehole 15-20 and for consistency in descriptions, this soil is described as a very stiff to hard silty clay till.

In Borehole 15-20, SPT ‘N’ values in the silty clay till generally ranged from 14 to 25 blows per 0.3 m of penetration, indicating a stiff to very stiff consistency. An SPT ‘N’ value of 100 blows for less than 0.3 m of penetration was measured near Elevation 174 m, where boulder fragments were encountered. The moisture content of the silty clay till ranged from 6% to 11%.

Two samples of the silty clay tills were subjected to gradation analysis and Atterberg Limits testing. Grain size distribution curves for samples of silty clay till are presented on the Record of Borehole sheets and on Figure D1 in Appendix D. Atterberg Limit test results are presented on Figure D3 of Appendix D. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	4 to 7
Sand	37 to 42
Silt	34 to 39
Clay	15 to 22

Soil Particles	Percentage (%)
Liquid Limit	21
Plasticity Index	8

The results indicate that the silty clay till has a low plasticity (CL).

Glacial tills inherently contain cobbles and boulders.

5.4.5 Silty clay

In Borehole 15-20, a 1.4-m thick layer of native grey silty clay was contacted below the silty clay till at 7.3 m depth. The depth to the base of the silty clay was at 8.7 m (Elevation 171.5 m).

Grey silty clay was contacted in Boreholes 11 and 13 at 5.5 to 5.8 m depths. Both boreholes were terminated within the silty clay at 7.6 and 6.2 m (Elevations 173.9 and 174.8 m), respectively.

SPT 'N' values measured in the silty clay ranged from 46 to 82 blows per 0.3 m of penetration indicating a hard consistency. A moisture content measured in the silty clay was 19%.

A sample of silty clay was subjected to gradation analysis and Atterberg Limits testing. The grain size distribution curve for this sample is presented on the Record of Borehole sheets and on Figure D2 in Appendix D. Atterberg Limit test results are presented on Figure D4 of Appendix D. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0
Sand	0
Silt	26
Clay	74

Soil Particles	Percentage (%)
Liquid Limit	41
Plasticity Index	21

The results indicate that the silty clay has medium plasticity (CI).

5.4.6 Silty Sand Till

Grey silty sand till containing trace clay and gravel was contacted below the silty clay at 8.7 m depth in Borehole 15-20, which was terminated within this till at 9.8 m depth (Elevation 170.4 m).

An SPT 'N' value measured in the silty sand till was 45 blows per 0.3 m of penetration, indicating a dense state. The moisture content in the silty sand till was 14%.

Glacial tills inherently contain cobbles and boulders.

5.4.7 Sand

A layer of coarse sand was contacted below the silty till at 6.7 m depth in Borehole 14, which was terminated within the sand layer at 7.7 m depth (Elevation 175.3 m).

A SPT 'N' value measured in the sand layer was 88 blows per 0.3 m of penetration, indicating a very dense condition.

5.4.8 Groundwater Levels

Free standing water was not observed in the open boreholes upon completion of drilling operations. A standpipe piezometer was installed in Borehole 15-20 to monitor water levels after completion of drilling. The water level measured in the piezometer upon completion of drilling and water levels reported in Boreholes 11 to 14 (previous investigation) are included in Table 5.4. The piezometric level in Borehole 15-20 will be measured again in the next round of monitoring and provided in the final report.

Table 5.4 – Water Level Measurements

Borehole Number	Date	Water Levels		Comment
		Depth (m)	Elevation (m)	
15-20	August 25, 2015	3.1	177.1	Piezometer
	October 26, 2015	2.0	178.2	
11*	May 5, 1962	1.7	179.9	Open borehole
12*	May 5, 1962	2.0	179.0	Open borehole
13*	May 5, 1962	1.2	179.9	Open borehole
14*	May 5, 1962	4.4	178.6	Open borehole

* Previous investigation

All groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

5.5 Noise Barrier Wall, Segments 5 & 6, West of Bayview Boreholes 15-21 to 15-24 (Current investigation) Boreholes 17, 18, 23 to 26 (Previous investigation)

Boreholes 15-21 to 15-24 were drilled near the alignments of Segments 5 and 6 of the noise barrier walls. Boreholes 17, 18 and 23 to 26, drilled during the previous investigation (Reference 5) have been included in this report to address the subsurface conditions along this wall segment. Records of boreholes sheets, laboratory testing results and a borehole location drawing are included in Appendix E.

5.5.1 Topsoil

A 150 mm thick layer of topsoil was contacted superficially in Borehole 17 at the time of the previous investigation.

5.5.2 Pavement Structure

Boreholes 15-21 to 15-24 were drilled through the paved surface of Highway 401 WBL Collector. The pavement structure revealed in the boreholes consisted of 100 to 150 mm of asphalt. A layer of concrete was encountered below the asphalt in Boreholes 15-21, 15-23 and 15-24. The concrete was 150 to 200 mm in thickness.

The granular road base contacted below the asphalt or the concrete consisted of sand containing trace to some silt, clay and gravel. The thickness of the granular road base ranged from 0.4 to 1.1 m.

An SPT 'N' value measured in the sand fill was 18 blows per 0.3 m of penetration, indicating a compact state. Moisture content measured in the sand fill were 7% and 13%.

A sample of the sand fill was subjected to gradation analysis. The grain size distribution results are presented on the Record of Borehole sheets and on Figure E1 of Appendix E. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	10
Sand	67
Silt	17
Clay	6

5.5.3 Silty Clay Fill

A layer of brown to grey silty clay fill, containing trace to some sand, trace gravel and occasional roots and rootlets, was contacted below the granular road base in Boreholes 15-21 to 15-23 at depths ranging from 0.7 to 1.4 m. The thickness of the silty clay fill ranged from 0.7 to 2.4 m. The depth to the base of the silty clay fill varied from 1.4 to 3.8m (Elevations 165.4 to 167.7 m).

SPT 'N' values in the silty clay fill ranged from 8 to 20 blows per 0.3 m of penetration, indicating a stiff to very stiff consistency. The moisture content in the silty clay fill ranged from 8% to 18%.

5.5.4 Silty Clay Till

Native brown to grey silty clay till with sand, trace gravel and thin sand seams was contacted below the fill in all the boreholes at depths ranging from 0.7 to 3.8 m. The thickness of the silty clay till was 2.1 and 2.9 m in Boreholes 15-22 and 15-23, respectively. The depth to the base of the silty clay till was at 4.3 and 6.7 m (Elevations 163.3 and 164.8 m) in Boreholes 15-22 and 15-23, respectively. Boreholes 15-21 and 15-24 were terminated within the silty clay till at 9.8 m depth (Elevations 157.5 and 160.1 m).

SPT 'N' values in the silty clay till ranged from 18 to 60 blows per 0.3 m of penetration, indicating a very stiff to hard consistency. SPT 'N' values of 91 blows per 0.25 m of penetration and 60 blows per 0.1 m of penetration, indicating hard consistency, were measured in Borehole 15-21 between Elevation 162.8 to 160.8. An SPT 'N' value of 91 blows per 0.225 m of penetration was measured in Borehole 15-23 near Elevation 165.3.

High SPT 'N' values ranging from 72 blows per 0.275 m of penetration to greater than 100 blows per 0.225 m of penetration were generally measured in Borehole 15-24.

The moisture content of the silty clay till varied from 6% to 18%.

Samples of silty clay till were subjected to gradation analysis and Atterberg Limits testing. Grain size distribution curves for samples of silty clay till are presented on the Record of Borehole sheets and on Figures E2 and E3 in Appendix E. Atterberg Limit test results are presented on Figure E6 of Appendix E. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0 to 7
Sand	17 to 54
Silt	20 to 37
Clay	21 to 46

Soil Particles	Percentage (%)
Liquid Limit	21 to 34
Plasticity Index	9 to 16

The results indicate that the silty clay till typically has low plasticity (CL).

Glacial tills inherently contain cobbles and boulders.

5.5.5 Clayey Silt

A deposit of native clayey silt with sand were contacted in Boreholes 17, 18, 25 and 26. The clayey silt was contacted below the topsoil in Borehole 17 and surficially in Borehole 25. A 600 mm thick layer of clayey silt was contacted in Borehole 18 at 3.7 m depth. In Borehole 26, the clayey silt was encountered at 3.4 m depth. Boreholes 17, 25 and 26 were terminated within the clayey silt at 6.3 and 6.4 m depth (Elevations 160.7 to 162.2 m).

SPT 'N' values in the clayey silt were 16 to 50 blows per 0.3 m of penetration, in the upper 2.5 m in Borehole 17, indicating a very stiff to hard consistency. Generally, the SPT 'N' values measured in the clayey silt, were greater than 104 blows per 0.25 m of penetration to 100 blows per 0.15 m of penetration, indicating hard consistency.

5.5.6 Sands and Silts

A 1.2-m thick layer of grey silty sand containing some clay was contacted below the silty clay till at 4.3 m depth in Borehole 15-22. The depth to the base of this layer was at 5.5 m (Elevation 162.1 m).

Silty sand was contacted surficially in Boreholes 23, 24 and 26 drilled during the previous investigation. The thickness of the silty sand was 3.4 m in Borehole 26 with a depth to its base at 3.4 m (Elevation 165.2 m) in Borehole 26. Boreholes 23 and 24 were terminated within the silty sand at 6.6 and 6.1 m depth (Elevations 159.6 and 160.7 m), respectively. Sandy silt was encountered surficially in Borehole 18, which was terminated within the sandy silt at 6.2 m (Elevation 159.9 m).

An SPT 'N' value measured in the silty sand in Borehole 15-22 was 8 blows per 0.3 m of penetration indicating a loose state. A measured moisture content in the silty sand was 14%.

In the previous Boreholes 23, 24 and 26, SPT 'N' values in the silty sand and sandy silt ranged from 30 blows per 0.3 m of penetration to greater than 100 blows for less than 0.3m of penetration, indicating a dense to very dense state.

A sample of the sand and silt was subjected to gradation analysis. Grain size distribution curve for the sand and silt is presented on the Record of Borehole sheets and on Figure E4 in Appendix E. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0
Sand	60
Silt	27
Clay	13

5.5.7 Sand and Silt Till

Grey sand and silt till containing trace clay and gravel was contacted below the silty sand and silty clay till at 5.5 and 6.7 m depth in Boreholes 15-22 and 15-23, respectively. Boreholes 15-22 and 15-23 were terminated within the sand and silt till at 9.8 m depth (Elevations 157.8 and 161.7 m), respectively.

SPT 'N' values measured in the sand and silt till ranged from 21 to 45 blows per 0.3 m of penetration indicating a compact to dense condition. Moisture content in the sand and silt till ranged from 8% to 16%.

Two samples of the sand and silt till were subjected to gradation analysis. Grain size distribution curves for the sand and silt till are presented on the Record of Borehole sheets and on Figure E5 in Appendix E. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	4 to 8
Sand	50 to 53

Silt	30 to 37
Clay	9

Glacial tills inherently contain cobbles and boulders.

5.5.8 Groundwater Levels

Free standing water levels were observed in some open boreholes upon completion of drilling operations. Standpipe piezometers were installed in two boreholes (Boreholes 15-21 and 15-24) to monitor water levels after completion of drilling. The water level measured in the piezometers and open boreholes upon completion of drilling and water levels reported in Boreholes 17, 23 to 26 (previous investigation) are included in Table 5.5. The piezometric levels in Boreholes 15-21 and 15-24 will be measured again in the next round of monitoring and provided in the final report.

Table 5.5 – Water Level Measurements

Borehole Number	Date	Water Levels		Comment
		Depth (m)	Elevation (m)	
15-21	August 24, 2015	8.2	159.1	Piezometer
	October 26, 2015	8.4	158.9	
15-24	August 23, 2015	3.3	166.6	Piezometer
	October 26, 2015	2.9	167.0	
15-22	August 24, 2015	5.7	161.9	Open borehole
15-23	August 24, 2015	6.2	165.3	Open borehole
17*	May 20, 1964	4.4	162.6	Open borehole
23*	-	3.2	162.9	Open borehole
24*	May 21, 1964	3.1	163.7	Open borehole
25*	May 21, 1964	2.8	164.6	Open borehole
26*	May 21, 1964	5.0	163.5	Open borehole

* Previous investigation

All groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

5.6 Noise Barrier Wall, Segment 7, East of Bayview Borehole 25 (Current investigation) Boreholes 8, 19, 20 (Previous investigation)

Borehole 15-25 was drilled near the alignment of Segment 7 of the noise barrier wall. Boreholes 8, 19 and 20, drilled during the previous investigation (Reference 6) have been included to address the subsurface conditions at this wall segment. Records of boreholes sheets, laboratory testing results and a borehole location drawing are contained in Appendix F.

5.6.1 Topsoil

A 270 mm thick layer of topsoil was contacted surficially in Borehole 8 at the time of the previous investigation.

5.6.2 Pavement Structure

Borehole 15-25 was drilled through the paved surface of the Highway 401 WBL Collector. The pavement structure consisted of 300 mm of asphalt, over a layer of granular road base.

The granular road base consisted of sand containing trace silt and gravel. The thickness of the sand fill was 500 mm. The moisture content measured in the sand fill was 5%.

5.6.3 Silty Clay Fill

A 700 mm thick layer of brown silty clay fill containing trace sand and gravel was contacted below the granular road base in Borehole 15-25. The depth to the base of the silty clay fill was 1.5 m (Elevation 169.3 m).

An SPT 'N' value of 28 blows per 0.3 m of penetration, indicating a very stiff consistency, was measured in the silty clay fill. The moisture content in the silty clay fill was 7%.

5.6.4 Silty Clay Till and Clayey Silt Till

Native brown to grey silty clay till with sand was contacted below the fill at 1.5 m depth. The thickness of the silty clay till was 5.8 m. The depth to the base of the silty clay till was at 7.3 m (Elevation 163.5 m).

Native clayey silt till containing trace of sand was encountered in Boreholes 8, 19 and 20. The clayey silt till was contacted surficially in Boreholes 19 and 20, and at 4.8 m depth in Borehole 8. The thickness of the clayey silt till was 1.7 and 2.4 m in Boreholes 19 and 20, respectively. The depth to the base of the clayey silt till was 1.7 and 2.4 m (Elevations 161.7 and 160.9 m) in Boreholes 19 and 20, respectively. Borehole 8 was terminated within the clayey silt till at 9.4 m depth (Elevation 158.3 m).

SPT 'N' values measured in the silty clay till generally ranged from 22 to 60 blows per 0.3 m of penetration, indicating a very stiff to hard consistency. An SPT 'N' value of 100 blows for less than 0.3 m of penetration was measured in Borehole 15-25 near Elevation 168.5 m. The moisture content in the silty clay till ranged from 6% to 10%.

SPT 'N' values measured in the clayey silt till generally ranged from 41 per 0.3 m of penetration to greater than 100 blows for less than 0.3 m of penetration, indicating a hard consistency. SPT 'N' values of 4 and 6 blows per 0.3 m of penetration, indicating the presence of firm zones, were encountered at shallow depths in Boreholes 19 and 20, respectively.

A sample of the silty clay till was subjected to gradation analysis and Atterberg Limits testing. The grain size distribution curve for the silty clay till is presented on the Record of Borehole sheets and on Figure F1 in Appendix F. Atterberg Limit test results are presented on Figure F3 of Appendix F. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	0
Sand	37
Silt	36
Clay	27

Soil Particles	Percentage (%)
Liquid Limit	17
Plasticity Index	7

The results indicate that the silty clay till has slight plasticity and belong to the group CL-ML.

Glacial tills inherently contain cobbles and boulders.

5.6.5 Clayey Silt to Silty Clay

Layers of native clayey silt to silty clay containing trace of sand, were contacted in Boreholes 8 and 19. In Borehole 8, the clayey silt was encountered surficially and in Borehole 19 at 3.8 m depth. The thickness of the clayey silt/silty clay was 4.8 and 1.7 m in Boreholes 8 and 19, respectively. The depth to the base of the clayey silt was at 4.8 and 5.5 m (Elevations 162.9 and 157.8 m).

SPT 'N' values in the clayey silt ranged from 4 to 32 blows per 0.3 m of penetration, indicating a soft to hard consistency.

5.6.6 Silty Sand and Sandy Silt

Layers of silty sand and sandy silt were encountered in Boreholes 19 and 20.

Silty sand was contacted in Boreholes 19 and 20 at 1.7 and 2.4 m depth (Elevations 161.7 and 160.9 m), respectively. The thickness of the silty sand was 2.1 m in Borehole 19. Borehole 20 was terminated within the silty sand at 4.1 m depth (Elevation 159.3 m).

Sandy silt was encountered in Boreholes 19 and 20 at 5.5 and 2.4 m depth (Elevations 157.8 and 160.9 m), respectively. The thickness of the sandy silt was 1.0 m in Borehole 20. Borehole 19 was terminated within the sandy silt at 6.6 m depth (Elevation 156.8 m).

SPT 'N' values measured in the silty sand were 27 and 29 blows per 0.3 m of penetration, in Borehole 19 indicating a compact state. In Borehole 20, an SPT 'N' value of the silty sand was 75 blows per 0.3 m of penetration, indicating a very dense condition.

SPT 'N' values in the sandy silt were 50 and 75 blows per 0.3 m of penetration, indicating a very dense state.

5.6.7 Sand and Silt Till

Grey sand and silt till containing some gravel and clay was contacted below the silty clay till at 7.3 m depth in Borehole 15-25, which was terminated within the sand and silt till at 9.8 m depth (Elevation 161.0 m).

SPT 'N' values measured in the sand and silt till ranged between 42 blows per 0.3 m of penetration and greater than 100 blows for less than 0.3 m of penetration, indicating a dense to very dense state. The moisture content in the sand and silt till was 7%.

A sample of the sand and silt till was subjected to gradation analysis. The grain size distribution curve for this sample is presented on the Record of Borehole sheets and on Figure F2 in Appendix F. The results of the laboratory test are summarized as follows:

Soil Particles	Percentage (%)
Gravel	12
Sand	47
Silt	30
Clay	11

Glacial tills inherently contain cobbles and boulders.

5.6.8 Groundwater Levels

There was no record of water level conditions in the previous open boreholes. A standpipe piezometer was installed in Borehole 15-25 to monitor water levels after completion of drilling. The measured piezometric level is shown in Table 5.6. The piezometric level will be measured again in the next round of monitoring and provided in the final report.

Table 5.6 – Water Level Measurements

Borehole Number	Date	Water Levels		Comment
		Depth (m)	Elevation (m)	
15-25	August 25, 2015	7.9	162.9	Piezometer
	October 26, 2015	6.0	164.8	

All groundwater observations at this site are short term and the levels are expected to fluctuate seasonally and after severe weather events.

6 MISCELLANEOUS

Borehole locations were established in the field based on information provided by MMM Group Limited (MMM). The coordinates at all as-drilled borehole locations were established by Thurber upon completion of drilling. The ground surface elevations of the as-drilled locations were provided by MMM. Underground utility clearances were obtained for the borehole locations prior to drilling.

DBW Drilling of Ajax, Ontario supplied track-mounted and truck-mounted drill rigs, and conducted the drilling, sampling and in-situ testing operations.

The field investigation was supervised by Mr. Amir Fereidouni and Mr. Abdul Nasri of Thurber. Geotechnical laboratory testing was carried out in Thurber's laboratory.

Planning and co-ordination of the field program was conducted by Mr. Stephane Loranger, C.E.T. Overall direction of the program was provided by Mr. Sydney Pang, P.Eng. Interpretation of the data and preparation of this report was carried out by Ms. R. Palomeque Reyna, P.Eng.

The report was reviewed by Mr. Sydney Pang, P.Eng. and Mr. P.K. Chatterji, P.Eng., who is a Designated Principal Contact for MTO Foundations Projects.

THURBER ENGINEERING LTD.



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**FOUNDATION INVESTIGATION AND DESIGN REPORT
NOISE BARRIER WALLS
HIGHWAY 401 WESTBOUND COLLECTOR
REHABILITATION
FROM BAYVIEW AVENUE TO JANE STREET
TORONTO, ONTARIO
MTO GWP 2074-13-00**

GEOCRES No. 30M11-259

PART 2: ENGINEERING DISCUSSION AND RECOMMENDATIONS

7 GENERAL

This section of the report presents foundation recommendations for the design of the proposed noise barrier walls which are anticipated to be approximately 5 m in height. The project involves seven segments of noise barrier walls as indicated in the following table:

Noise Barrier Wall Segment	Location	Approximate Length (m)
1	East of Jane Street	1400
2	West of Dufferin Street	900
3	East of Bathurst Street Off Ramp West of Bathurst Street Off Ramp	300 800
4	West of Avenue Road	350
5 & 6	West of Bayview	1,250
7	East of Bayview	85

Information on the general alignments of the noise barrier walls, Segments 1 to 7, were provided to Thurber by MMM. Twenty five (25) boreholes were drilled during this investigation in close proximity to the proposed wall alignments. Selected boreholes from previous investigations conducted in the 1960's near the noise barrier walls are also utilized (References 1 to 6). It should be noted that ground conditions surrounding those 1960 boreholes may have been modified after several decades.

8 FOUNDATION DESIGN PARAMETERS

For design of the noise barrier wall foundations, reference may be made to the following document:

- Canadian Highway Bridge Design Code and Commentary (2010). CAN/CSA-S6-00 and S6.1-00.
- Ministry of Transportation, Ontario (2004) “Guidelines for the Design of High Mast Pole Foundation”, Fourth Edition, BRO-009, Engineering Standards Branch, Bridge Office (Reference 3).

It is anticipated that the proposed noise barrier walls will be supported on conventional augered caissons (i.e. drilled shafts) with typical diameters ranging from 0.45 to 0.9 m. Tables 1 to 6 immediately following the text of this report present the recommended geotechnical design parameters for the augered caisson foundations.

In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance of a caisson within the upper 1.2 m below final grade should be neglected in the foundation design. It is recommended that all surficial weak soils, including topsoil and organics, be neglected in determining lateral resistance. Sloping highway embankments in front of a caisson will result in reduced lateral passive resistance that must be taken into account during design.

Where downward sloping fill or native soil exists in front of a caisson, reduction of lateral passive resistance should be taken into account during design. For design of the caissons, it should be assumed that full lateral resistance can only be mobilized where the width of the soil in front of or behind the caisson is equal to or greater than approximately four (4) times the diameter of the caissons. For sloping ground in front of a caisson, the magnitude of the mobilized passive resistance can be estimated by interpolating between zero passive resistance at the level where the slope face intersects the pile, and full passive resistance at the level where the slope face is equal to or greater than four (4) times the diameter of the caisson.

Where an undrained shear strength, C_u , is provided for a cohesive soil (silty clay, silty clay till, clayey silt), the ultimate lateral passive resistance should be calculated in conjunction with the total soil unit weight. When designing for portions of the caissons below the groundwater level in cohesionless soils (sands and silts) and fills, the submerged soil unit weight, γ' , should be used.

The required depth of the drilled shaft will be governed by lateral loads, including wind loads, acting on the pole. The length of the caisson should also be sufficient to counteract frost jacking (upward) forces.

An equivalent caisson width equal to 2 times the caisson diameter may be assumed for lateral resistance calculations. Appropriate load and resistance factors should be applied for caisson design.

8.1 Caisson Installation

Caisson installation should generally be carried out in accordance with OPSS 903.

At the noise barrier wall sites, cobbles and boulders were encountered within the fill. The resistance to augering at random locations within the fill during the investigation may be attributed to the presence of such cobbles and boulders.

Caisson installation equipment must be able to dislodge, handle and remove cobbles, boulders, and to penetrate other obstructions within the fill, where encountered. Cobbles and boulders are present in the glacial tills.

Groundwater levels are at variable depths below existing ground surface. Soil sloughing and water seepage may occur in unsupported holes especially at depths below the groundwater level. Temporary liners must be available to support the caisson sidewalls and provide seepage cut-off where required. Any accumulated water may have to be pumped out from the hole prior to placing concrete. Should it be considered impractical to remove the accumulated water inside the hole, it is recommended that the concrete be placed by the tremie method. Suggested wordings for an NSSP to cover the above aspects are provided in Appendix G.

8.2 Construction Concerns

Concerns during caisson construction mainly involve the handling and removal of cobbles or boulders in the existing fill, soil sloughing and water seepage from caisson sidewalls. Recommendations on how to address these issues have been outlined in the previous section.

8.3 Construction Inspection and Testing

Caisson construction should be monitored by qualified geotechnical personnel as per OPSS 903 to verify the soil conditions and to confirm that those conditions are consistent with the design assumptions in this report.

9 CLOSURE

Engineering analysis and preparation of the report were carried out by Ms. R. Palomeque Reyna, P.Eng.

The report was reviewed by Dr. Sydney Pang, P.Eng. and Dr. P. K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations Projects.

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TABLES 1 TO 6

TABLE 1
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL
SEGMENT 1 - EAST OF JANE STREET

Approximate Location along Wall Alignment	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Highway Grade (m)	Geotechnical Design Parameters						Groundwater Depth (m)
				C_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (kN/m ³)	K_p	
From west limit of wall easterly to 250 m (Point A)	5, 2 15-01	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	4 (below ground surface)
		Silty clay fill (very stiff to stiff)	1.0 – 5.0	80	-	19	-		-	
		Silty clay till (stiff to hard)	5.0 – 8.0	125	-	20	-		-	
		Silty clay (stiff to firm)	8.0 – 10.0	50	-	19	-		-	
From Point A to east limit of wall	15-02	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	4 (below ground surface)
	15-03	Silty clay fill (very stiff to stiff)	1.0 – 3.0	80	-	19	-		-	
	15-04	Silty clay till (very stiff to stiff)	3.0 – 9.0	100	-	20	-		-	
	15-05	Silty clay till (very stiff to stiff)	3.0 – 9.0	100	-	20	-		-	
	15-06	Silty clay (stiff to firm)	9.0 – 10.0	50	-	19	-		-	

TABLE 2
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL
SEGMENT 2 - WEST OF DUFFERIN STREET

Approximate Location along Wall Alignment	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Highway Grade (m)	Geotechnical Design Parameters						Groundwater Depth (m)
				C_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (kN/m ³)	K_p	
From west limit of wall easterly to 300 m (Point A)	15-09 15-10 15-11	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	3 (below ground surface)
		Silty clay till (hard)	1.0 – 10.0	175	-	21	-	-	-	
From Point A easterly to 200 m (Point B)	15-12 15-13	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	3 (below ground surface)
		Silty clay fill (very stiff to hard)	1.0 – 2.0	175	-	19	-	-	-	
		Silty clay till (hard)	2.0 – 10.0	200	-	21	-	-	-	
From Point B easterly to east limit of wall	15-14 1C	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	4 (below ground surface)
		Silty clay fill (stiff to hard)	1.0 – 4.0	125	-	19	-	-	-	
		Silty clay till (very stiff to hard)	4.0 – 10.0	150	-	20	-	-	-	

TABLE 3
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL
SEGMENT 3 – EAST AND WEST OF BATHURST STREET OFF RAMP

Approximate Location along Wall Alignment	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Highway Grade (m)	Geotechnical Design Parameters						Groundwater Depth (m)
				C_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (kN/m ³)	K_p	
From west limit of wall easterly to 100 m (Point A)	15-15	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	3 (below ground surface)
		Silty clay fill (stiff)	1.0 – 6.0	75	-	19	-	-	-	
		Silty clay/silty clay till (stiff to hard)	6.0 – 10.0	125	-	20	-	-	-	
From Point A easterly to ramp	15-16 15-17 15-18 15-19	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	2 (below ground surface)
		Silty clay fill (stiff to very stiff)	1.0 – 2.0	100	-	19	-	-	-	
		Silty clay till (very stiff to hard)	2.0 – 10.0	175	-	20	-	-	-	
From ramp easterly to east limit of wall	18 17 16	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	3 (below ground surface)
		Silty clay fill (stiff to very stiff)	1.0 – 2.0	100	-	19	-	-	-	
		Silty Fill (dense to very dense)	2.0 – 10.0	-	38	-	11	10,000	4.2	

TABLE 4
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL
SEGMENT 4 – WEST OF AVENUE ROAD

Approximate Location along Wall Alignment	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Highway Grade (m)	Geotechnical Design Parameters						
				C_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (kN/m ³)	K_p	Groundwater Depth (m)
From west limit of wall easterly to 300 m (Point A)	14	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	3 (below ground surface)
	13									
	12	Silty clay till (hard)	1.0 – 10.0	200	-	21	-	-	-	
From Point A easterly to east limit of wall	11									2 (below ground surface)
	15-20	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	
		Silty clay till (very stiff)	1.0 – 10.0	150	-	20	-	-	-	

TABLE 5
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL
SEGMENTS 5 & 6 – WEST OF BAYVIEW AVENUE

Approximate Location along Wall Alignment	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Highway Grade (m)	Geotechnical Design Parameters						
				C_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (kN/m ³)	K_p	Groundwater Depth (m)
From west limit of wall easterly to 100 m (Point A)	17	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	4 (below ground surface)
		Silty clay fill (firm)	1.0 – 2.0	40	-	19	-	-	-	
		Silty clay/silty clay till (very stiff to hard)	2.0 – 10.0	150	-	20	-	-	-	
From Point A easterly 100 m (Point B)	18	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	4 (below ground surface)
		Silty clay fill (firm)	1.0 – 2.0	40	-	19	-	-	-	
		Sandy Silt (very dense)	2.0 – 10.0	-	38	21	11	10,000	4.2	
From Point B easterly to 200 m (Point C)	15-21	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	4 (below ground surface)
		Silty clay fill (firm)	1.0 – 2.0	40	-	19	-	-	-	
		Silty Clay Till (very stiff to hard)	2.0 – 10.0	150	-	20	-	-	-	
From Point C easterly to 400 m (Point D)	15-22 23 24	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	3 (below ground surface)
		Silty clay fill (stiff to very stiff)	1.0 – 3.0	100	-	19	-	-	-	
		Sands and Silts (Till) (loose to dense)	3.0 – 10.0	-	32	20	10	4,000	3.2	
From Point D easterly to east limit of wall	25 26 15-23 15-24	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	3 (below ground surface)
		Silty clay fill (stiff to very stiff)	1.0 – 2.0	100	-	19	-	-	-	
		Clayey silt/silty clay till (hard)	2.0 – 10.0	200	-	21	-	-	-	

TABLE 6
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL
SEGMENT 7 – EAST OF BAYVIEW AVENUE

Approximate Location along Wall Alignment	Borehole Number	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Highway Grade (m)	Geotechnical Design Parameters						Groundwater Depth (m)
				C_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	n_h (kN/m ³)	K_p	
From west limit of wall easterly to 50 m (Point A)	15-25	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	3 (below ground surface)
		Silty clay fill (very stiff)	1.0 – 2.0	150	-	19	-	-	-	
		Silty clay till (very stiff to hard)	2.0 – 7.0	175	-	20	-	-	-	
		Sand and silt till (dense to very dense)	7.0 – 10.0	-	36	21	11	8,000	3.8	
From Point A easterly to east limit of wall	198	Sand fill	0.0 – 1.0	-	30	20	-	2,500	3.0	4 (below ground surface)
		Sands and silts (loose to compact)	1.0 – 4.0	-	30	20	-	3,000	3.0	
		Silty clay till (very stiff to hard)	4.0 – 10.0	150	-	20	-	-	-	

Legend:

C_u	=	undrained shear strength = unconfined compressive strength, $q_u / 2$
ϕ'	=	angle of internal friction
γ	=	bulk unit weight
γ'	=	submerged unit weight
K_p	=	coefficient of passive earth pressure

Notes:

- This table must be read in conjunction with the report. In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.2 m below final grade should be neglected in the foundation design.
- All groundwater levels are reported as the depth below the ground surface in metres at the time of the borehole investigation.

SYMBOLS, ABBREVIATIONS AND TERMS USED ON RECORDS OF BOREHOLES

1. TEXTURAL CLASSIFICATION OF SOILS

CLASSIFICATION	PARTICLE SIZE	VISUAL IDENTIFICATION
Boulders	Greater than 200mm	same
Cobbles	75 to 200mm	same
Gravel	4.75 to 75mm	5 to 75mm
Sand	0.075 to 4.75mm	Not visible particles to 5mm
Silt	0.002 to 0.075mm	Non-plastic particles, not visible to the naked eye
Clay	Less than 0.002mm	Plastic particles, not visible to the naked eye

2. COARSE GRAIN SOIL DESCRIPTION (50% greater than 0.075mm)

TERMINOLOGY	PROPORTION
Trace or Occasional	Less than 10%
Some	10 to 20%
Adjective (e.g. silty or sandy)	20 to 35%
And (e.g. sand and gravel)	35 to 50%

3. TERMS DESCRIBING CONSISTENCY (COHESIVE SOILS ONLY)

DESCRIPTIVE TERM	UNDRAINED SHEAR STRENGTH (kPa)	APPROXIMATE SPT ⁽¹⁾ 'N' VALUE
Very Soft	12 or less	Less than 2
Soft	12 to 25	2 to 4
Firm	25 to 50	4 to 8
Stiff	50 to 100	8 to 15
Very Stiff	100 to 200	15 to 30
Hard	Greater than 200	Greater than 30

NOTE: Hierarchy of Soil Strength Prediction

- 1) Laboratory Triaxial Testing
- 2) Field Insitu Vane Testing
- 3) Laboratory Vane Testing
- 4) SPT value
- 5) Pocket Penetrometer

4. TERMS DESCRIBING DENSITY (COHESIONLESS SOILS ONLY)

DESCRIPTIVE TERM	SPT "N" VALUE
Very Loose	Less than 4
Loose	4 to 10
Compact	10 to 30
Dense	30 to 50
Very Dense	Greater than 50

5. LEGEND FOR RECORDS OF BOREHOLES

SYMBOLS AND ABBREVIATIONS FOR SAMPLE TYPE	SS Split Spoon Sample	WS Wash Sample	AS Auger (Grab) Sample
	TW Thin Wall Shelby Tube Sample	TP Thin Wall Piston Sample	
	PH Sampler Advanced by Hydraulic Pressure	PM Sampler Advanced by Manual Pressure	
	WH Sampler Advanced by Self Static Weight	RC Rock Core	SC Soil Core

$$\text{Sensitivity} = \frac{\text{Undisturbed Shear Strength}}{\text{Remoulded Shear Strength}}$$



Water Level

C_{pen}






Shear Strength Determination by Pocket Penetrometer

- (1) SPT 'N' Value Standard Penetration Test 'N' Value – refers to the number of blows from a 63.5kg hammer free falling a height of 0.76m to advance a standard 50 mm outside diameter split spoon sampler for 0.3 m depth into undisturbed ground.
- (2) DCPT Dynamic Cone Penetration Test – Continuous penetration of a 50 mm outside diameter, 60° conical steel point attached to "A" size rods driven by a 63.5 kg hammer free falling a height of 0.76 m. The resistance to cone penetration is the number of hammer blows required for each 0.3 m advance of the conical point into undisturbed ground.

UNIFIED SOILS CLASSIFICATION

MAJOR DIVISIONS		GROUP SYMBOL	TYPICAL DESCRIPTION
COARSE GRAINED SOILS	GRAVEL AND GRAVELLY SOILS	GW	Well-graded gravels or gravel-sand mixtures, little or no fines.
		GP	Poorly-graded gravels or gravel-sand mixtures, little or no fines.
		GM	Silty gravels, gravel-sand-silt mixtures.
		GC	Clayey gravels, gravel-sand-clay mixtures.
	SAND AND SANDY SOILS	SW	Well-graded sands or gravelly sands, little or no fines.
		SP	Poorly-graded sands or gravelly sands, little or no fines.
		SM	Silty sands, sand-silt mixtures.
		SC	Clayey sands, sand-clay mixtures.
FINE GRAINED SOILS	SILTS AND CLAYS $W_L < 50\%$	ML	Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity.
		CL	Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays. ($W_L < 30\%$).
		CI	Inorganic clays of medium plasticity, silty clays. ($30\% < W_L < 50\%$).
		OL	Organic silts and organic silty-clays of low plasticity.
	SILTS AND CLAYS $W_L > 50\%$	MH	Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts.
		CH	Inorganic clays of high plasticity, fat clays.
		OH	Organic clays of medium to high plasticity, organic silts.
HIGHLY ORGANIC SOILS		Pt	Peat and other highly organic soils.
CLAY SHALE			
SANDSTONE			
SILTSTONE			
CLAYSTONE			
COAL			

EXPLANATION OF ROCK LOGGING TERMS

ROCK WEATHERING CLASSIFICATION		SYMBOLS	
Fresh (FR)	No visible signs of weathering.		
Fresh Jointed (FJ)	Weathering limited to the surface of major discontinuities.		CLAYSTONE
Slightly Weathered (SW)	Penetrative weathering developed on open discontinuity surfaces, but only slight weathering of rock material.		SILTSTONE
Moderately Weathered (MW)	Weathering extends throughout the rock mass, but the rock material is not friable.		SANDSTONE
Highly Weathered (HW)	Weathering extends throughout the rock mass and the rock is partly friable.		COAL
Completely Weathered (CW)	Rock is wholly decomposed and in a friable condition, but the rock texture and structure are preserved.		Bedrock (general)

DISCONTINUITY SPACING		STRENGTH CLASSIFICATION			
Bedding	Bedding Plane Spacing	Rock Strength	Approximate Uniaxial Compressive Strength		Field Estimation of Hardness*
			(MPa)	(psi)	
Very thickly bedded	Greater than 2m	Extremely Strong	Greater than 250	Greater than 36,000	Specimen can only be chipped with a geological hammer
Thickly bedded	0.6 to 2m				
Medium bedded	0.2 to 0.6m	Very Strong	100-250	15,000 to 36,000	Requires many blows of geological hammer to break
Thinly bedded	60mm to 0.2m				
Very thinly bedded	20 to 60mm	Strong	50-100	7,500 to 15,000	Requires more than one blow of geological hammer to break
Laminated	6 to 20mm				
Thinly Laminated	Less than 6mm	Medium Strong	25.0 to 50.0	3,500 to 7,500	Breaks under single blow of geological hammer.
		Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
		Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
		Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail

TERMS	
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.
Rock Quality Designation: (RQD)	Total length of sound core recovered in pieces 0.1m in length or larger as a percentage of total core run length.
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.

Appendix A

Noise Barrier Wall, Segment 1, East of Jane Street Boreholes 15-01 to 15-08 (Current investigation) Boreholes 2, 5, 7 (Previous investigation)

- Record of Borehole Sheets
- Laboratory Test Results
- Drawing titled “Borehole Locations”

RECORD OF BOREHOLE No 15-01

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 046.1 E 304 381.7 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.23 - 2015.09.23 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)				
132.9	GROUND SURFACE															
0.0	ASPHALT:(275mm)															
132.6																
0.3	SAND, some silt, trace gravel Brown Moist (FILL)		1	GS												
132.1																
0.8	Silty CLAY, with sand, trace gravel Stiff Brown Moist (FILL)		1	SS	13		132									
			2	SS	11		131								0 30 44 26	
			3	SS	10		130									
	Very Stiff		4	SS	20		129									
	Occasional roots and rootlets Grey		5	SS	18		128									
127.3																
5.6	Silty CLAY, some sand, trace gravel Very Stiff Brown Moist (TILL)		6	SS	28		127								0 15 51 34	
			7	SS	20		125									
124.3																
8.6	Silty CLAY Firm Grey Moist		8	SS	8		124									
123.1																
9.8	END OF BOREHOLE AT 9.8m.															

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-01

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 046.1 E 304 381.7 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.23 - 2015.09.23 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep23/2015 Dry Oct26/2015 5.7 127.2																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-02

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 076.3 E 304 535.3 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.23 - 2015.09.23 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)							
								○ UNCONFINED	+ FIELD VANE	● QUICK TRIAXIAL	× LAB VANE	W _P	W	W _L					
134.2	GROUND SURFACE							20	40	60	80	100							
0.0	ASPHALT:(275mm)																		
133.9																			
0.3	SAND, some silt, trace gravel Brown Moist (FILL)			GS															
133.4																			
0.8	Silty CLAY, some sand, trace gravel, sand seams Hard to Very Stiff Brown Moist (FILL)		1	SS	52														
			2	SS	16														
			3	SS	20														
131.3																			
2.9	Silty CLAY, some sand, trace gravel Hard to Stiff Brown Moist (TILL)		4	SS	30														
	Grey		5	SS	14														

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-02

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 076.3 E 304 535.3 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.23 - 2015.09.23 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
	WATER LEVEL AT 5.5m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.																

RECORD OF BOREHOLE No 15-03

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 128.7 E 304 680.3 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.22 - 2015.09.22 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
137.6	GROUND SURFACE													
0.0	ASPHALT:(100mm)													
0.1	SAND, some silt, trace gravel Brown Moist (FILL)		1	GS			137							
136.8														
0.8	Silty CLAY, trace sand and gravel Very Stiff to Stiff Brown Moist (FILL)		1	SS	20		136							
			2	SS	13									
			3	SS	23		135							
134.6														
3.0	Silty CLAY, with sand, trace gravel, sand seams, oxidized stains Very Stiff Brown Moist (TILL)		4	SS	22		134							2 30 43 25
132.8							133							
4.8	Silty CLAY Stiff to Firm Grey Moist		5	SS	11		132							
			6	SS	8		131							0 0 52 48
			7	SS	6		130							
			8	SS	5		129							
							128							
127.8														
9.8	END OF BOREHOLE AT 9.8m.													

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-03

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 128.7 E 304 680.3 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.22 - 2015.09.22 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
	NO WATER OBSERVED IN THE BOREHOLE UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.																

RECORD OF BOREHOLE No 15-04

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 180.5 E 304 801.2 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.22 - 2015.09.22 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa												
140.6	GROUND SURFACE							20	40	60	80	100								
0.0	ASPHALT:(100mm)							20	40	60	80	100								
0.1	SAND and GRAVEL, some silt and clay Brown Moist (FILL)		1	GS														42	39	19 (SI+CL)
139.8																				
0.8	Silty CLAY, some sand, trace gravel Very Stiff Brown Moist (FILL)		1	SS	18															
			2	SS	15															
			3	SS	15															
	Grey		4	SS	25															
136.5																				
4.1	Silty CLAY, trace sand and gravel Very Stiff to Stiff Brown Moist (TILL)		5	SS	22															
			6	SS	9															
			7	SS	7															
	Firm Grey																			
132.1																				
8.5	Silty CLAY Firm Grey Moist		8	SS	6															
130.8																				
9.8	END OF BOREHOLE AT 9.8m.																			

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-04

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 180.5 E 304 801.2 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.22 - 2015.09.22 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%)				
							20	40	60	80	100	20	40	60			
	Continued From Previous Page Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep22/2015 Dry Oct26/2015 6.0 134.6																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-05

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 243.0 E 305 055.4 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.21 - 2015.09.21 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE LIQUID CONTENT LIMIT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%) w _p w w _L				
150.6	GROUND SURFACE							20	40	60	80	100					
0.0	ASPHALT:(200mm)							20	40	60	80	100					
0.2	SAND, some silt, trace gravel Brown Moist (FILL)		1	GS			150							○			
149.8																	
0.8	Silty CLAY, with sand, occasional roots and rootlets Very Stiff Brown to Grey Moist (FILL)		1	SS	23		149							○			
			2	SS	23		148							○			
			3	SS	15		148							○			
147.6							147							○			
3.0	Silty CLAY, with sand Very Stiff Grey Moist (TILL)		4	SS	26		147										
							146							○			
			5	SS	24		146										
							145										
			6	SS	25		144							4	1		
							143										
	Hard		7	SS	37		143							○			
141.9							142										
8.7	Silty CLAY Stiff Grey Moist																
			8	SS	11		141							○			
140.8																	
9.8	END OF BOREHOLE AT 9.8m.																

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-05

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 243.0 E 305 055.4 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.21 - 2015.09.21 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	NO WATER OBSERVED IN THE BOREHOLE UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.																

RECORD OF BOREHOLE No 15-06

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 248.1 E 305 211.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.21 - 2015.09.21 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100	W _P	W			W _L	WATER CONTENT (%)	GR
149.7	GROUND SURFACE																		
0.0	ASPHALT:(200mm)																		
0.2	SAND, some silt and gravel Brown Moist (FILL)		1	GS															
148.9																			
0.8	Silty CLAY, with sand, trace gravel, occasional roots and rootlets Very Stiff Brown Moist (FILL)		1	SS	21														
			2	SS	23														
			3	SS	25														
146.7																			
3.0	Silty CLAY, with sand Very Stiff to Stiff Brown Moist (TILL)		4	SS	27														
	Grey		5	SS	10														
			6	SS	15														
142.5																			
7.2	Silty CLAY Hard to Very Stiff Brown Moist		7	SS	43														
			8	SS	24														
139.9																			
9.8	END OF BOREHOLE AT 9.8m.																		

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-06

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 248.1 E 305 211.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.21 - 2015.09.21 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep21/2015 Dry Oct26/2015 6.5 143.2																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-07

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 259.6 E 305 354.8 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.14 - 2015.09.14 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)		
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				W _P	W	W _L			WATER CONTENT (%)	
151.7	GROUND SURFACE							20	40	60	80	100					GR SA SI CL	
0.0	Gravelly SAND , some silt and clay Brown Moist (FILL)		1	GS			151										0 36 43 21	
150.8																		
0.9	Silty CLAY , trace sand and gravel, oxidized seams Very Stiff to Stiff Brown Moist (FILL)		1	SS	22		150											
			2	SS	15													
	Occasional roots and rootlets Occasional wood fibres		3	SS	13		149											
148.7																		
3.0	Silty CLAY Very Stiff to Stiff Grey Moist (TILL)		4	SS	18		148										0 0 48 52	
				5	SS	10		147										
				6	SS	22		146										
144.8							145											
6.9	Silty CLAY Stiff Grey Moist		7	SS	14		144										0 0 48 52	
				8	SS	12		143										
141.9							142											
9.8	END OF BOREHOLE AT 9.8m.																	

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15 10 5 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-07

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 259.6 E 305 354.8 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.14 - 2015.09.14 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	NO WATER OBSERVED IN THE BOREHOLE UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO 0.3m, SAND FROM 0.3m TO 0.2m, THEN ASPHALT COLDPATCH TO SURFACE.																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 10/23/15

RECORD OF BOREHOLE No 15-08

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 300.7 E 305 514.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.14 - 2015.09.14 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										
155.3	GROUND SURFACE							20	40	60	80	100						
0.0	ASPHALT:(150mm)							20	40	60	80	100						
0.2	Gravelly SAND , some silt and clay Brown Moist (FILL)		1	GS			155											
154.5																		
0.8	Silty CLAY , some sand, trace gravel, occasional roots, rootlets and organics Stiff Grey Moist (FILL)		1	SS	11		154											
			2	SS	10													
			3	SS	10		153											
			4	SS	9		152											
151.5																		
3.8	Silty CLAY , some sand Firm to Stiff Grey Moist (TILL)		5	SS	6		151											
			6	SS	14		149											
			7	SS	44		148											
							147											
146.5																		
8.8	SAND and SILT , some clay, trace gravel Very Dense Grey Wet (TILL)		8	SS	65		146											
145.5																		
9.8	END OF BOREHOLE AT 9.8m.																	

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity 20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-08

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 1 N 4 842 300.7 E 305 514.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.14 - 2015.09.14 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa										WATER CONTENT (%)			
								20	40	60	80	100		20	40	60		GR	SA	SI	CL
	Continued From Previous Page																				
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep14/2015 5.1 150.2 Oct26/2015 4.7 150.6																				

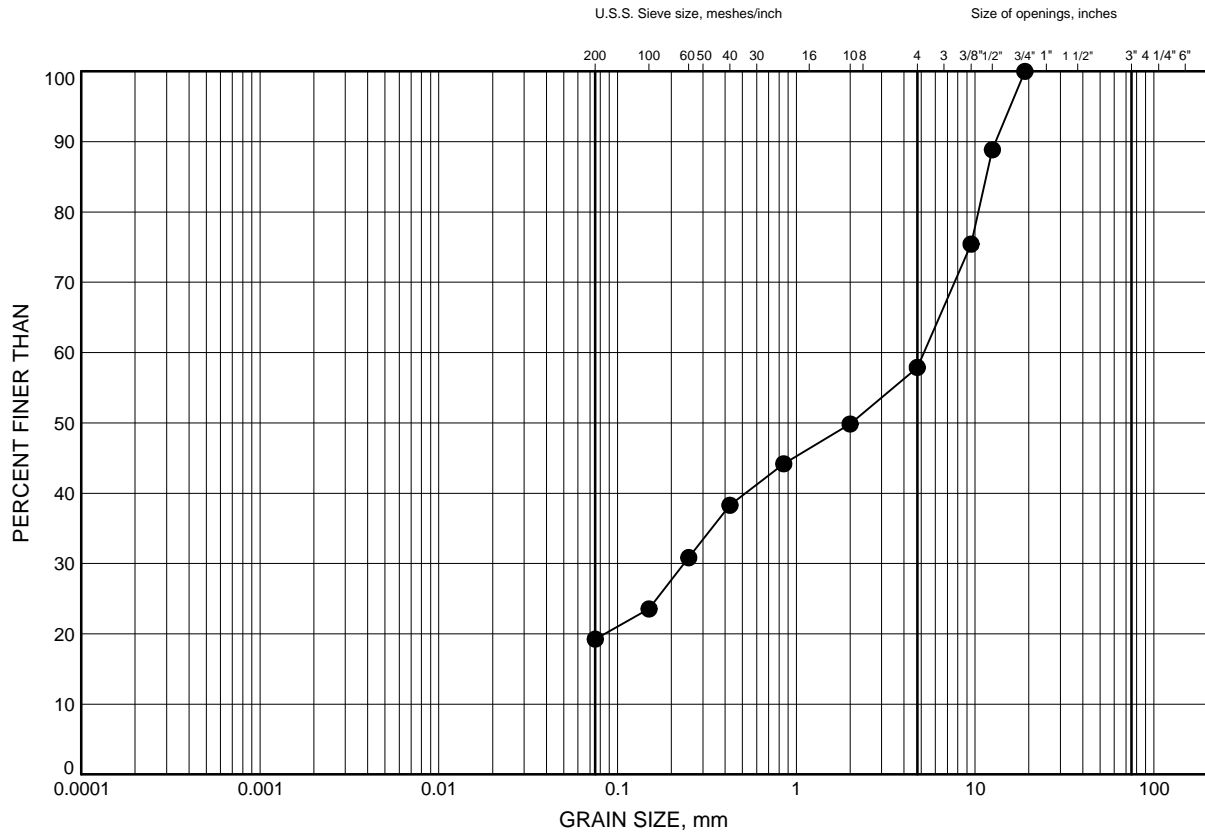
ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE A1

SAND & GRAVEL FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-04	0.46	140.14

Date October 2015
W.P. 2074-13-00



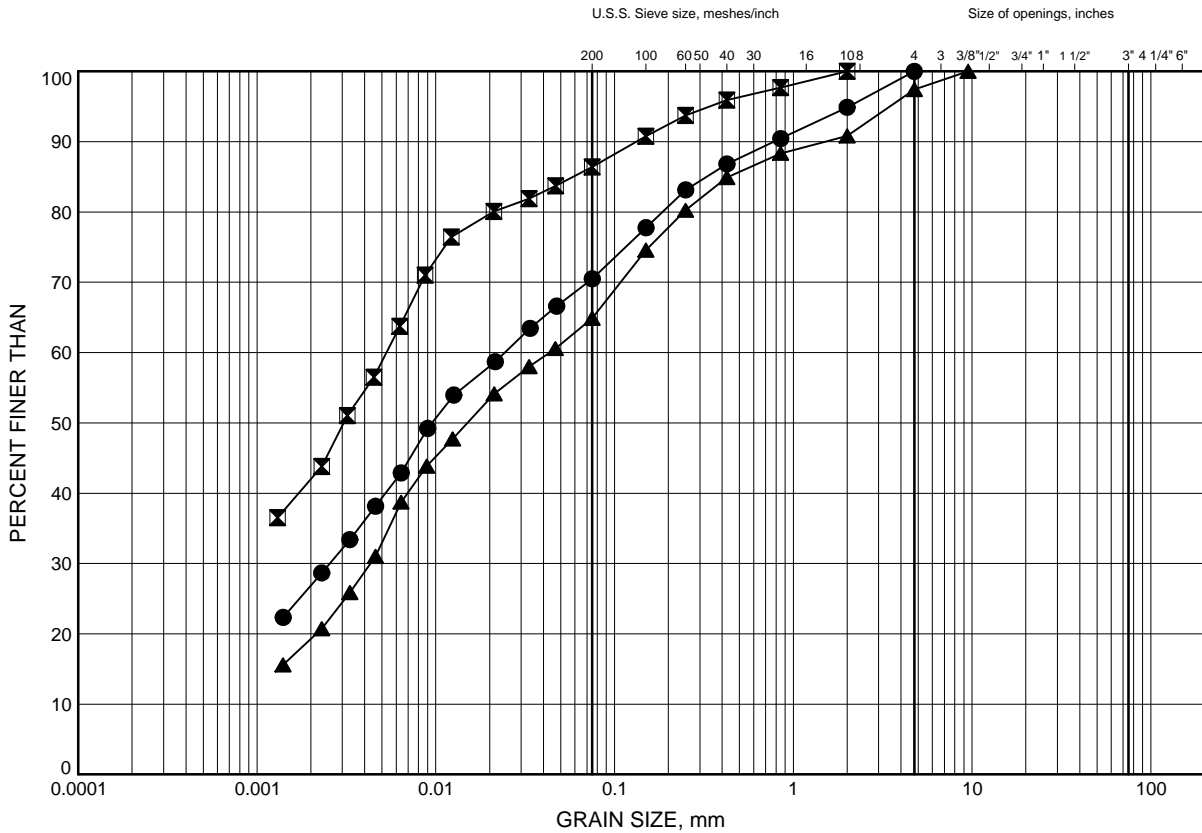
Prep'd AN
Chkd. RPR

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE A2

Silty CLAY FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-01	1.83	131.07
⊠	15-04	2.59	138.01
▲	15-06	1.07	148.63

Date ..October 2015.....
W.P. ..2074-13-00.....



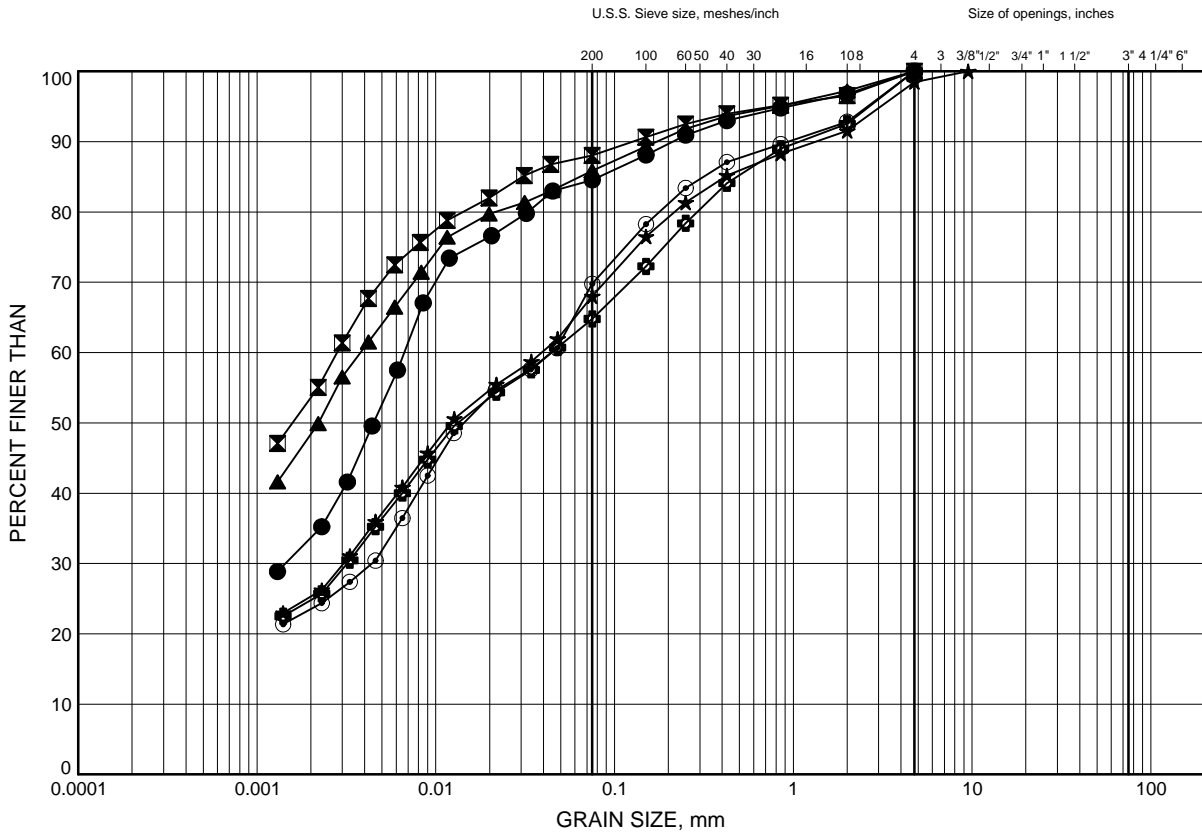
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE A3

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-01	6.40	126.50
⊠	15-02	3.35	130.85
▲	15-02	7.92	126.28
★	15-03	3.35	134.25
⊙	15-05	3.35	147.25
⊕	15-05	6.40	144.20

Date ..October 2015.....
W.P. ..2074-13-00.....



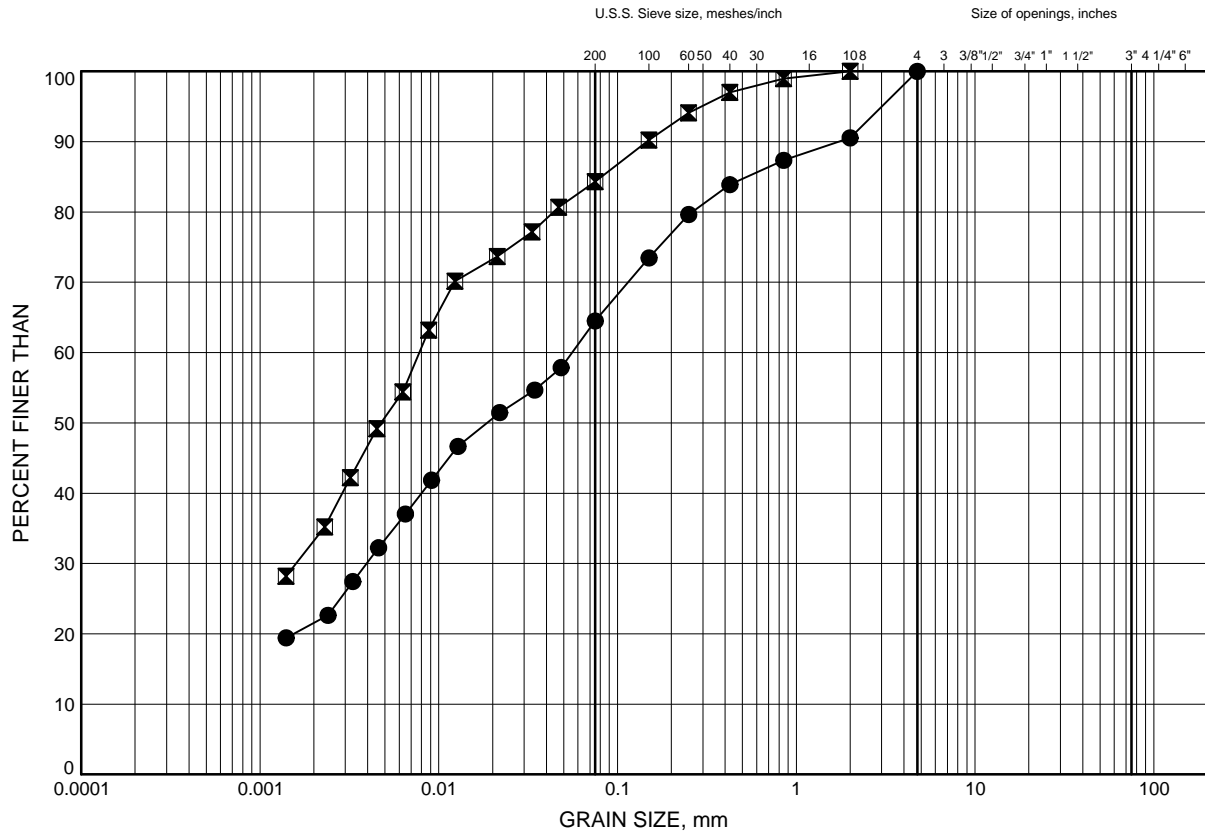
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE A4

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-07	3.35	148.35
◻	15-08	4.88	150.42

Date ..October 2015.....
W.P. ..2074-13-00.....

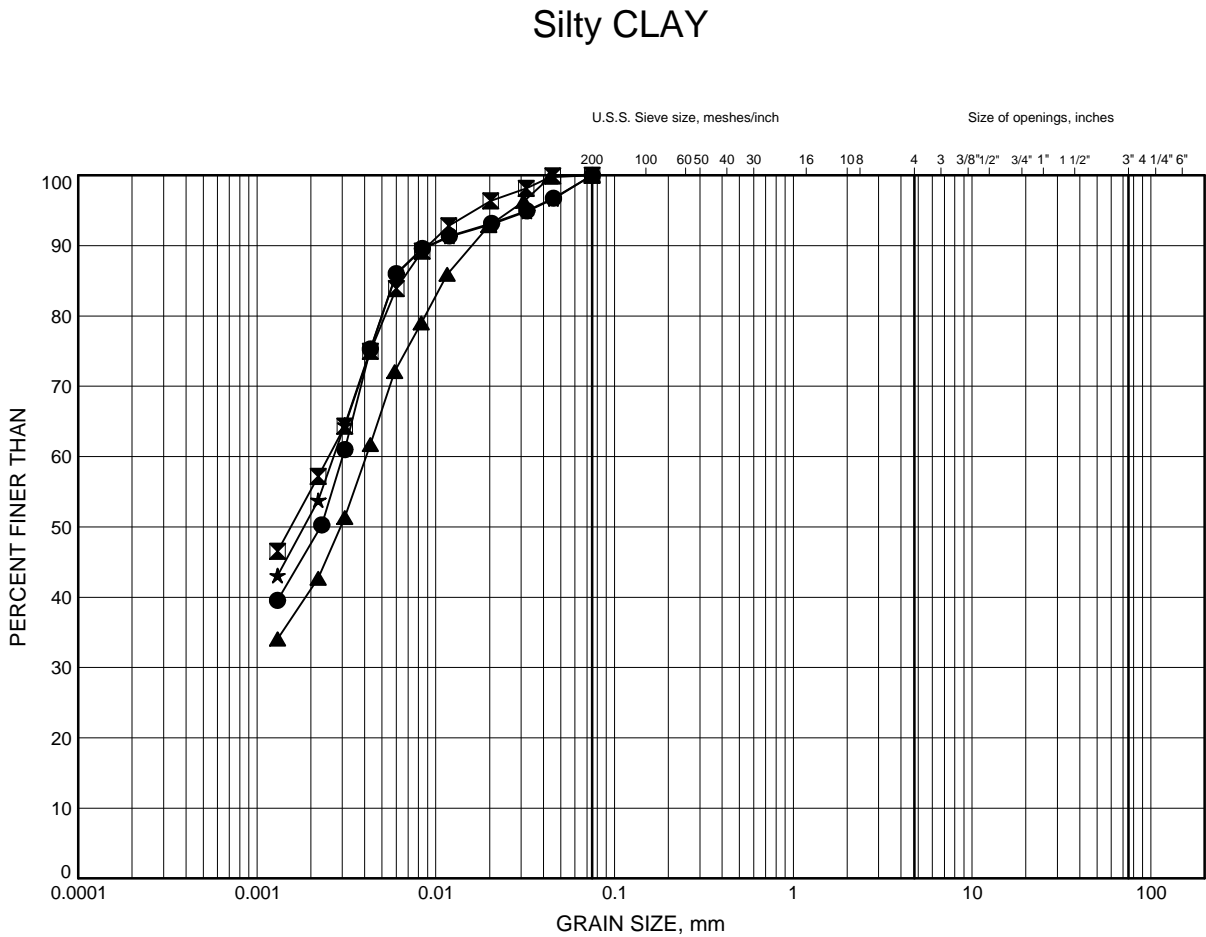


Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE A5



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-03	6.40	131.20
⊠	15-04	9.45	131.15
▲	15-06	7.92	141.78
★	15-07	7.92	143.78

Date ..October 2015.....
W.P. ..2074-13-00.....



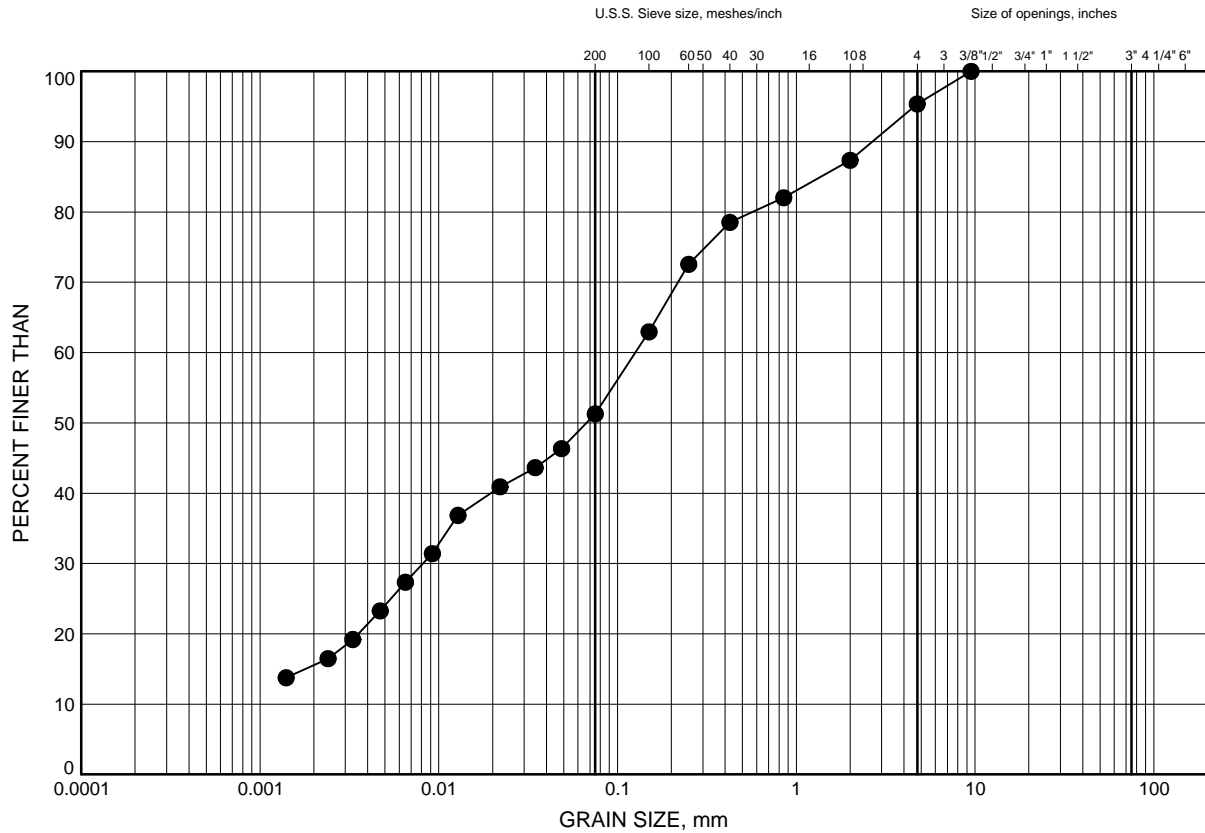
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE A6

SAND & SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-08	9.45	145.85

Date ..October 2015.....
W.P. ..2074-13-00.....

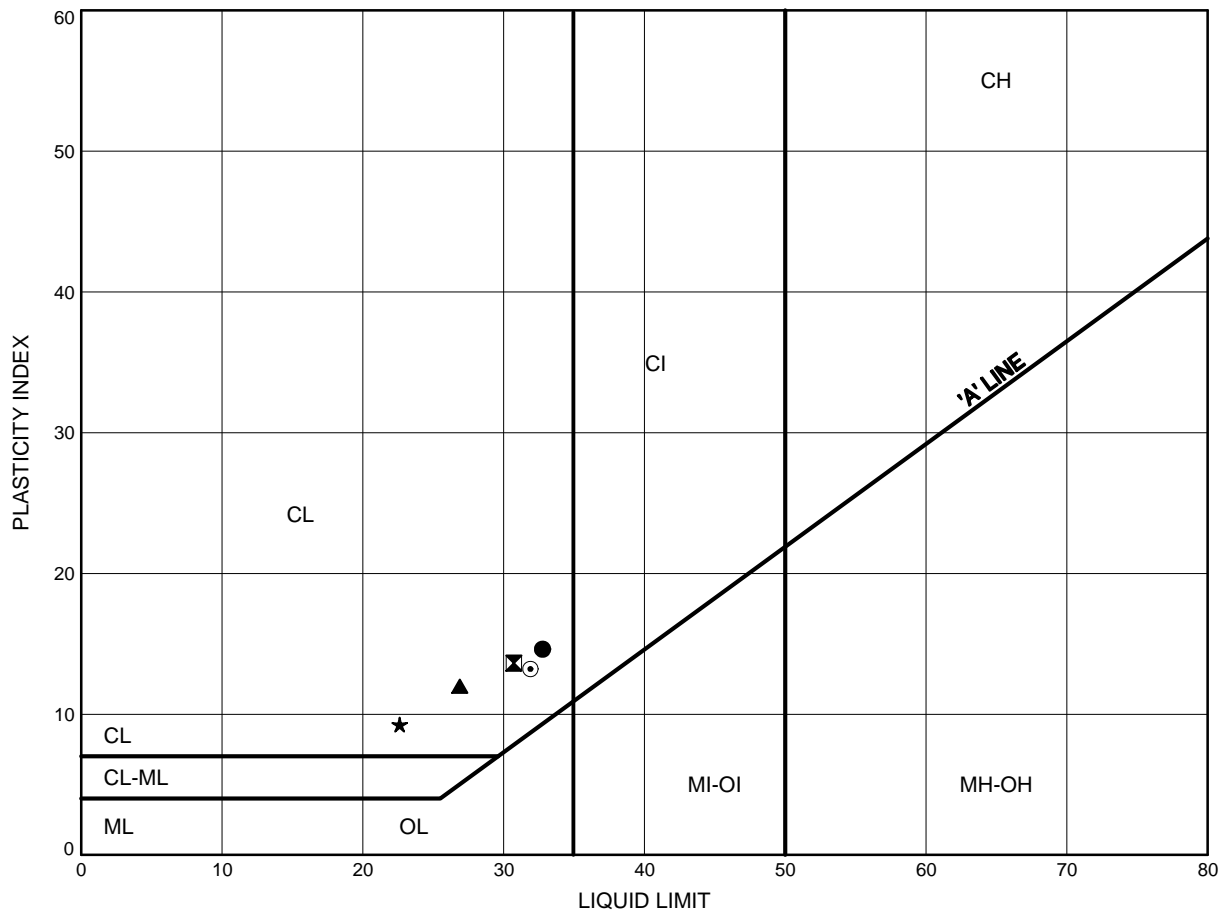


Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE A7

Silty CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-01	6.40	126.50
⊠	15-02	7.92	126.28
▲	15-05	6.40	144.20
★	15-07	3.35	148.35
⊙	15-08	4.88	150.42

Date October 2015
 W.P. 2074-13-00

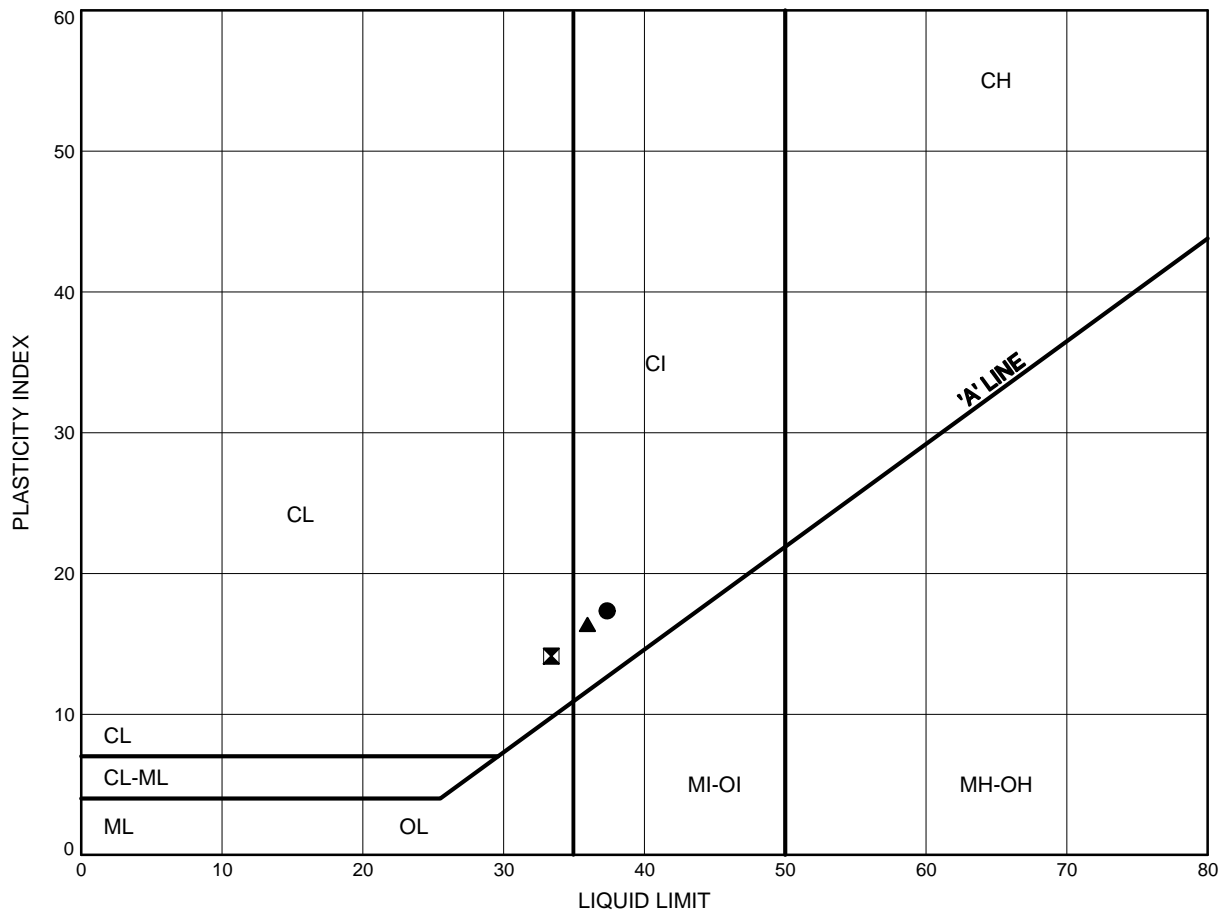


Prep'd AN
 Chkd. RPR

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE A8

Silty CLAY



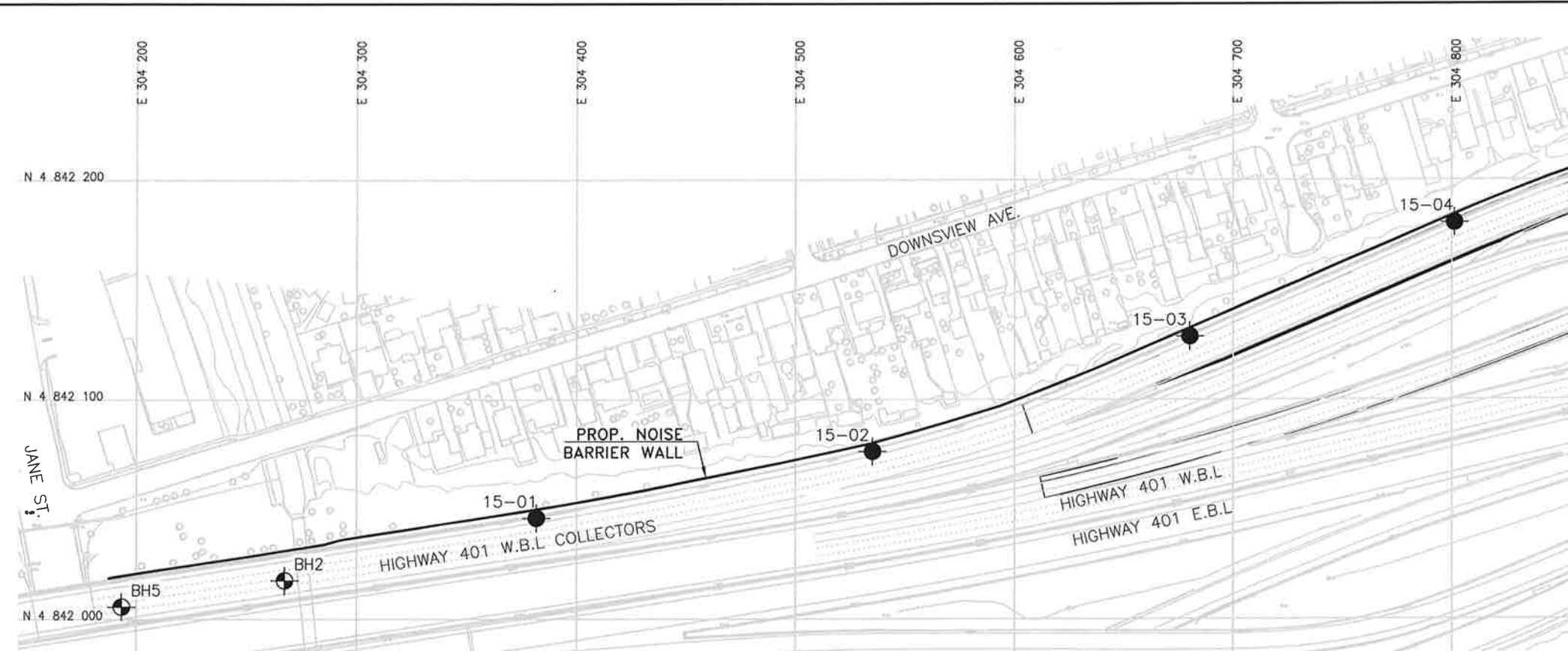
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-04	9.45	131.15
⊠	15-06	7.92	141.78
▲	15-07	7.92	143.78

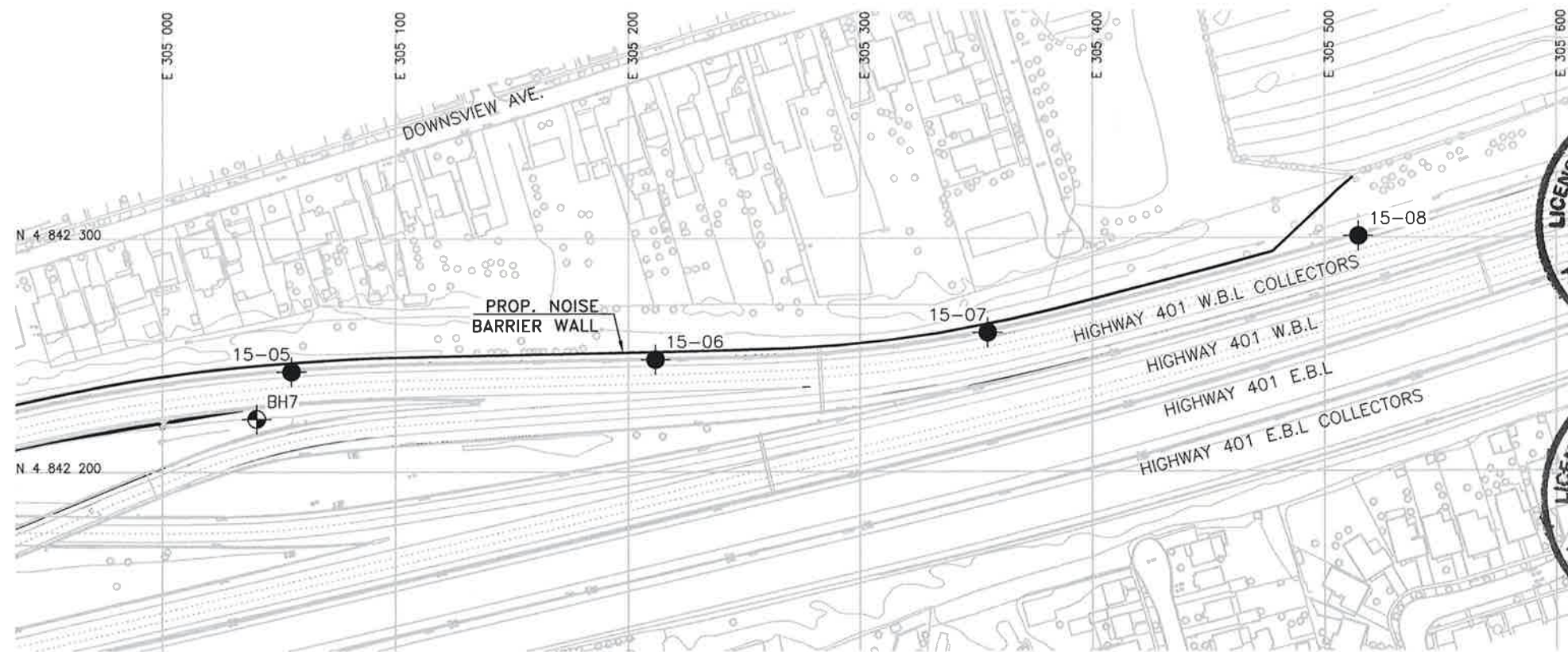
Date ..October 2015.....
W.P. ..2074-13-00.....



Prep'dAN.....
Chkd.RPR.....



PLAN



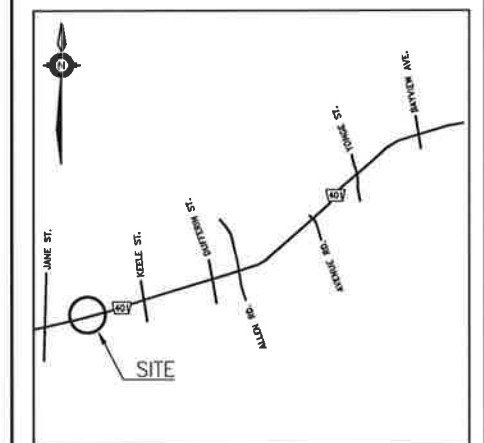
PLAN



METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 2074-13-00

HWY 401 WBL COLLECTORS
NOISE BARRIER WALL (SEGMENT 1)
EAST OF JANE STREET
BOREHOLE LOCATIONS PLAN



KEYPLAN

LEGEND

- Borehole (By Thurber)
- ⊙ Borehole (By Others)
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- W Water Level
- HA Head Artesian Water
- PZ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
15-01	132.9	4 842 046.1	304 381.7
15-02	134.2	4 842 076.3	304 535.3
15-03	137.6	4 842 128.7	304 680.3
15-04	140.6	4 842 180.6	304 801.2
15-05	150.6	4 842 243.0	305 055.4
15-06	149.7	4 842 248.1	305 211.6
15-07	151.7	4 842 259.6	305 354.8
15-08	155.3	4 842 300.7	305 514.6
BH2*	123.4	4 842 017.7	304 267.3
BH5*	124.4	4 842 005.7	304 193.3
BH7*	143.9	4 842 222.7	305 040.5

NOTES-

- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
- * Estimated coordinates.

GEOCRES No. 30M11-259



REVISIONS	DATE	BY	DESCRIPTION
DESIGN	RPR	CHK	RPR
DRAWN	AN	CHK	SKP
LOAD	DATE	DEC 2015	DWG 1

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS AND RESEARCH SECTION

W.P. 85-59-3

BORE HOLE NO. 2

JOB 61-F-113

STATION 85+46 (120' R.L.)

DATUM 404.7

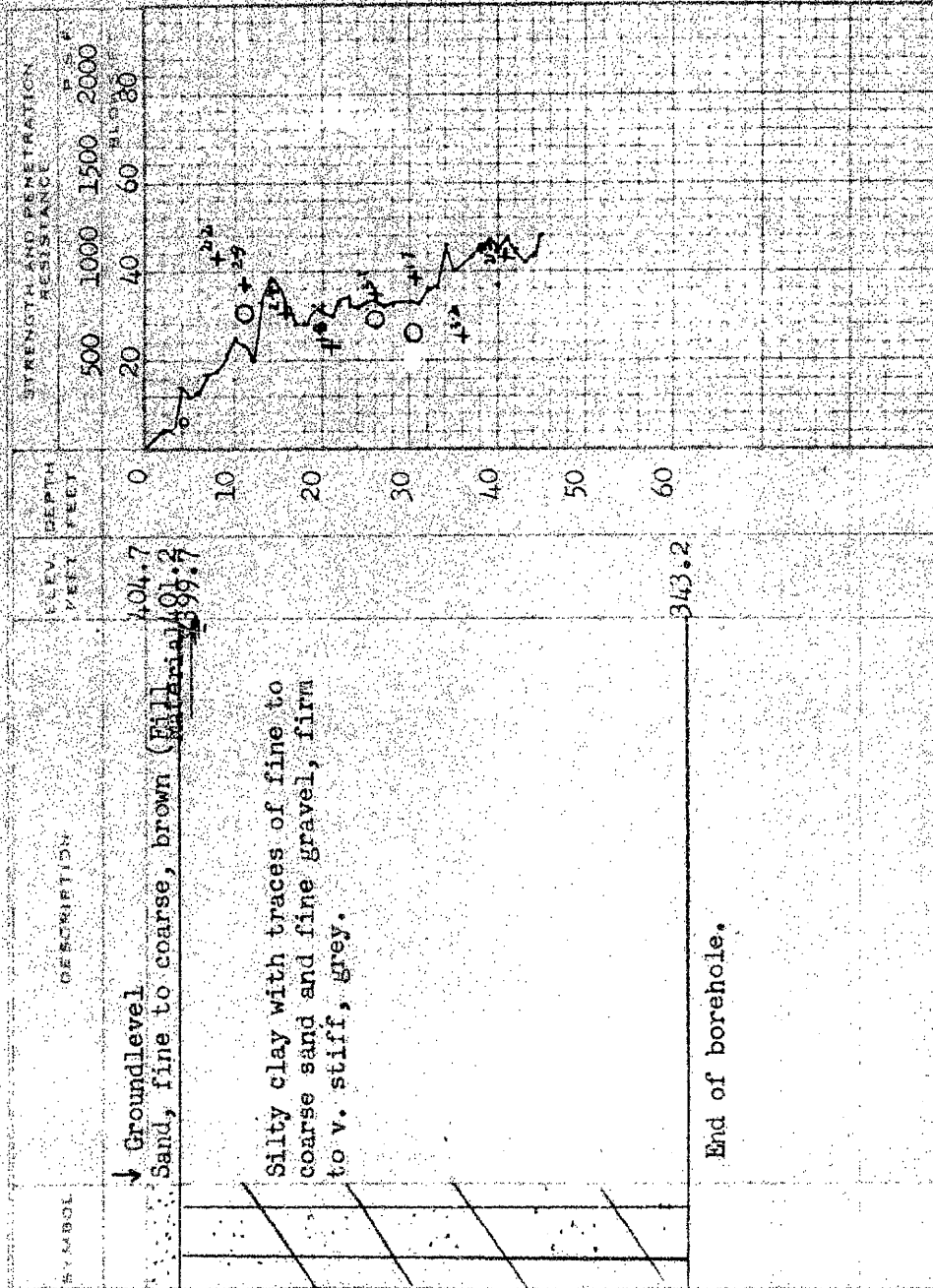
COMPILED BY I.H.

BORING DATE Nov. 16/61

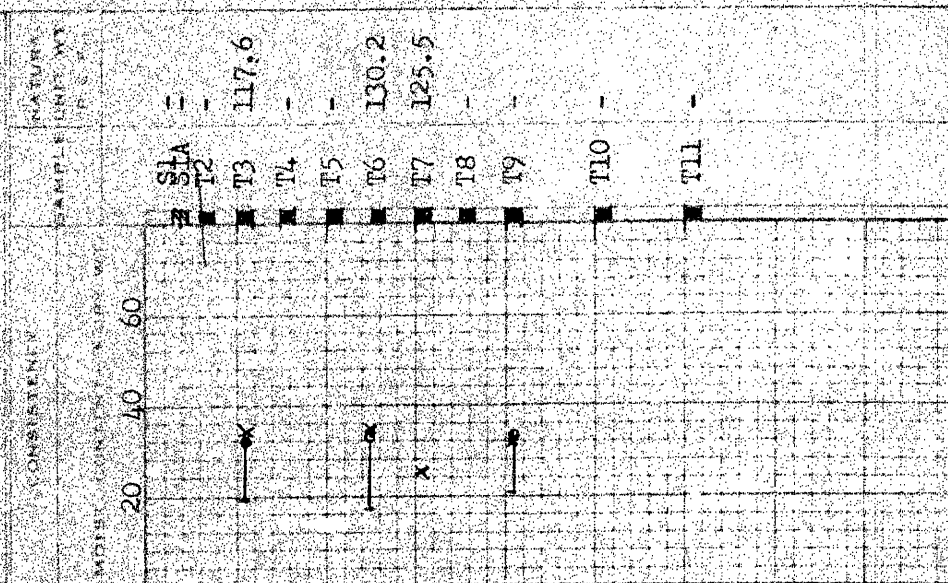
CHECKED BY K.S.

LEGEND

1/2 UNCONFINED COMPRESSION (QU)
VANE TEST (C) AND SENSITIVITY
NATURAL MOISTURE AND
LIQUIDITY INDEX
LIQUID LIMIT
PLASTIC LIMIT



End of borehole.



DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

JOB 61-F-113

LOCATION Sta. 86+14 (139' Rt. E Hwy. 401)

ORIGINATED BY H.S.

W P 85-59-3

BORING DATE March 13, 1963.

COMPILED BY H.S.

DATUM Geodetic

BOREHOLE TYPE Washboring using NX casing.

CHECKED BY B.K.

SOIL PROFILE			SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		SHEAR STRENGTH P.S.F. + Unconfined Shear Strength					WP	W	WL		
						400	800	1200	1600	2000	WATER CONTENT % 20 40 60				
408.0	Groundlevel														
0.0	Fine sand Loose brown.		1	SS	6										
398.0					400										
397.0	Sand and gravel.		2	SS	12										
11.0			3	SS	18										
	Grey silty clay - Firm to stiff.		4	SS	12			1.4							
			5	SS	7			2.9							
			6	SS	12			2.9							
			7	SS	12				5.7						
370.0					370										
368.0	Clayey silt to silt- stiff.		8	SS	12			3.6							
42.0	Grey silty clay Stiff		9	SS	11				1.9						
360.0					360										
48.0	Grey silt Very stiff.		10	SS	28										
			11	SS	21				4.2						
350.5					350										
37.5	End of borehole.				340										

W.L. in
borehole
397.7
10.3

134.8

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 7

FOUNDATION SECTION

JOB 62-F-85 LOCATION Sta. 273+35 (218' Rt.) ORIGINATED BY H.S.
W.P. 105-62 BORING DATE Oct. 4, 1962. COMPILED BY H.S.
DATUM 472.3 BOREHOLE TYPE Washboring CHECKED BY B.K.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F.	LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w <div>w_p — w — w_L</div>	WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT							
472.3	Groundlevel					480						
0.0	Desiccated zone. Hard to very stiff.											WL in borehole on 10/10/62
456.3												456.3
16.0	Clayey silt. Firm to stiff.		1	SS	3	450						16.0
437.3												
35.0	Sandy silt with some gravel.		2	SS	61	420						
407.3												GR. 27% SA. 46% SI. 22% CL. 5%
65.0	Clayey silt with sand, gravel and boulders. (Glacial Till) Very dense.		3	SS	88	390						GR. 34% SA. 11% SI. 36% CL. 19%
377.3			4	SS	>100							
372.8	Weathered zone.		5	RC	-							
97.5	Sound Bedrock (Grey Shale)		6	RC	-							
365.8			7	RC	-							
106.5	End of borehole.		8	RC	-							
			9	RC	-							
						360						

Appendix B

Noise Barrier Wall, Segment 2, West of Dufferin Street Boreholes 15-09 to 15-14 (Current investigation) Boreholes 1C, 2A (Previous investigation)

- Record of Borehole Sheets
- Laboratory Test Results
- Drawing titled “Borehole Locations”

RECORD OF BOREHOLE No 15-09

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 842 933.1 E 307 433.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.10.01 - 2015.10.01 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE									
185.8	GROUND SURFACE																
0.0	ASPHALT:(200mm)																
0.2	SAND, some silt, trace gravel Compact Brown Moist (FILL)		1	GS													
			1	SS	29												
184.4																	
1.4	Silty CLAY, with sand, trace gravel, sand seams Hard Brown Moist (TILL)		2	SS	30												
			3	SS	57												
			4	SS	49												
			5	SS	36												
			6	SS	34												
			7	SS	38												
			8	SS	70												
176.0																	
9.8	END OF BOREHOLE AT 9.8m.																

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity 20
15 10 5 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-09

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 842 933.1 E 307 433.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.10.01 - 2015.10.01 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Oct01/2015 Dry Oct26/2015 7.5 178.3																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-10

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 842 962.5 E 307 524.1 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.30 - 2015.09.30 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID LIMIT MOISTURE LIMIT CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)							
								○ UNCONFINED + FIELD VANE		● QUICK TRIAXIAL × LAB VANE		w _P w w _L							
186.0	GROUND SURFACE						20	40	60	80	100								
0.0	ASPHALT:(175mm)						20	40	60	80	100								
0.2	SAND, some silt, trace gravel Brown Moist (FILL)		1	GS															
185.2																			
0.8	Silty CLAY, with sand, trace gravel, oxidized seams Hard Brown Moist (TILL)		1	SS	37														
			2	SS	43														
			3	SS	46														
183.0																			
3.0	Very Stiff Grey		4	SS	25													4	33 40 23
			5	SS	28														
180.5																			
5.5			6	SS	30													0	34 45 21
			7	SS	31														
176.2			8	SS	30														
9.8	END OF BOREHOLE AT 9.8m.																		

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-10

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 842 962.5 E 307 524.1 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.30 - 2015.09.30 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
	WATER NOT OBSERVED IN BOREHOLE UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.																

RECORD OF BOREHOLE No 15-11

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 842 999.3 E 307 647.8 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.30 - 2015.09.30 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
187.1	GROUND SURFACE							20 40 60 80 100								
0.0	ASPHALT:(175mm)						187									
0.2	SAND, some silt, trace gravel Brown Moist (FILL)		1	GS												
186.3																
0.8	Silty CLAY, with sand, trace gravel, oxidized seams Hard Brown Moist (TILL)		1	SS	36		186									
			2	SS	60											0 35 41 24
							185									
	Grey		3	SS	33											
	Very Stiff		4	SS	25		184									
							183									
			5	SS	29											0 32 47 21
							182									
			6	SS	16		181									
							180									
			7	SS	15		179									
							178									
			8	SS	17											
177.3																
9.8	END OF BOREHOLE AT 9.8m.															

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15 10 5 0
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-11

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 842 999.3 E 307 647.8 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.30 - 2015.09.30 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	WATER NOT OBSERVED IN BOREHOLE UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.																

RECORD OF BOREHOLE No 15-12

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 843 038.1 E 307 770.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.29 - 2015.09.29 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
189.0	GROUND SURFACE							20 40 60 80 100						
0.0	ASPHALT:(175mm)							20 40 60 80 100						
0.2	SAND, some silt, trace gravel Brown Moist (FILL)		1	GS										
188.2														
0.8	Silty CLAY, trace sand and gravel Hard Brown Moist (FILL)		1	SS	34		188							
187.5														
1.5	Silty CLAY, with sand, trace gravel, oxidized seam Very Stiff to Hard Brown Moist (TILL)		2	SS	42		187							
			3	SS	28		186							2 34 41 23
			4	SS	35		185							
	Grey													
			5	SS	30		184							3 33 42 22
			6	SS	42		183							
			7	SS	38		181							
			8	SS	36		180							
179.2														
9.8	END OF BOREHOLE AT 9.8m.													

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-12

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 843 038.1 E 307 770.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.29 - 2015.09.29 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep29/2015 Dry Oct26/2015 7.0 182.0																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-13

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 843 081.9 E 307 889.4 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.29 - 2015.09.29 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
191.0	GROUND SURFACE													
0.0	ASPHALT:(175mm)													
0.2	SAND, some silt, trace gravel Brown Moist (FILL)		1	GS										
190.2														
0.8	Silty CLAY, trace sand and gravel Hard Brown Moist (FILL)		1	SS	30									
			2	SS	34									
188.7														
2.3	Silty CLAY, with sand, trace gravel, oxidized seams Hard Brown Moist (TILL)		3	SS	38									
			4	SS	50									
			5	SS	66									
	Boulder fragments Wet													
			6	SS	45									
	Grey													
			7	SS	50									
			8	SS	43									
181.2														
9.8	END OF BOREHOLE AT 9.8m.													

Continued Next Page

+³, ×³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-13

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 843 081.9 E 307 889.4 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.29 - 2015.09.29 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	WATER LEVEL AT 4.3m UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.																

RECORD OF BOREHOLE No 15-14

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 843 133.4 E 308 031.4 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.24 - 2015.09.24 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)			
192.7	GROUND SURFACE							20	40	60	80	100					GR	SA	SI	CL
0.0	SAND , some silt, trace gravel Brown Moist (FILL)		1	GS			192													
191.9	Silty CLAY , with sand, trace gravel Very Stiff to Hard Brown Moist (FILL)		1	SS	29		191													
0.8	Occasional cobbles		2	SS	30		190													
	Grey		3	SS	20		189													
	Stiff		4	SS	9		188													
188.6	Silty CLAY , with sand, trace gravel Hard to Very Stiff Brown Moist (TILL)		5	SS	45		187													
4.1	Grey		6	SS	29		186													
			7	SS	28		185													
			8	SS	35		184													
182.9	END OF BOREHOLE AT 9.8m.						183													
9.8																				

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-14

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 2 N 4 843 133.4 E 308 031.4 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.24 - 2015.09.24 CHECKED BY RPR

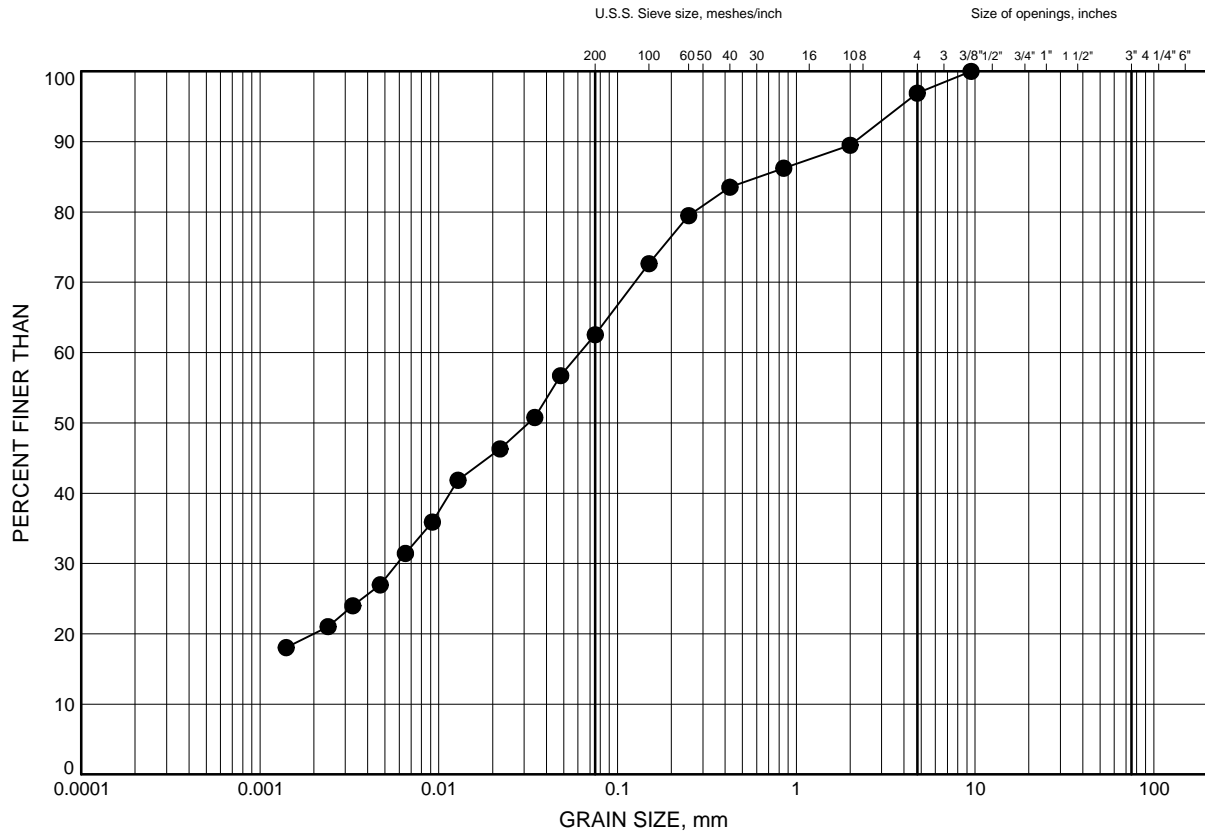
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep 24/ 15 8.6 184.1 Oct26/2015 4.5 188.2																

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE B1

Silty CLAY FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-14	1.83	190.87

Date ..October 2015.....
W.P. ..2074-13-00.....



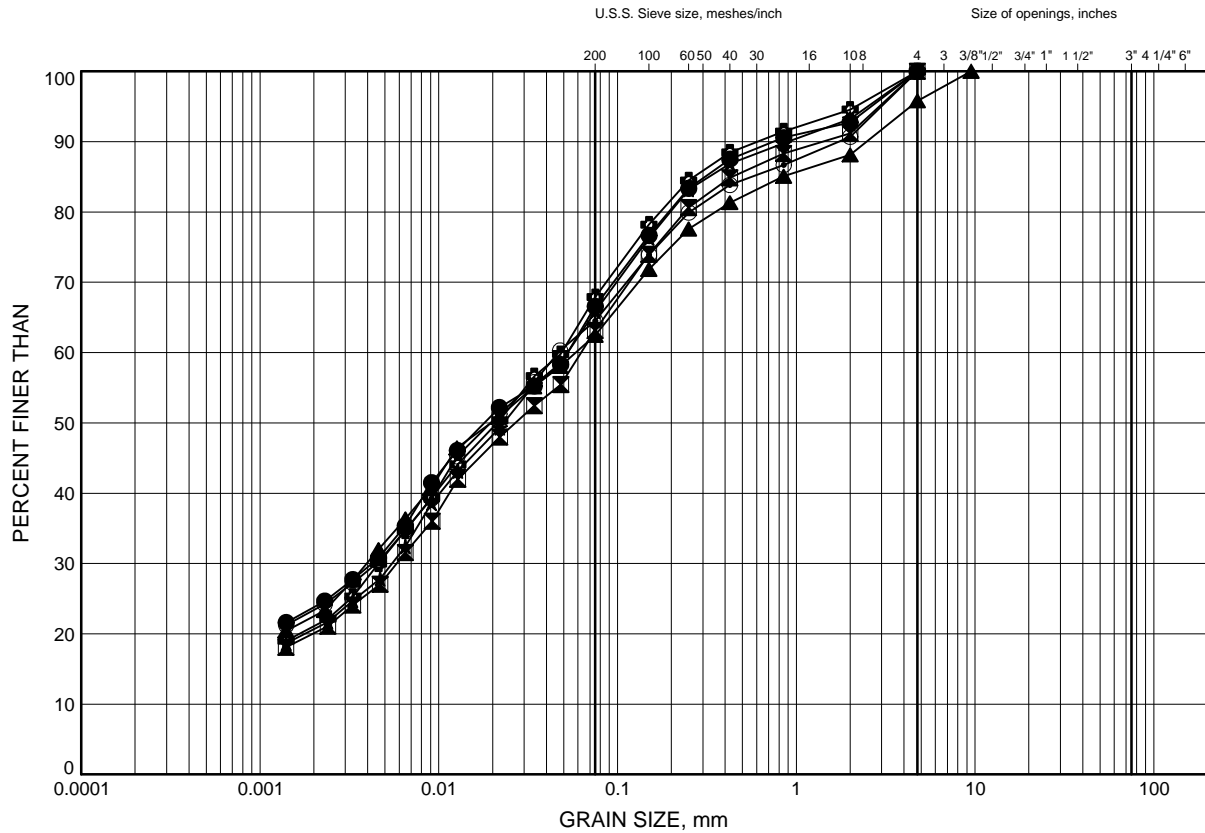
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE B2

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-09	2.59	183.21
⊠	15-09	7.92	177.88
▲	15-10	3.35	182.65
★	15-10	6.40	179.60
⊙	15-11	1.83	185.27
⊕	15-11	4.88	182.22

Date ..October 2015.....
W.P. ..2074-13-00.....



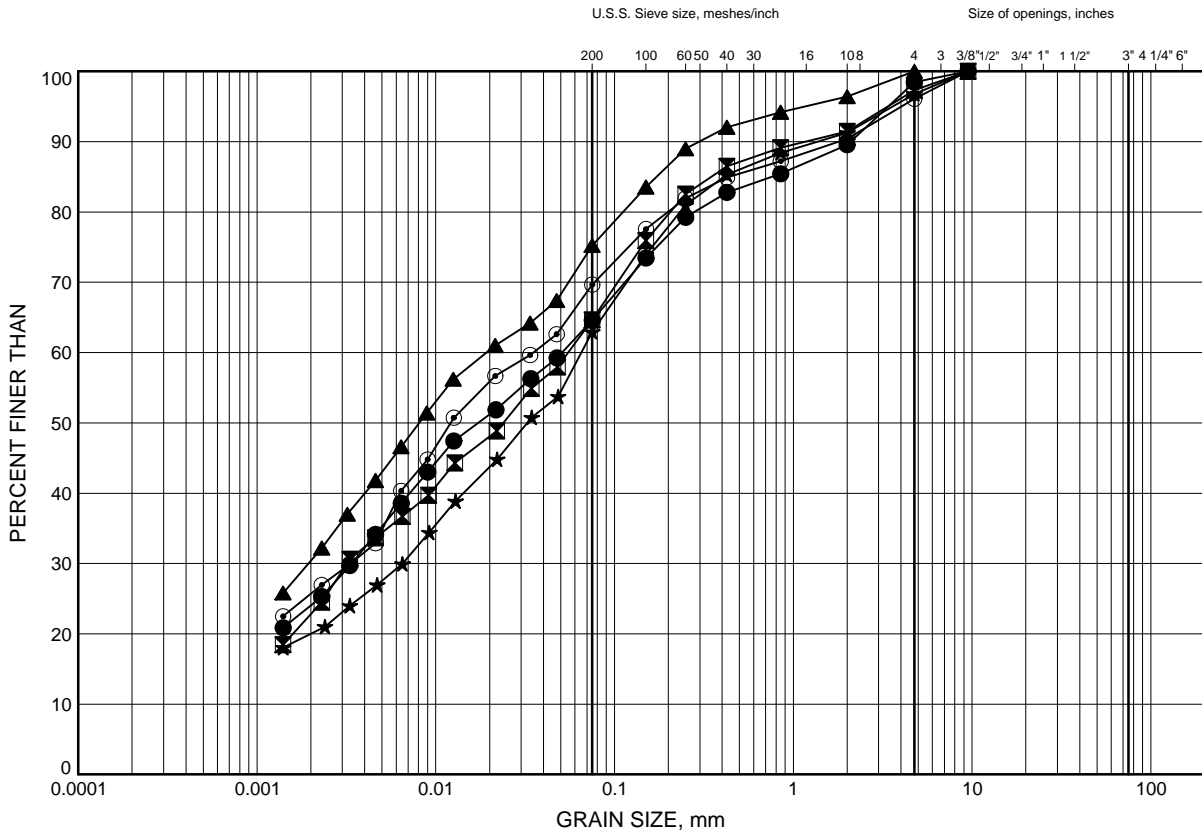
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE B3

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-12	2.59	186.41
⊠	15-12	4.88	184.12
▲	15-13	3.35	187.65
★	15-13	7.92	183.08
⊙	15-14	6.40	186.30

Date ..October 2015.....
W.P. ..2074-13-00.....

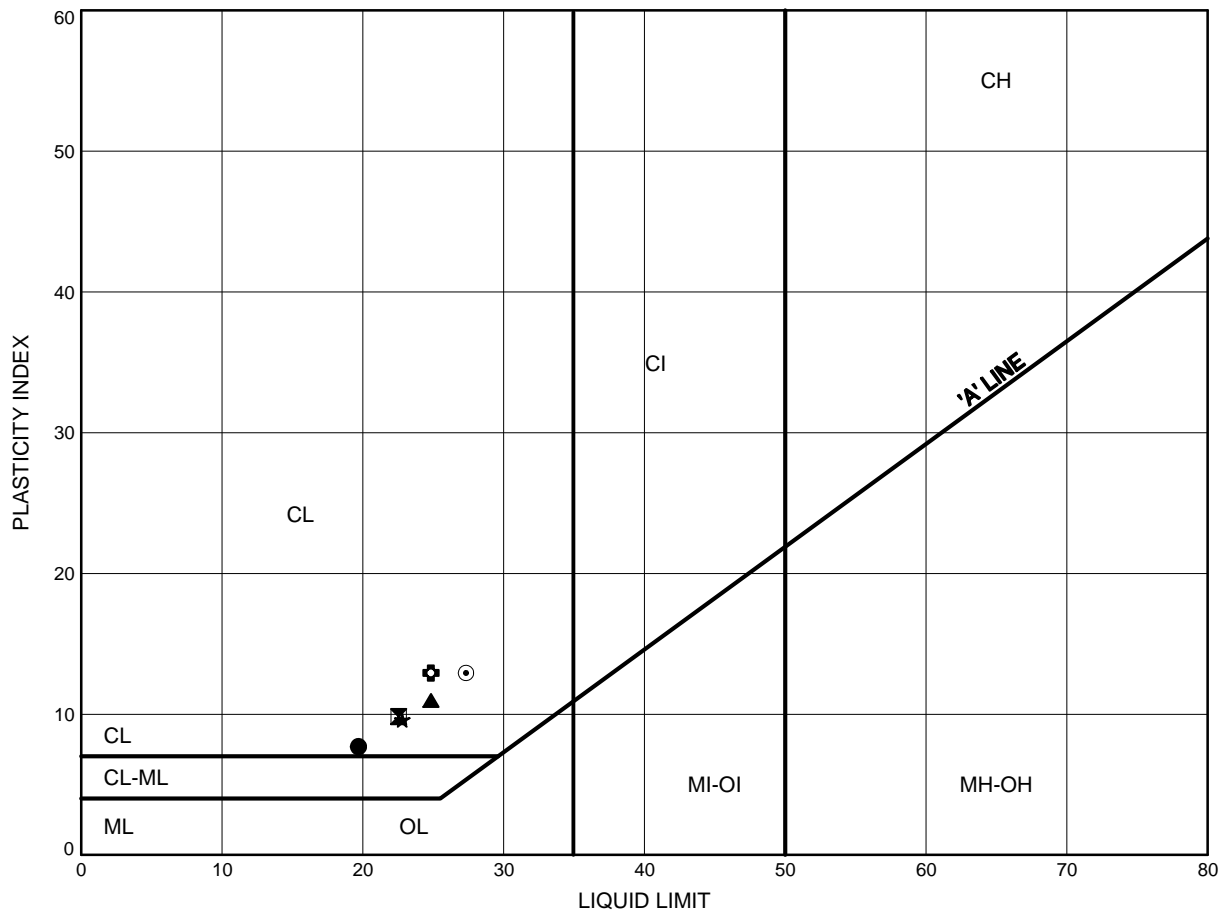


Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE B4

Silty CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-09	7.92	177.88
⊠	15-10	3.35	182.65
▲	15-11	1.83	185.27
★	15-12	2.59	186.41
⊙	15-13	3.35	187.65
⊕	15-14	6.40	186.30

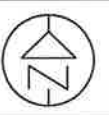
Date October 2015
W.P. 2074-13-00



Prep'd AN
Chkd. RPR

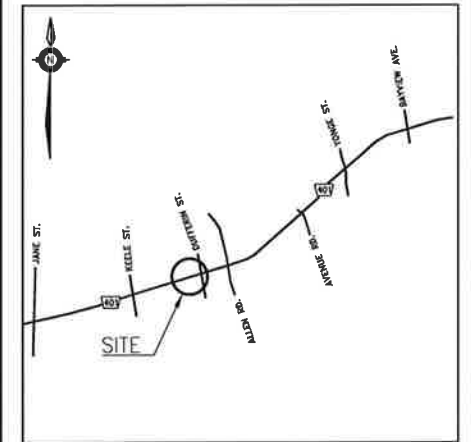
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 2074-13-00



HWY 401 WBL COLLECTORS
NOISE BARRIER WALL (SEGMENT 2)
WEST OF DUFFERIN STREET
BOREHOLE LOCATIONS PLAN

SHEET



KEYPLAN

LEGEND

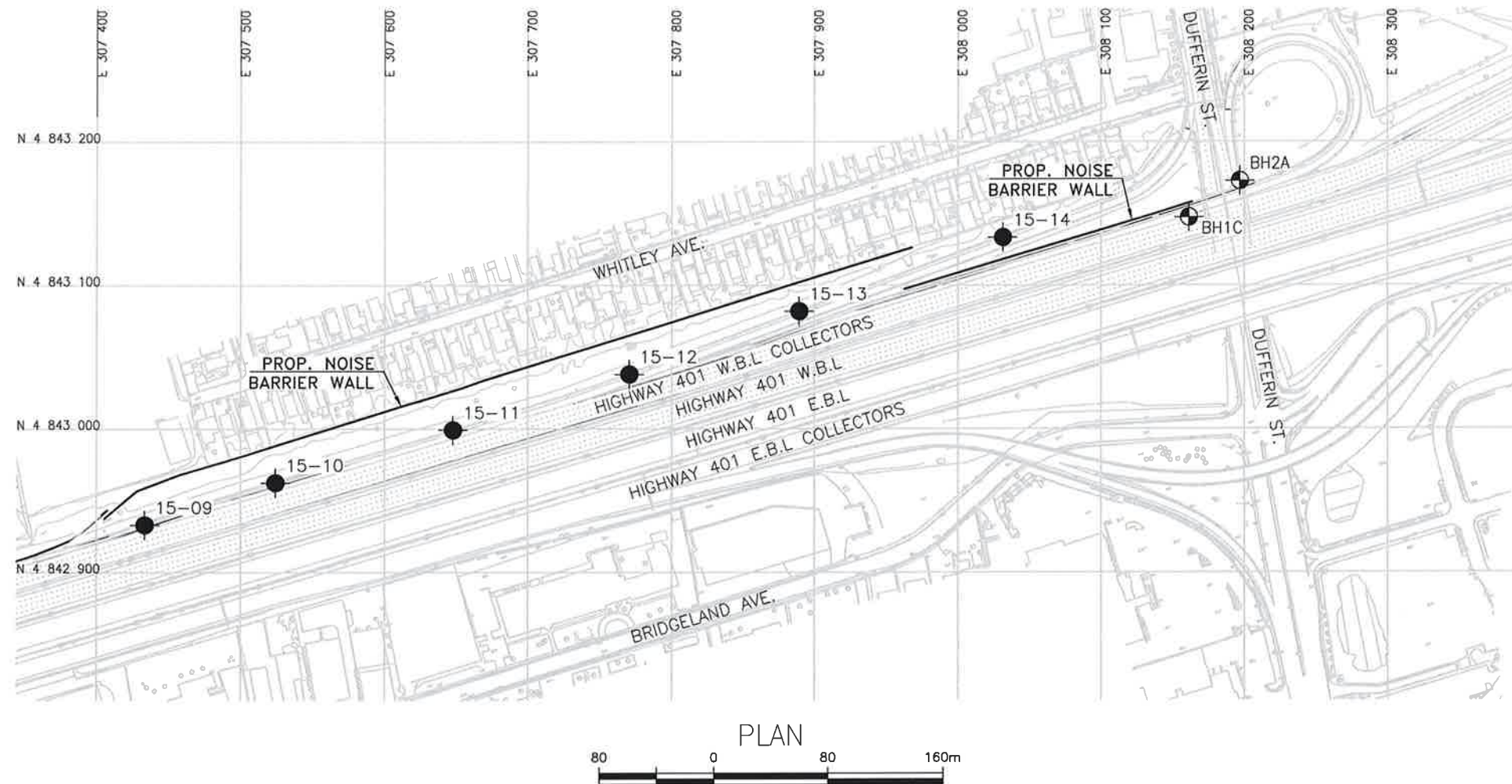
- Borehole (By Thurber)
- ⊕ Borehole (By Others)
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- ▽ Water Level
- ⌋ Head Artesian Water
- ⌋ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
15-09	185.8	4 842 933.1	307 433.6
15-10	186.0	4 842 962.5	307 524.1
15-11	187.1	4 842 999.3	307 647.8
15-12	189.0	4 843 038.1	307 770.6
15-13	191.0	4 843 081.9	307 889.4
15-14	192.7	4 843 133.4	308 031.4
BH1C*	189.9	4 843 147.5	308 161.4
BH2A*	190.2	4 843 172.8	308 197.0

-NOTES-

- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
- * Estimated coordinates.

GEOCRES No. 30M11-259



PLAN



REVISIONS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
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DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 10

FOUNDATION SECTION

JOB 63-F-24 LOCATION 218+35 102' Lt. ORIGINATED BY B.M.G.
W.P. 229-60 BORING DATE March 25, 1963. COMPILED BY B.M.G.
DATUM Geodetic BOREHOLE TYPE Pennsylvania Auger - 4 1/2" Ø CHECKED BY K.G.S.

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — WL		BULK DENSITY	REMARKS
ELEV	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	20 40 60 80 100	PLASTIC LIMIT — WP		
DEPTH							WATER CONTENT — W		
							WP — W — WL		
							WATER CONTENT %		
623.0	Groundlevel								
0.0	Topsoil and fill material V. stiff to hard. Brown and black.								
618.4			1	SS	32				
4.6			2	SS	30				
	Silty clay and clayey silt with traces of sand and fine gravel. (Glacial Till)		3	SS	31				
	V. stiff to hard.								
	Brown changing to grey at El. 613.		4	SS	37				
			5	SS	27				
601.5			6	SS	36				
21.5	End of borehole.								

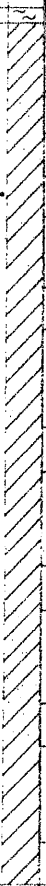
NWL 605.0
18.0

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 2A

FOUNDATION SECTION

JOB 63-F-24 LOCATION 219+55 167' Lt. ORIGINATED BY B.M.G.
W.P. 229-60 BORING DATE March 14, 1963. COMPILED BY B.M.G.
DATUM Geodetic BOREHOLE TYPE Pennsylvania Auger - 4 1/2" Ø CHECKED BY K.G.S.

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.					WATER CONTENT % WP W WL			
623.9	Groundlevel														
0.6	Topsoil														
	Silty clay and clayey silt with some sand and gravel. (Glacial Till)		1	SS	23	620									
			2	SS	36	615									
			3	SS	86	610									
	V. Stiff to Hard.														
	Brown changing to grey at El. 614.		4	TW	P	605									
		5	SS	41	600										
		6	SS	65	595										
592.4		7	SS	74											
31.6	End of borehole														

∇ El. 615

Appendix C

Noise Barrier Wall, Segment 3, East of Bathurst Street off Ramp and West of Bathurst Street off Ramp Boreholes 15-15 to 15-19 (Current investigation) Boreholes 16, 17, 18 (Previous investigation)

- Record of Borehole Sheets
- Laboratory Test Results
- Drawing titled “Borehole Locations”

RECORD OF BOREHOLE No 15-15

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 3 N 4 843 604.7 E 309 458.3 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.17 - 2015.09.17 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa							
190.6	GROUND SURFACE							20	40	60	80	100			
0.0	ASPHALT:(100mm)							20	40	60	80	100			
190.3	CONCRETE:(200mm)							20	40	60	80	100			
0.3	Gravelly SAND , trace silt, trace gravel		1	GS			190								
189.8	Brown														
0.8	Moist (FILL)		1	SS	11										
	Silty CLAY , with sand														
	Stiff														
	Brown		2	SS	13		189								
	Moist (FILL)														
	Brown to Brownish Grey														
			3	SS	8		188								0 32 42 26
	Occasional rootlets		4	SS	14		187								
	Grey														
	Very Stiff		5	SS	21		186								
184.8							185								
5.8	Silty CLAY , with sand														
	Stiff														
	Grey		6	SS	14		184								0 31 42 27
	Moist														
183.4															
7.2	Silty CLAY , with sand, trace gravel														
	Very Stiff to Hard														
	Brown														
	Moist (TILL)		7	SS	28		183								
			8	SS	44		182								
180.8							181								2 34 44 20
9.8	END OF BOREHOLE AT 9.8m.														

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-15

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 3 N 4 843 604.7 E 309 458.3 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.17 - 2015.09.17 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page NO WATER OBSERVED IN BOREHOLE UPON COMPLETION OF DRILLING. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep17/2015 Dry Oct26/2015 6.9 183.7																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-16

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 3 N 4 843 706.8 E 309 621.2 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.16 - 2015.09.16 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT				UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)					
								20 40 60 80 100				w _p w w _L					
								○ UNCONFINED + FIELD VANE									
								● QUICK TRIAXIAL × LAB VANE									
186.0	GROUND SURFACE																
0.0	ASPHALT:(200mm)																
0.2	Gravelly SAND , some silt and clay		1	GS												21 65 14 (SI+CL)	
185.2	Brown Moist (FILL)																
0.8	Silty CLAY , trace sand and gravel		1	SS	17		185										
	Very Stiff to Stiff																
	Grey Moist (FILL)		2	SS	11		184										
183.7																	
2.3	Silty CLAY , with sand, oxidized seam		3	SS	32		183										
	Hard Brown Moist (TILL)																
	Occasional boulder fragments		4	SS	50		182									0 38 41 21	
	Grey																
			5	SS	34		181										
180.2																	
5.8			6	SS	26		180										
	Very Stiff																
179.0							179										
7.0			7	SS	34		178									3 37 40 20	
	Trace gravel																
			8	SS	60		177										
176.2																	
9.8	END OF BOREHOLE AT 9.8m>																

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-16

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 3 N 4 843 706.8 E 309 621.2 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.16 - 2015.09.16 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	NO WATER OBSERVED IN BOREHOLE UPON COMPLETION OF DRILLING. BOREHOLE WAS BACKFILLED WITH AUGER CUTTINGS AND BENTONITE HOLEPLUG TO 0.6m, SAND FROM 0.6m TO 0.3m. THEN ASPHALT COLDPATCH TO SURFACE.																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 10/23/15

RECORD OF BOREHOLE No 15-17

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 3 N 4 843 795.0 E 309 775.8 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.16 - 2015.09.16 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa				WATER CONTENT (%)					
184.4	GROUND SURFACE							20	40	60	80	100					
0.0	ASPHALT:(200mm)							20	40	60	80	100					
0.2	Gravelly SAND , some silt and clay		1	GS			184										22 57 21 (SI+CL)
183.6	Brown Moist (FILL)																
0.8	Silty CLAY , trace sand and gravel		1	SS	10		183										
183.0	Stiff Brown Moist (FILL)																
1.4	Silty CLAY , with sand, trace gravel, oxidized seams		2	SS	20		182										2 37 44 17
	Very Stiff to Hard Brown Moist (TILL)																
			3	SS	35		181										
			4	SS	49		180										
			5	SS	50/ 0.075		179										
	Occasional boulder fragments Grey		6	SS	42		178										0 40 43 17
			7	SS	38		177										
			8	SS	40		176										
174.6							175										
9.8	END OF BOREHOLE AT 9.8m.																

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No 15-18

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 3 N 4 844 028.3 E 309 819.0 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.15 - 2015.09.15 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									WATER CONTENT (%)
184.2	GROUND SURFACE							20	40	60	80	100					
0.0	ASPHALT: (150mm)							20	40	60	80	100					
0.2	CONCRETE: (250mm)							20	40	60	80	100					
0.4	SAND, some silt and clay, trace gravel		1	GS			184									3	81 16 (SI+CL)
183.4	Brown Moist (FILL)		1	SS	12												
0.8	Silty CLAY, trace sand and gravel Stiff						183										
182.7	Brown Moist (FILL)		2	SS	21												
1.5	Silty CLAY, with sand, oxidized seams Very Stiff to Hard						182										
	Brown Moist (TILL)		3	SS	27												
			4	SS	48		181									0	38 42 20
							180										
	Grey		5	SS	36		179										
			6	SS	95		178										
							177										
			7	SS	100/ 0.275		176										
							175										
174.4	END OF BOREHOLE AT 9.8m.		8	SS	70												
9.8																	

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-18

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 3 N 4 844 028.3 E 309 819.0 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.15 - 2015.09.15 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	NO WATER OBSERVED IN BOREHOLE UPON COMPLETION OF DRILLING. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND AUGER CUTTINGS TO SURFACE.																

METRIC

SOIL PROFILE					
ELEV DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES	GROUND WATER CONDITIONS	ELEVATION SCALE
		NUMBER	TYPE	"N" VALUES	
184.3	GROUND SURFACE				
0.0	ASPHALT:(150mm)				
183.9	CONCRETE:(250mm)				
0.4	Gravelly SAND, some silt and clay	1	GS		
183.6	Brown Moist (FILL)				
0.7	Silty CLAY, with sand, trace gravel Stiff to Very Stiff Brown Moist (FILL)	1	SS	12	
		2	SS	21	
182.2					
2.1	Silty CLAY, with sand, oxidized seams Hard Brown Moist (TILL) Grey	3	SS	36	
		4	SS	45	
		5	SS	64	
		6	SS	38	
		7	SS	73/ 0.250	
		8	SS	78	
174.6	END OF BOREHOLE AT 9.7m. NO FREE STANDING WATER				
9.7					

+³, ×³: Numbers refer to Sensitivity

RECORD OF BOREHOLE No 15-19

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 3 N 4 843 929.4 E 309 918.3 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.09.15 - 2015.09.15 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
	OBSERVED IN BOREHOLE. Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.0m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Sep15/2015 Dry Oct26/2015 6.9 177.4																

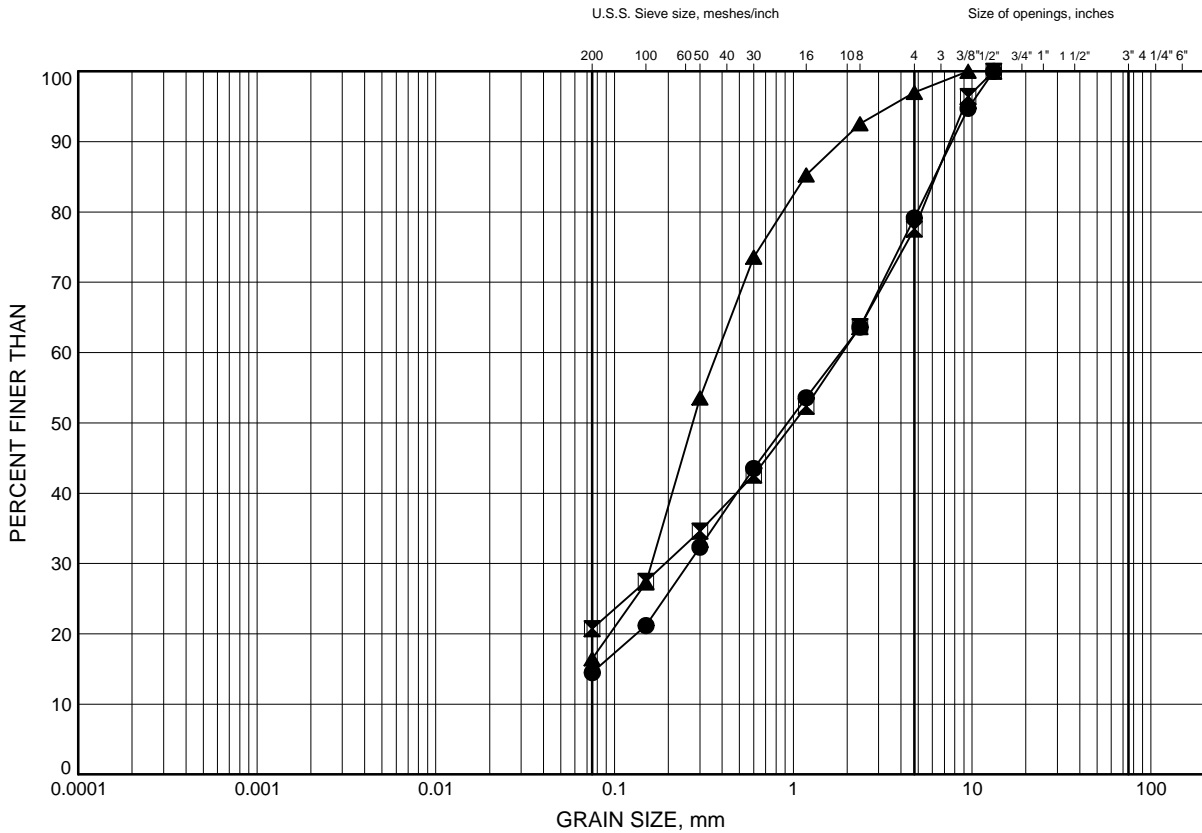
ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE C1

Gravelly SAND FILL/SAND FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-16	0.46	185.54
⊠	15-17	0.46	183.94
▲	15-18	0.46	183.74

Date ..October 2015.....
W.P. ..2074-13-00.....



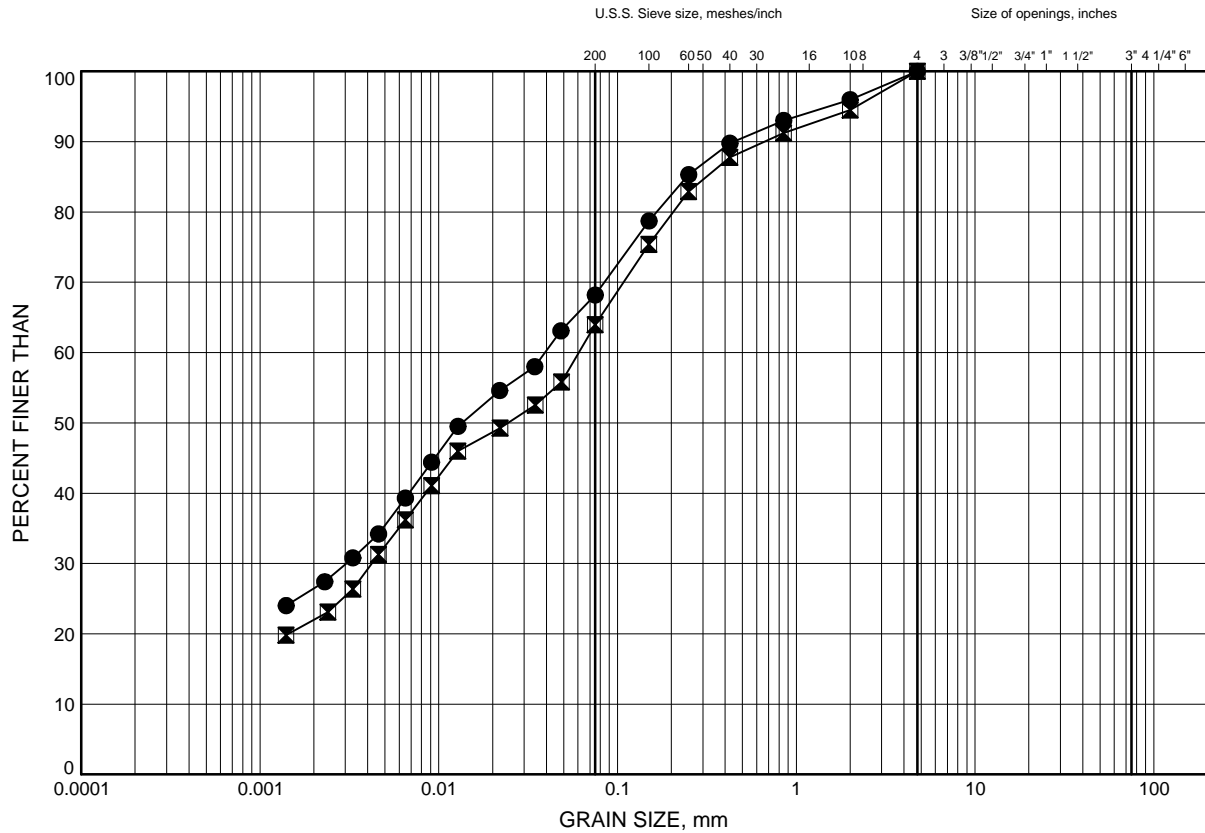
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE C2

Silty CLAY FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-15	2.59	188.01
⊠	15-19	1.83	182.47

Date ..October 2015.....
W.P. ..2074-13-00.....



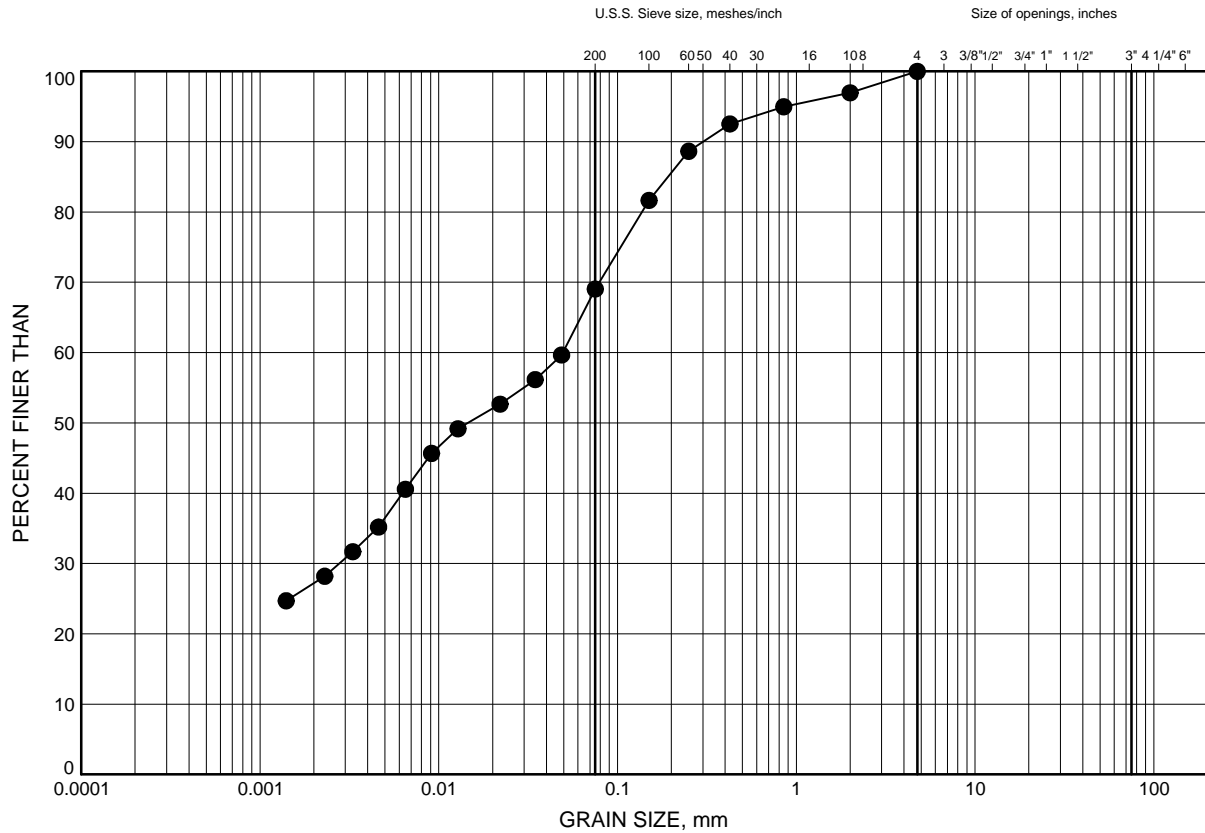
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE C3

Silty CLAY



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-15	6.40	184.20

Date ..October 2015.....
W.P. ..2074-13-00.....



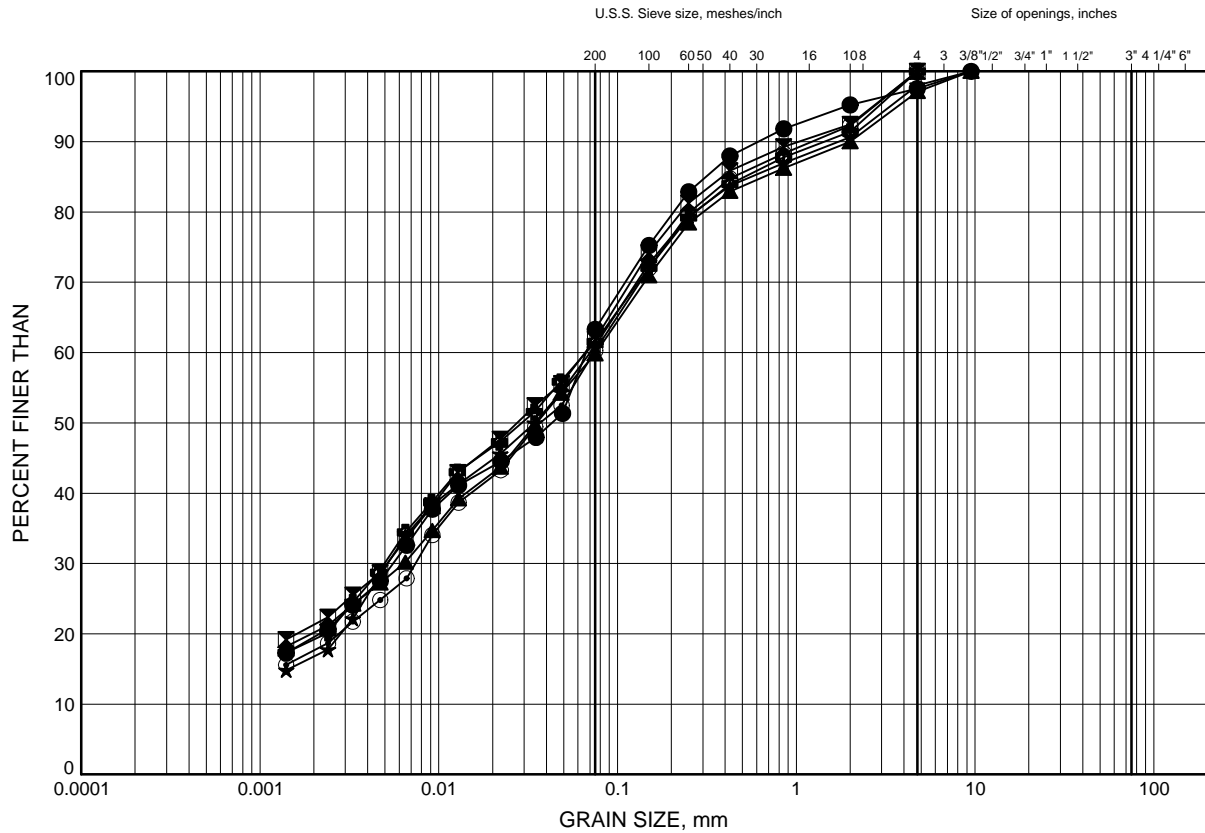
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE C4

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-15	9.45	181.15
⊠	15-16	3.35	182.65
▲	15-16	7.92	178.08
★	15-17	2.59	181.81
⊙	15-17	6.40	178.00
⊕	15-18	3.35	180.85

Date ..October 2015.....
W.P. ..2074-13-00.....



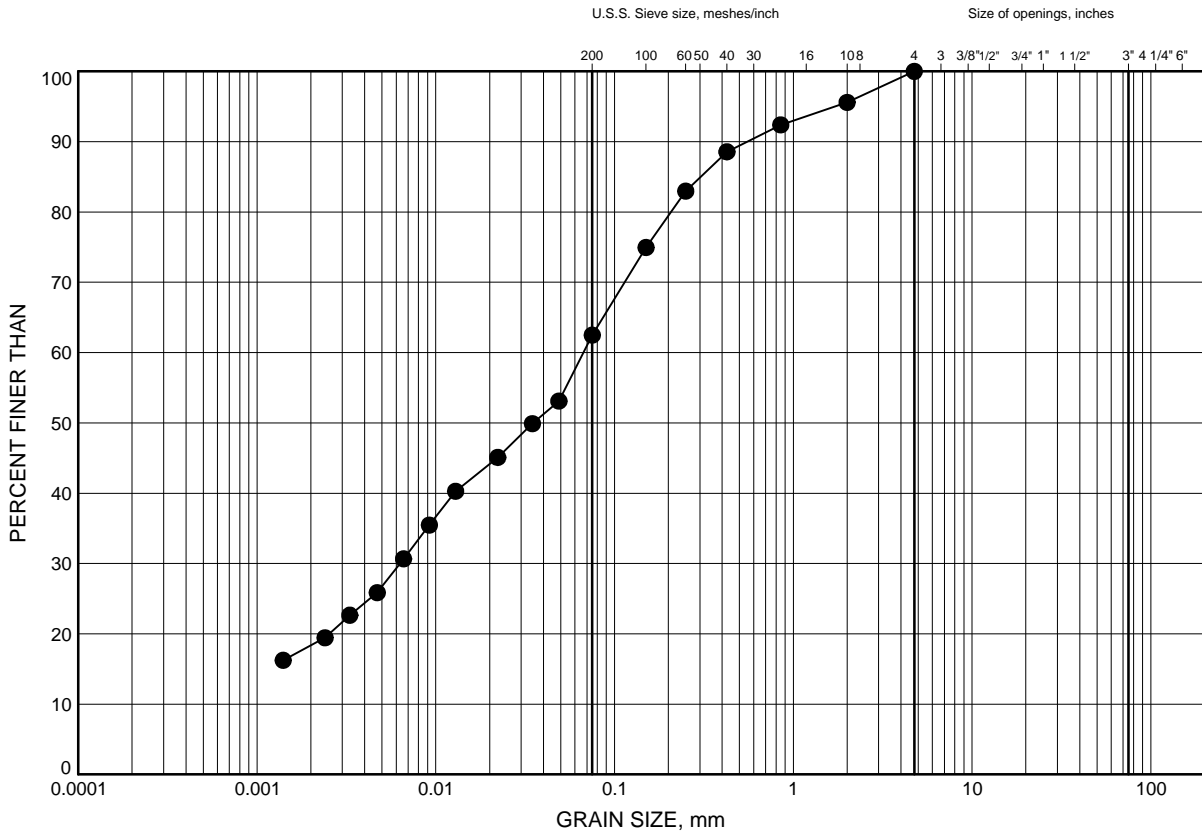
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE C5

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-19	6.40	177.90

Date ..October 2015.....
W.P. ..2074-13-00.....

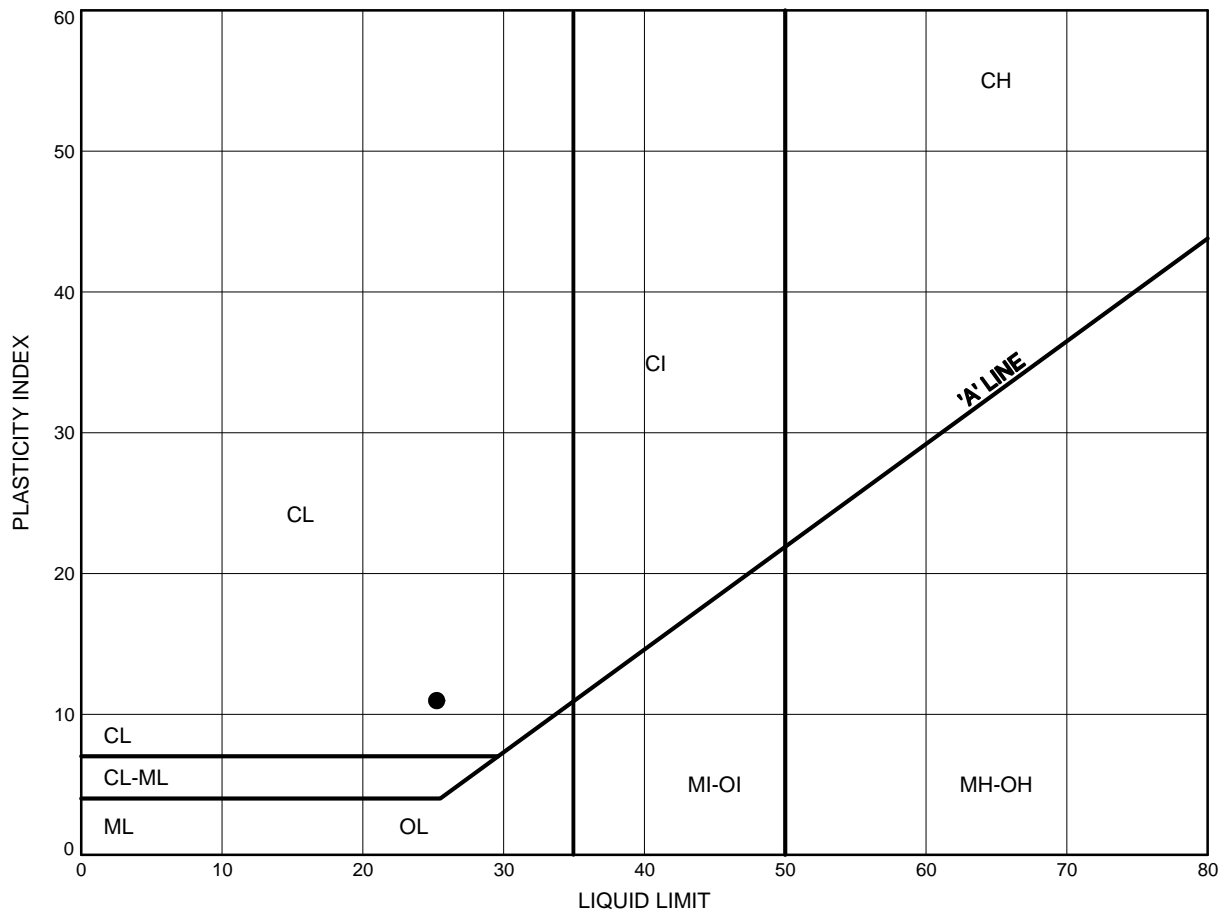


Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE C6

Silty CLAY FILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-19	1.83	182.47

Date ..October 2015.....
W.P. ..2074-13-00.....

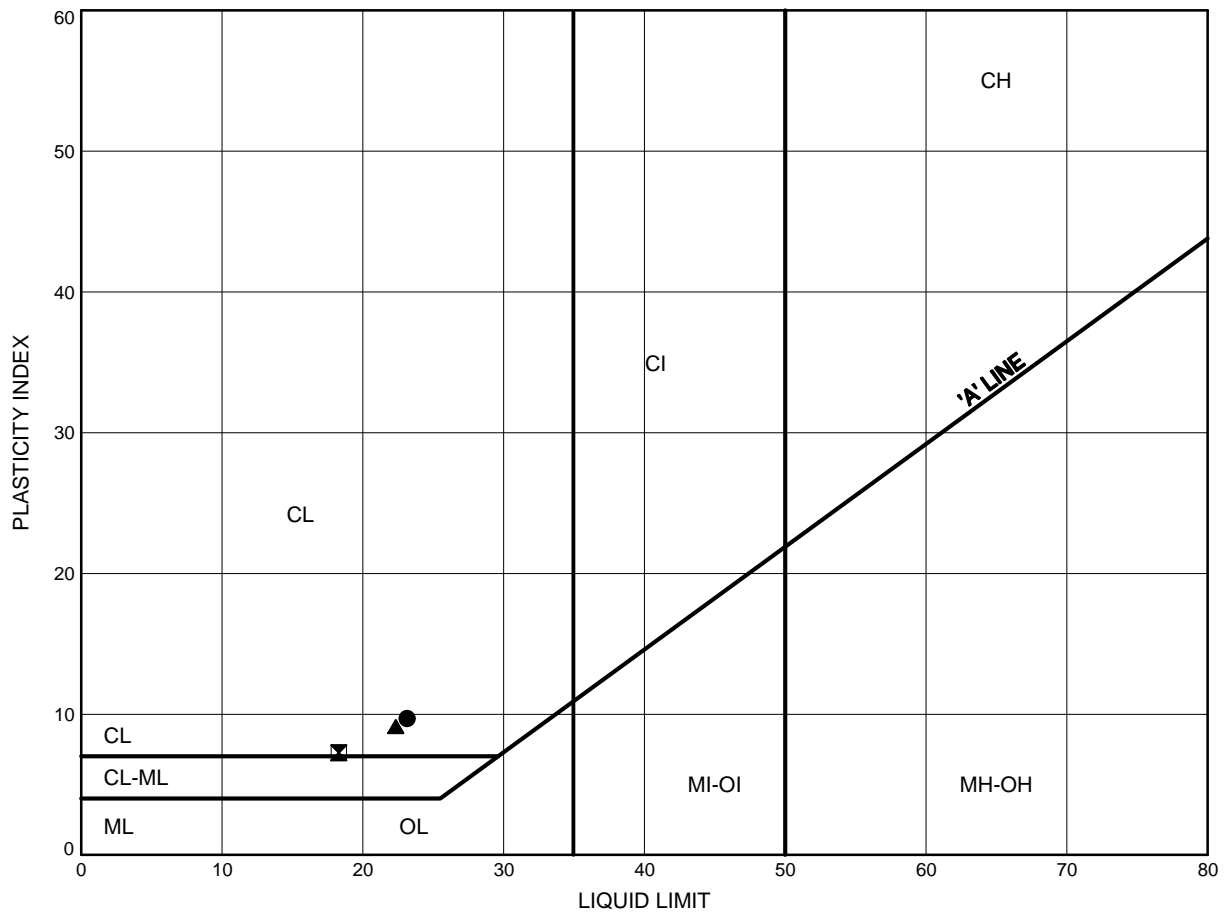


Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE C7

Silty CLAY TILL



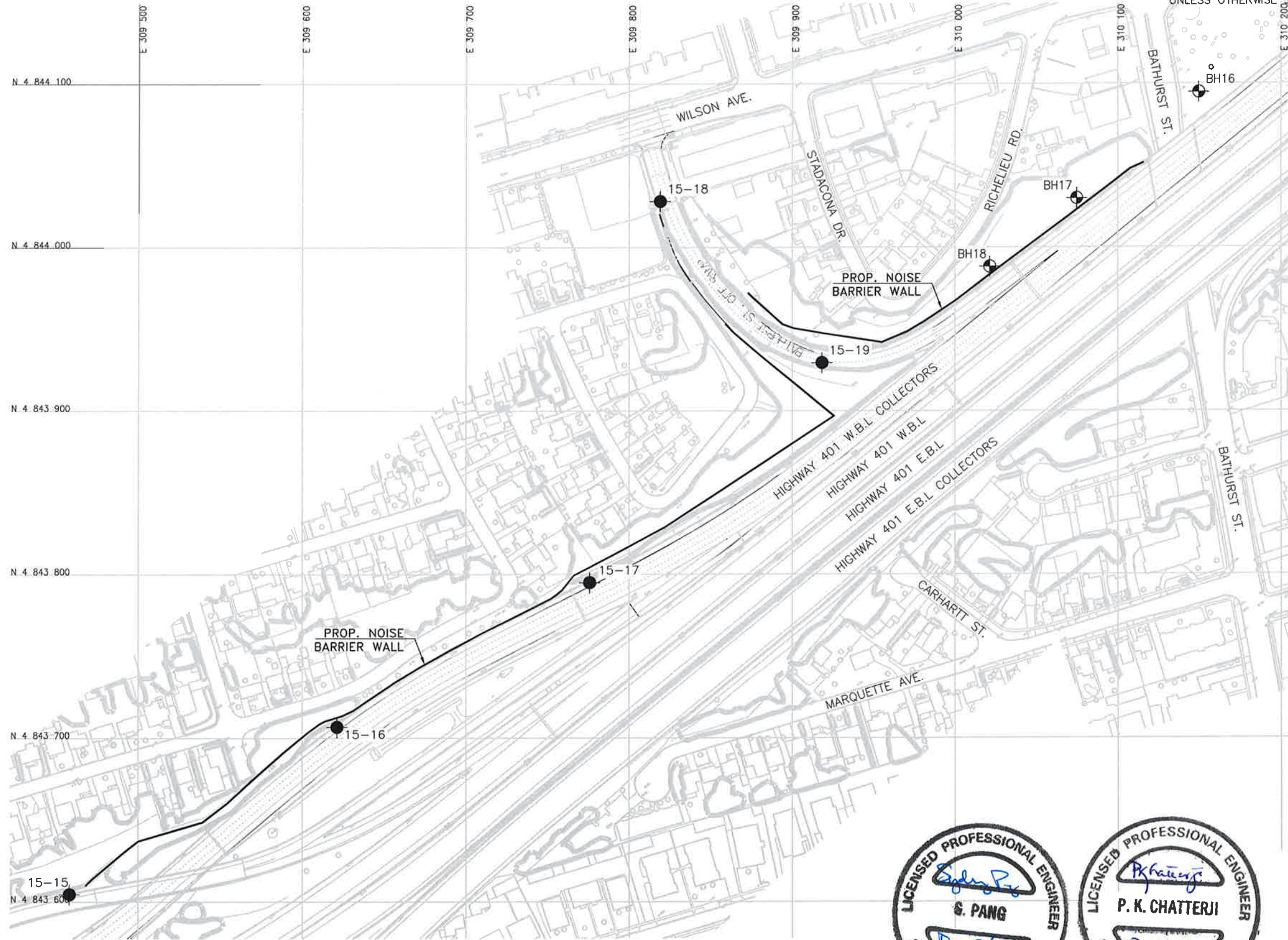
LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-15	9.45	181.15
⊠	15-17	6.40	178.00
▲	15-18	3.35	180.85

Date October 2015
W.P. 2074-13-00

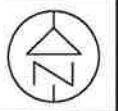


Prep'd AN
Chkd. RPR



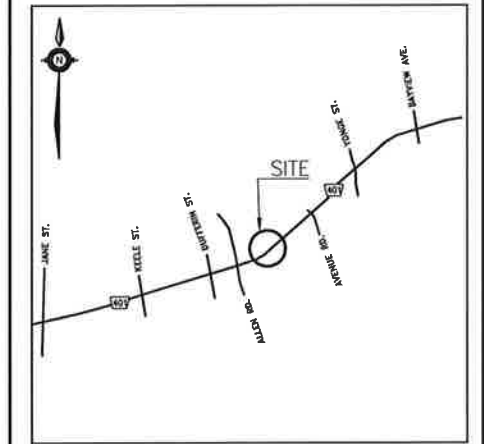
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 2074-13-00



HWY 401 WBL COLLECTORS
NOISE BARRIER WALL (SEGMENT 3)
E. & W. OF BATHURST ST. OFF RAMP
BOREHOLE LOCATIONS PLAN

SHEET



KEYPLAN

LEGEND

- Borehole (By Thurber)
- ⊕ Borehole (By Others)
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- ▽ Water Level
- ⬆ Head Artesian Water
- ⬆ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
15-15	190.6	4 843 604.7	309 458.3
15-16	186.0	4 843 706.8	309 621.2
15-17	184.4	4 843 795.0	309 775.8
15-18	184.2	4 844 028.3	309 819.0
15-19	184.3	4 843 929.4	309 918.3
BH16*	183.1	4 844 094.8	310 149.6
BH17*	183.4	4 844 030.0	310 074.6
BH18*	183.3	4 843 988.2	310 021.2

NOTES-

- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
- * Estimated coordinates.

GEOCRES No. 30M11-259



PLAN

REVISIONS	DATE	BY	DESCRIPTION
DESIGN RPR	CHK RPR	CODE	LOAD
DRAWN AN	CHK SKP	SITE	STRUCT
			DWG 3

OFFICE REPORT ON SOIL EXPLORATION

SAMPLE CONDITION

SAMPLE TYPES

ABBREVIATIONS



DISTURBED
FAIR
GOOD
LOST

A.S. - AUGER SAMPLE
S.T. - SLOTTED TUBE
W.S. - WASHED SAMPLE
D.O. - DRIVE-OPEN
D.F. - DRIVE-FOOT VALVE
C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
S.O. - SLEEVE-OPEN
S.F. - SLEEVE-FOOT VALVE
T.O. - THIN WALLED OPEN
R.C. - ROCK CORE

V - IN-SITU VANE TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
QC - TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW

ABBREVIATIONS

γ - WET UNIT WEIGHT PCF
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

SOIL PROFILE					COMPRESSIVE STRENGTH TONS PER SQ. FT.		UNDRAINED TRIAXIAL TEST		OTHER TESTS		SAMPLES				
ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION SCALE	WATER CONTENT W%	10	20	30	40	50	OTHER TESTS	CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
					DYNAMIC PENETRATION TEST BLOWS PER FOOT										
					20 40 60 80 100										
					10 20 30 40 50										
					0 NAT. □ LW △ Pw										
					20 40 60 80 100										
503.0 4.0	STANDPIPE W. @ EL. 583.4 MAY 5 1962	GROUND LEVEL LOOSE TO COMPACT BROWN SILTY TILL FILL		500	BH #15										
					END OF PENETRATION TEST AT ELEV. 555.2										
579.0 24.0		DENSE TO VERY DENSE BROWN SILTY TILL		550	BH #16										
					END OF PENETRATION TEST AT ELEV. 551.7										
566.7 14.0	STANDPIPE W. @ EL. 576.7 MAY 5 1962	GROUND LEVEL LOOSE TO DENSE BROWN SILTY TILL FILL		600	BH #17										
					END OF PENETRATION TEST AT ELEV. 551.7										
573.7 27.0		COMPACT TO VERY DENSE BROWN SILTY TILL		550	BH #18										
					END OF PENETRATION TEST AT ELEV. 551.7										
570.7 30.0		VERY DENSE GREY SILTY TILL		580	BH #19										
					END OF PENETRATION TEST AT ELEV. 551.7										
570.7 30.0		HARD GREY SILTY CLAY		570	BH #20										
					END OF PENETRATION TEST AT ELEV. 551.7										

GEOCON

OFFICE REPORT ON SOIL EXPLORATION

CONTRACT 27358 BORING # 17 18 DATUM GEODETIC CASING WT
 BORING DATE APRIL 30 1962 REPORT DATE MAY 1 1962 COMPILED BY ALL CHECKED BY DBO
 SAMPLER HAMMER WT. 140 LBS. DROP 30 INCHES (PENETRATION RESISTANCES CONVERTED TO BLOWS OF 4200 IN - LBS. ENERGY)

SAMPLE CONDITION



A.S. - AUGER SAMPLE
 S.T. - SLOTTED TUBE
 W.S. - WASHED SAMPLE
 D.O. - DRIVE-OPEN
 D.F. - DRIVE-FOOT VALVE
 C.S. - CHUNK SAMPLE

SAMPLE TYPES

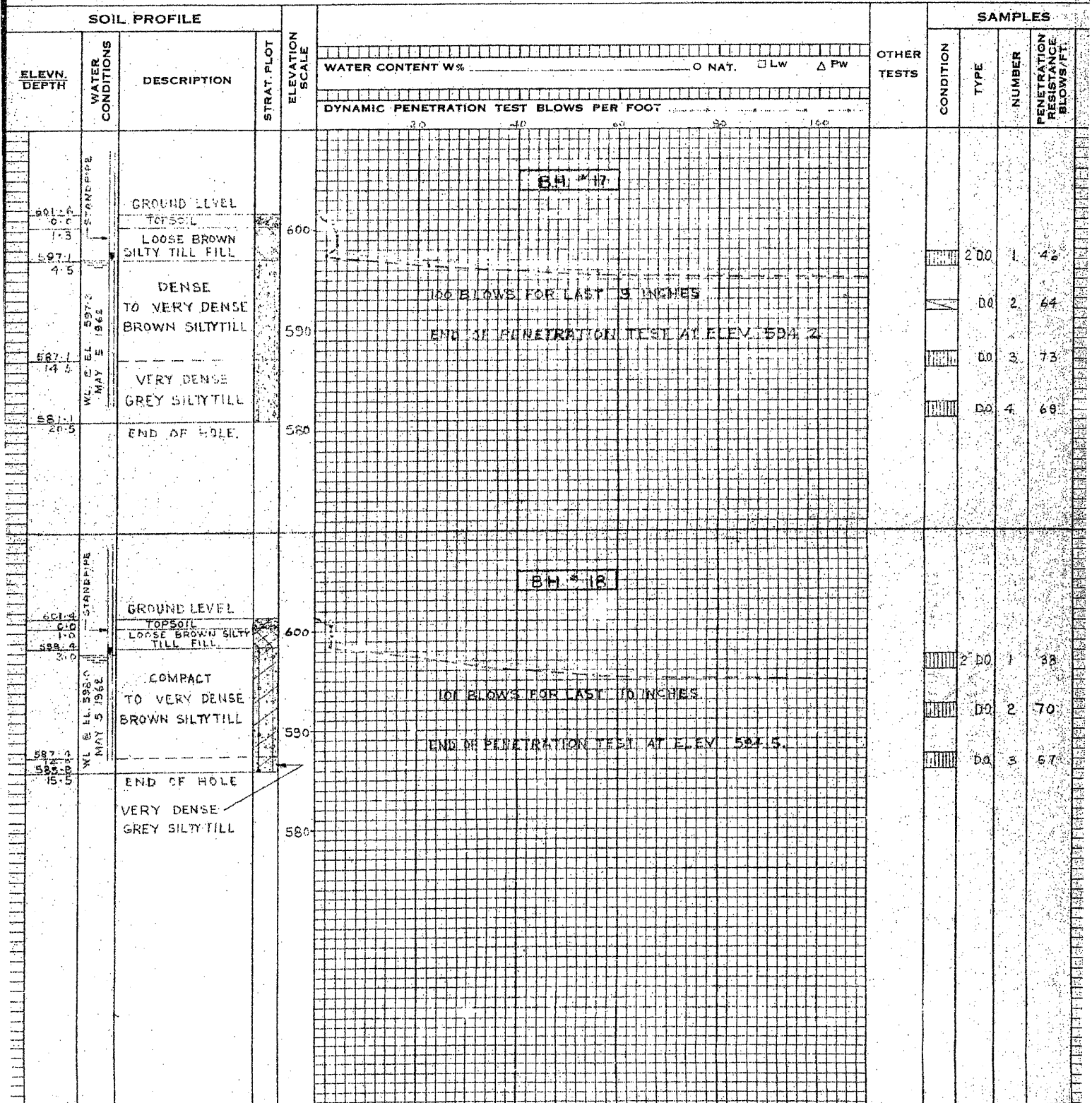
F.S. - FOIL SAMPLE
 S.O. - SLEEVE-OPEN
 S.F. - SLEEVE-FOOT VALVE
 T.O. - THIN WALLED OPEN
 R.C. - ROCK CORE

ABBREVIATIONS

V - IN-SITU VANE TEST
 M - MECHANICAL ANALYSIS
 U - UNCONFINED COMPRESSION
 QC - TRIAXIAL CONSOLIDATED QUICK
 Q - TRIAXIAL QUICK
 S - TRIAXIAL SLOW

γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION

WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL



Appendix D

Noise Barrier Wall, Segment 4, West of Avenue Road Borehole 15-20 (Current investigation) Boreholes 11 to 14 (Previous investigation)

- Record of Borehole Sheets
- Laboratory Test Results
- Drawing titled “Borehole Locations”

RECORD OF BOREHOLE No 15-20

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 4 N 4 844 596.1 E 310 776.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.25 - 2015.08.25 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
180.2	GROUND SURFACE															
0.0	ASPHALT:(175mm)															
0.2	SAND, trace silt and gravel Brown Moist (FILL)		1	GS			180									
179.5																
0.7	Silty CLAY, with sand, trace gravel, oxidized seams Very Stiff Brown Moist (TILL)		1	SS	19		179									
			2	SS	18		178									
	Grey		3	SS	24		177									7 37 34 22
			4	SS	14		176									
			5	SS	25		175									
	Boulder fragments Hard		6	SS	100/ 0.225		174									4 42 39 15
172.9							173									
7.3	Silty CLAY, trace gravel Hard Grey Moist		7	SS	53		172									0 0 26 74
171.5																
8.7	Silty SAND, trace clay and gravel Dense Grey Wet (TILL)		8	SS	45		171									
170.4																
9.8	END OF BOREHOLE AT 9.8m.															

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-20

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 4 N 4 844 596.1 E 310 776.6 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.25 - 2015.08.25 CHECKED BY RPR

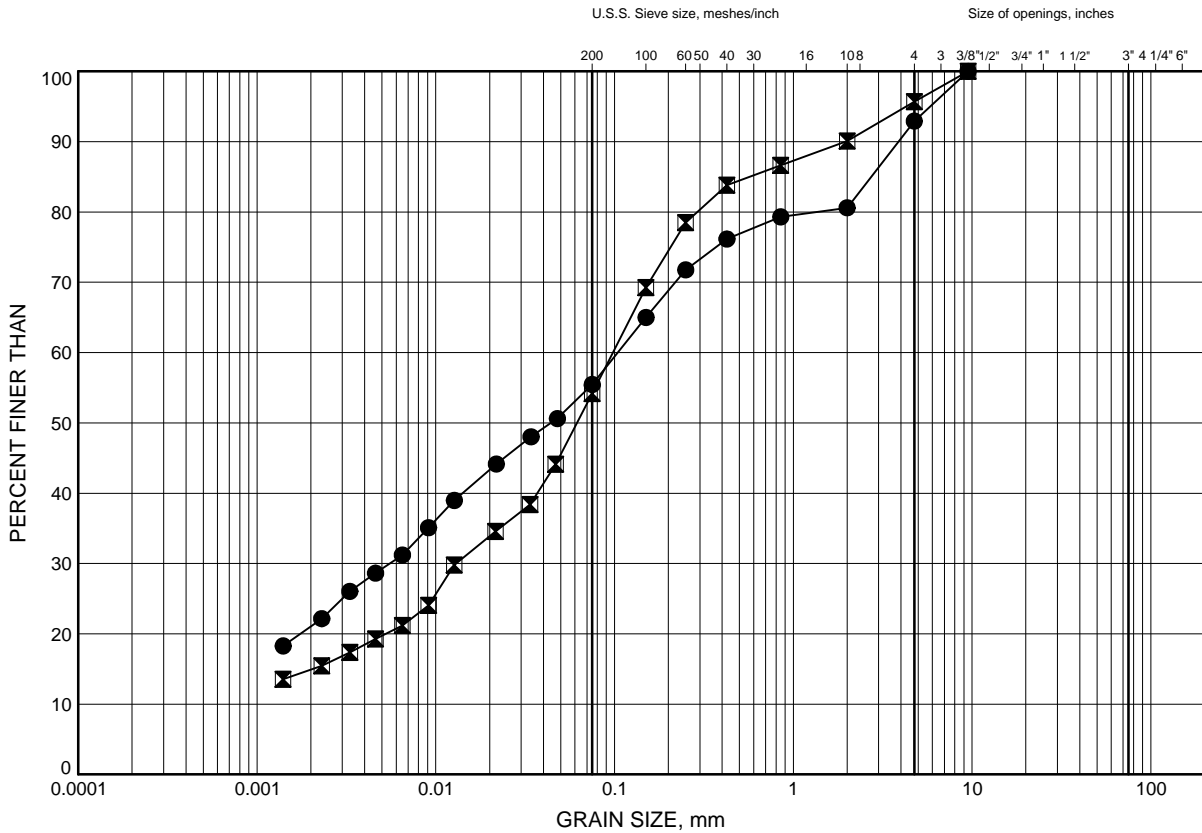
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.04m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug 25/ 15 3.1 177.1 Oct26/2015 2.0 178.2																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

Hwy 401 WBL Coll Rehab Bayview to Jane
GRAIN SIZE DISTRIBUTION

FIGURE D1

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-20	2.59	177.61
⊠	15-20	6.28	173.92

Date October 2015
W.P. 2074-13-00



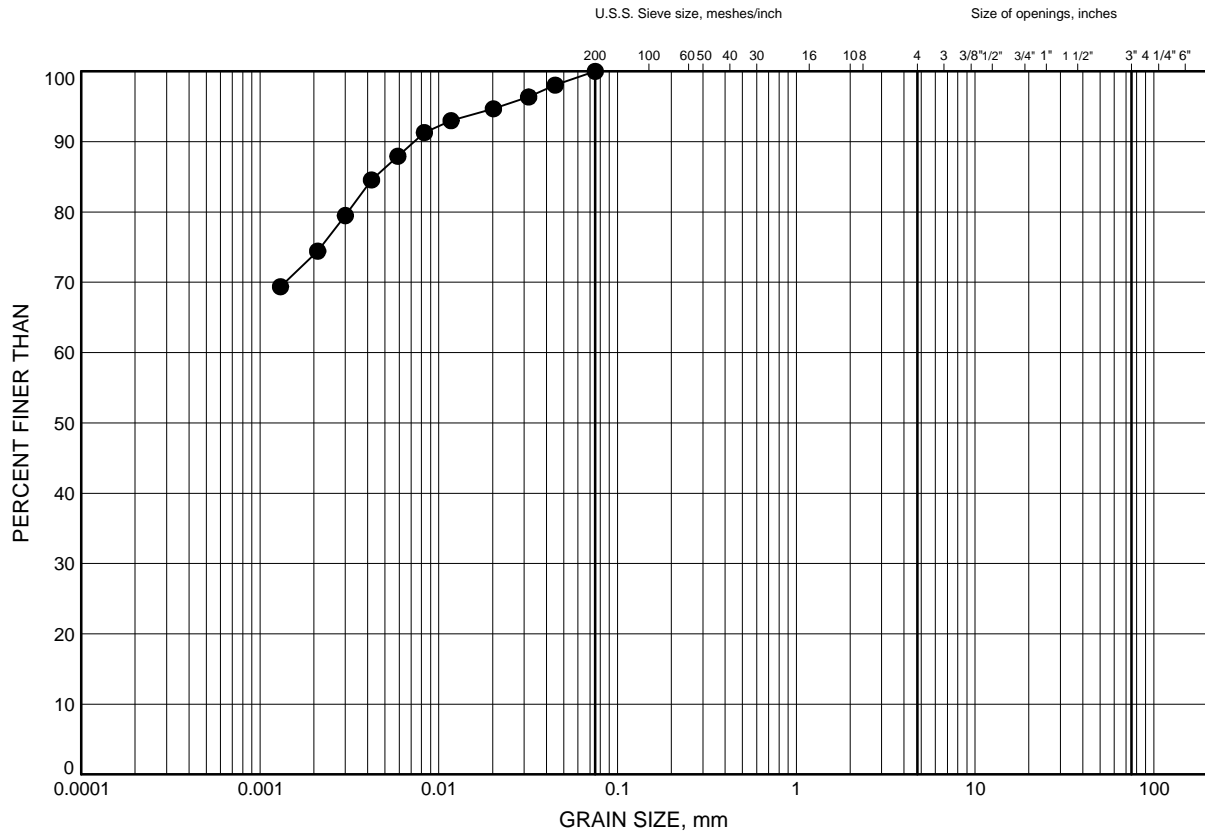
Prep'd AN
Chkd. RPR

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE D2

Silty CLAY



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-20	7.92	172.28

Date: October 2015
W.P.: 2074-13-00

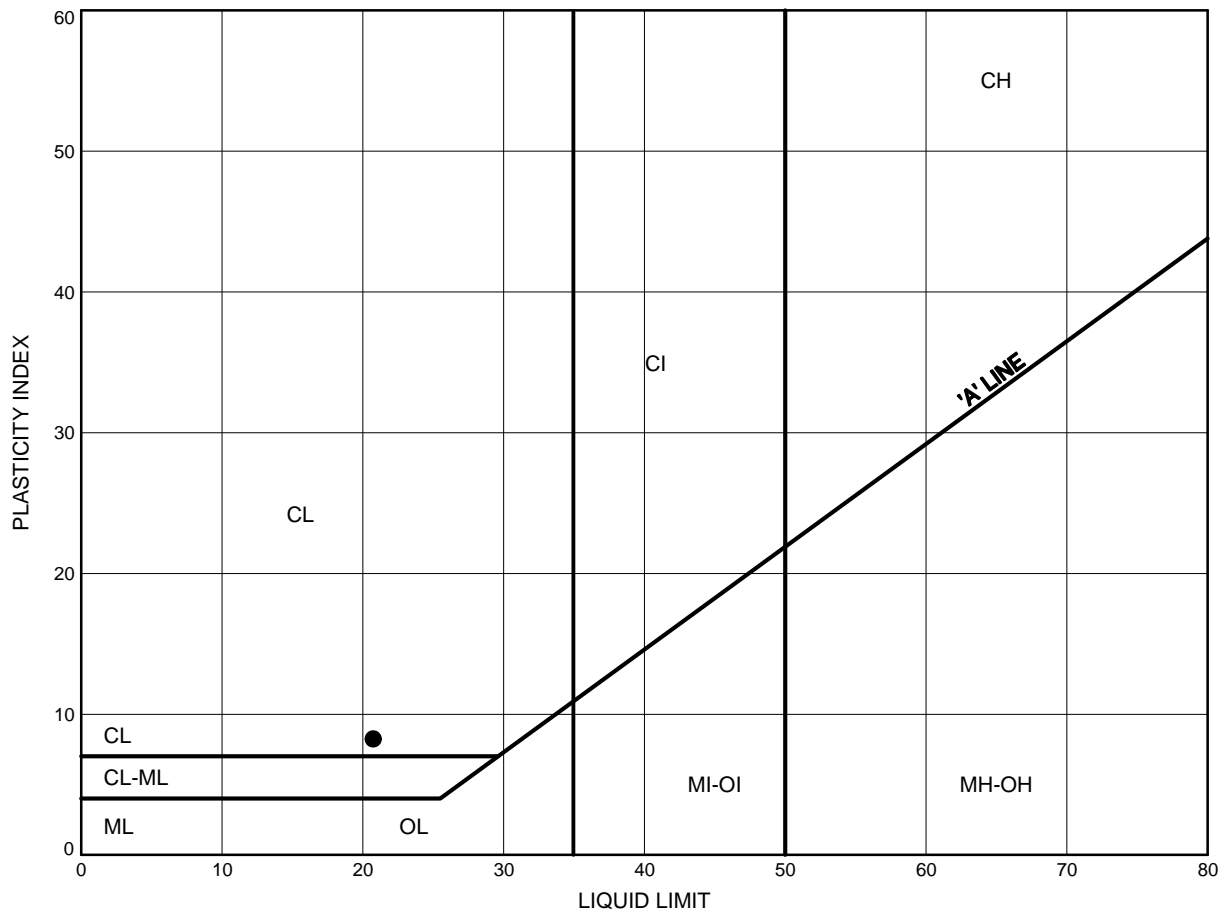


Prep'd: AN
Chkd.: RPR

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE D3

Silty CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-20	2.59	177.61

Date October 2015
W.P. 2074-13-00

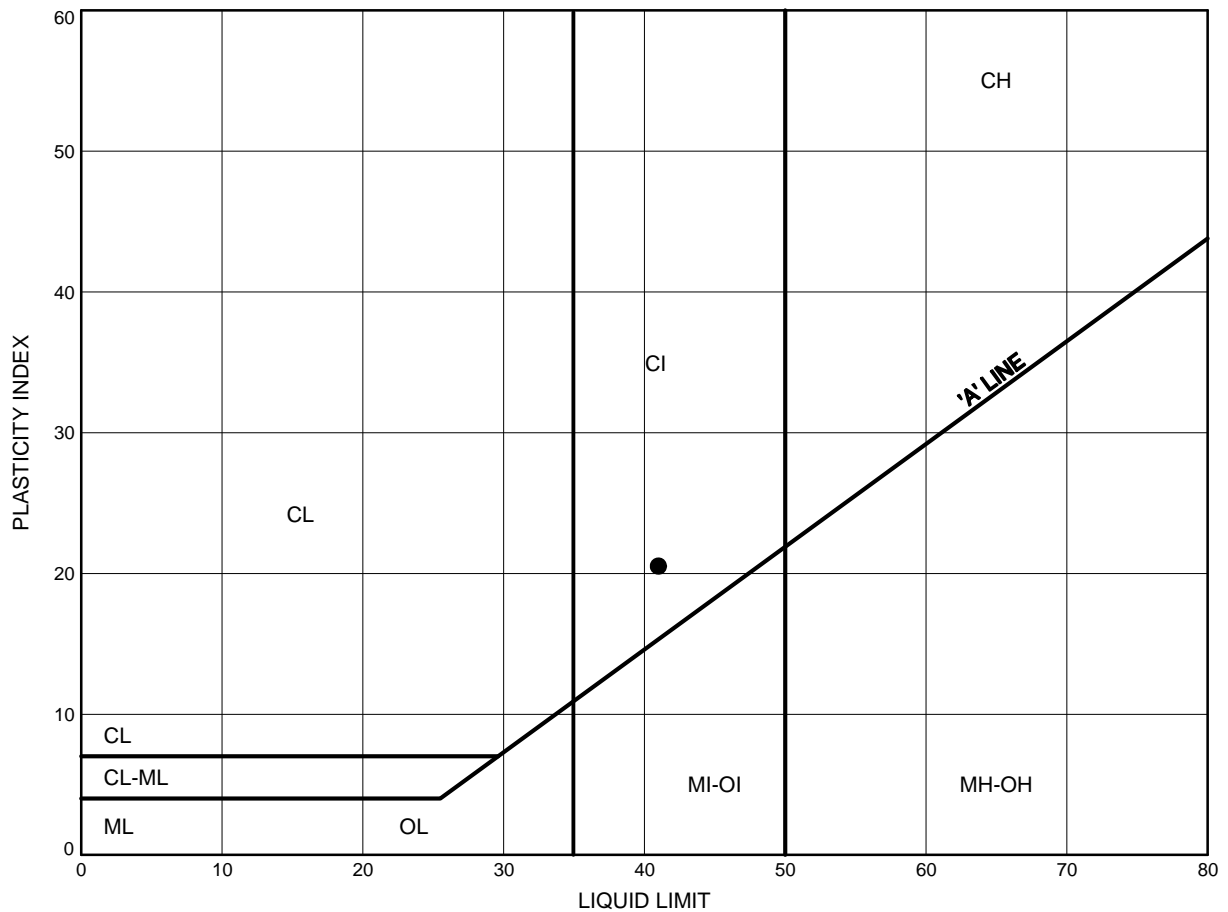


Prep'd AN
Chkd. RPR

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE D4

Silty CLAY



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-20	7.92	172.28

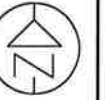
Date ..October 2015.....
W.P. ..2074-13-00.....



Prep'dAN.....
Chkd.RPR.....

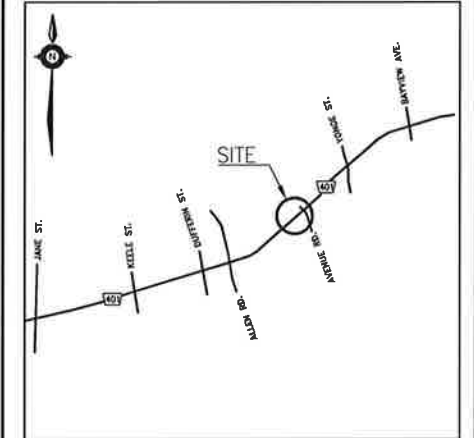
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 2074-13-00








HWY 401 WBL COLLECTORS NOISE BARRIER WALL (SEGMENT 4) WEST OF AVENUE ROAD BOREHOLE LOCATIONS PLAN	
--	--

SHEET



KEYPLAN

LEGEND

- | | |
|---|---------------------------------------|
|  | Borehole (By Thurber) |
|  | Borehole (By Others) |
| N | Blows /0.3m (Std Pen Test, 475J/blow) |
| CONE | Blows /0.3m (60° Cone, 475J/blow) |
| PH | Pressure, Hydraulic |
|  | Water Level |
|  | Head Artesian Water |
|  | Piezometer |
| 90% | Rock Quality Designation (RQD) |
| A/R | Auger Refusal |

NO	ELEVATION	NORTHING	EASTING
15-20	180.2	4 844 596.1	310 776.6
BH11*	181.5	4 844 538.6	310 704.1
BH12*	180.9	4 844 489.6	310 651.0
BH13*	181.0	4 844 425.3	310 574.5
BH14*	183.0	4 844 333.4	310 458.1

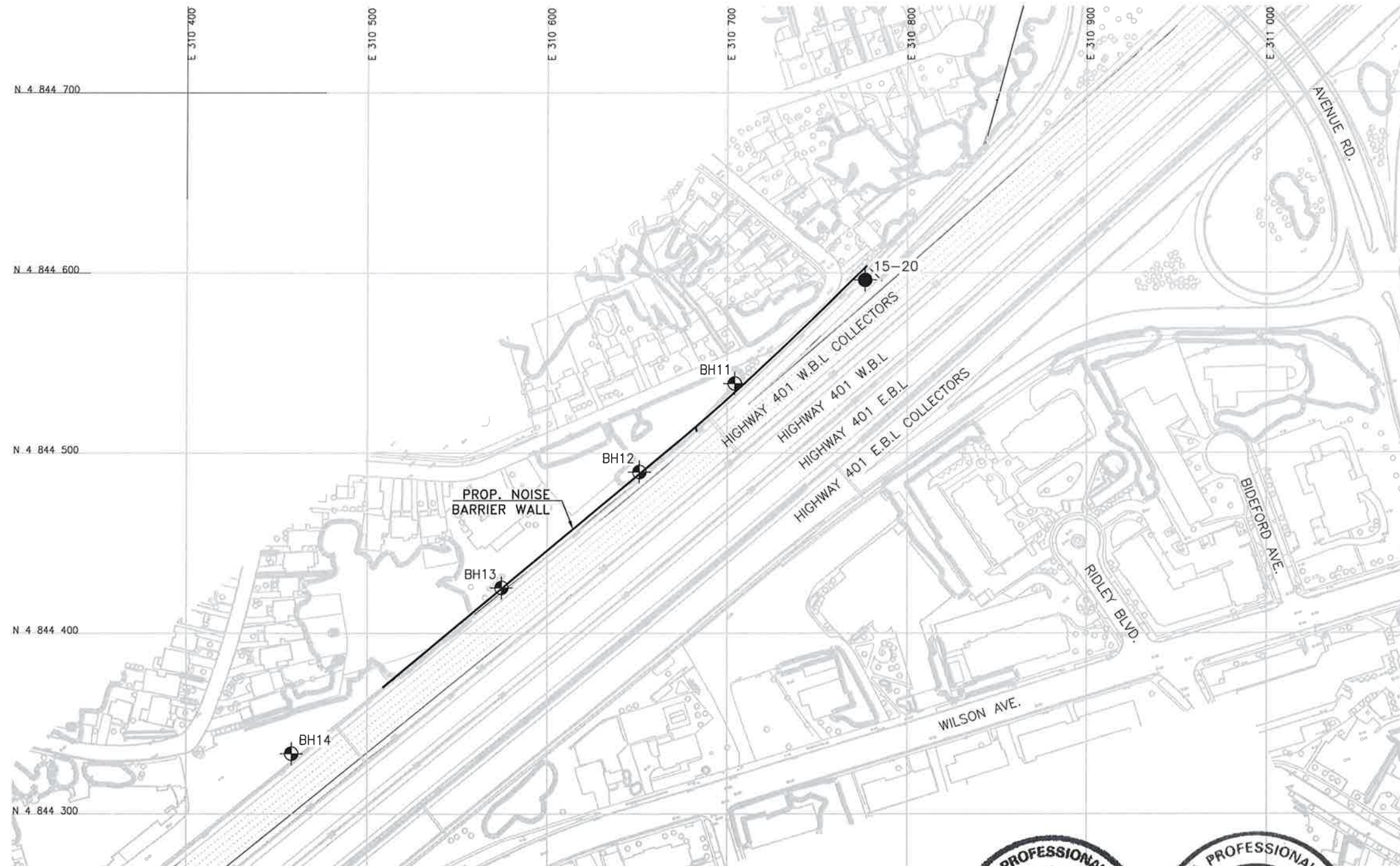
-NOTES-

- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- 2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
- 3) * Estimated coordinates.

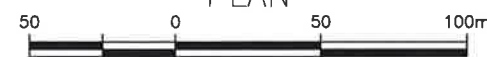
GEOCRES No. 30M11-259

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PLAN



OFFICE REPORT ON SOIL EXPLORATION

SAMPLE CONDITION

SAMPLE TYPES

ABBREVIATIONS



A.S. - AUGER SAMPLE
S.T. - SLOTTED TUBE
W.S. - WASHED SAMPLE
D.O. - DRIVE-OPEN
D.F. - DRIVE-FOOT VALVE
C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
S.O. - SLEEVE-OPEN
S.F. - SLEEVE-FOOT VALVE
T.O. - THIN WALLED OPEN
R.C. - ROCK CORE

- V - IN-SITU VANE TEST
- M - MECHANICAL ANALYSIS
- U - UNCONFINED COMPRESSION
- QC - TRIAXIAL CONSOLIDATED QUICK
- Q - TRIAXIAL QUICK
- S - TRIAXIAL SLOW

γ - WET UNIT WEIGHT
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASIN
 WT - WATER TABLE IN SOIL

SOIL PROFILE

ELEV. DEPTH	WATER CONDITIONS	DESCRIPTION	STRAT. PLOT	ELEVATION
	STANDPIPE	GROUND LEVEL		6
595.6 0.0		LOOSE BROWN SILTY TILL FILL		
591.6 4.0		COMPACT TO VERY DENSE BROWN SILTY TILL		5
582.6 13.0	W.C. @ EL 580.1 MAY 5, 1962	DENSE GREY SILTY TILL		5
577.6 18.0		HARD GREY SILTY CLAY		
570.6 25.0		END OF HOLE		5
	STANDPIPE	GROUND LEVEL		
593.6 0.0				
591.6 2.0		COMPACT TO VERY DENSE BROWN SILTY TILL		5
578.6 15.0	W.C. @ EL 577.1 MAY 5, 1962	END OF HOLE		
578.6 15.0		VERY DENSE GREY SILTY TILL		

WATER CONTENT W%			O NAT.	<input type="checkbox"/> LW	<input checked="" type="checkbox"/> PW
10	20	30	40	50	
DYNAMIC PENETRATION TEST BLOWS PER FOOT					
20	40	60	80	100	

OTHER
TESTS

SAMPLES

CONDITION	TYPE	NUMBER	PENETRATION RESISTANCE BLOWS/FT.
	2. DO	1	26
	DO	2	56
	SO	3	41
	SO	4	46
	DO	5	74
	2. DO	1	33
	DO	2	67
	DO	3	60

OFFICE REPORT ON SOIL EXPLORATION

SAMPLE CONDITION

SAMPLE TYPES

ABBREVIATIONS


 DISTURBED
 FAIR
 GOOD
 LOST

A.S. - AUGER SAMPLE
S.T. - SLOTTED TUBE
W.S. - WASHED SAMPLE
D.O. - DRIVE-OPEN
D.F. - DRIVE-FOOT VALVE
C.S. - CHUNK SAMPLE

F.S. - FOIL SAMPLE
S.O. - SLEEVE-OPEN
S.F. - SLEEVE-FOOT VALVE
T.O. - THIN WALLED OPEN
R.C. - ROCK CORE

V - IN-SITU VANE TEST
M - MECHANICAL ANALYSIS
U - UNCONFINED COMPRESSION
QC - TRIAXIAL CONSOLIDATED QUICK
Q - TRIAXIAL QUICK
S - TRIAXIAL SLOW

γ - WET UNIT WEIGHT PCF
 K - PERMEABILITY
 C - CONSOLIDATION
 WL - WATER LEVEL IN CASING
 WT - WATER TABLE IN SOIL

WL - WATER LEVEL IN CASING
WT - WATER TABLE IN SOIL

[illegible]

Appendix E

Noise Barrier Wall, Segments 5 & 6, West of Bayview Boreholes 15-21 to 15-24 (Current investigation) Boreholes 17, 18, 23 to 26 (Previous investigation)

- Record of Borehole Sheets
- Laboratory Test Results
- Drawing titled “Borehole Locations”

RECORD OF BOREHOLE No 15-21

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 5 N 4 846 751.3 E 313 061.2 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.24 - 2015.08.24 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE								
167.3	GROUND SURFACE															
0.0	ASPHALT:(100mm)															
167.0	CONCRETE:(200mm)															
0.3	SAND, trace silt, trace gravel		1	GS												
166.6	Brown Moist (FILL)		1	SS	8											
0.7	Silty CLAY, trace sand, trace gravel, occasional roots and rootlets															
165.9	Firm Brown Moist (FILL)		2	SS	18											
1.4	Silty CLAY, with sand, trace gravel, oxidized seams															
	Very Stiff Brown Moist (TILL)		3	SS	22											
			4	SS	23											
			5	SS	91/ 0.250											
	Boulder fragments Hard															
			6	SS	60/ 0.100											
			7	SS	42											
			8	SS	60											
157.5																
9.8	END OF BOREHOLE AT 9.8m.															

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-21

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 5 N 4 846 751.3 E 313 061.2 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Soild Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.24 - 2015.08.24 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			20	40	60	80	100					
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.04m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug 24/ 15 8.2 159.1 Oct26/2015 8.4 158.9																

ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

RECORD OF BOREHOLE No 15-22

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 5 N 4 846 844.4 E 313 220.9 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.24 - 2015.08.24 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
								20 40 60 80 100						
167.6	GROUND SURFACE													
0.0	ASPHALT:(150mm)													
0.2	SAND, some silt, trace gravel Brown Moist (FILL)		1	GS			167							
166.9														
0.7	Silty CLAY, trace sand, trace gravel Stiff to Very Stiff Brown Moist (FILL)		1	SS	12		166							
			2	SS	17									
165.4														
2.2	Silty CLAY, with sand, trace gravel, oxidized seams Very Stiff Brown to Grey Moist (TILL)		3	SS	24		165							
	Boulder fragments Grey		4	SS	22		164							2 39 34 25
163.3														
4.3	Silty SAND, some clay Loose Grey Moist		5	SS	8		163							0 60 27 13
162.1														
5.5	SAND and SILT, trace clay and gravel Compact to Dense Brown Wet (TILL)		6	SS	21		162							
							161							
			7	SS	43		160							4 50 37 9
							159							
			8	SS	45		158							
157.8														
9.8	END OF BOREHOLE AT 9.8m.													

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity

20
15
10
(%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No 15-23

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 6 N 4 847 026.0 E 313 688.3 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.24 - 2015.08.24 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
								20 40 60 80 100									
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE									
171.5	GROUND SURFACE																
0.0	ASPHALT:(100mm)																
170.2	CONCRETE:(175mm)																
0.3	SAND, some silt, trace clay, trace gravel Compact Brown to Grey Moist (FILL)		1	GS			171								10	67 17 6	
			1	SS	18												
170.1																	
1.4	Silty CLAY, some sand, trace gravel, roots and rootlets, topsoil stained Very Stiff to Stiff Grey Moist (FILL)		2	SS	20		170										
			3	SS	8		169										
			4	SS	16		168										
167.7																	
3.8	Silty CLAY, with sand, trace gravel, oxidized seams Hard Brown Moist (TILL)		5	SS	36		167								3	38 37 22	
			6	SS	91/ 0.225	▽	166										
164.8							165										
6.7	SAND and SILT, trace clay, trace gravel Dense Grey Wet (TILL)		7	SS	33		164										
							163										
			8	SS	40		162								8	53 30 9	
161.7																	
9.8	END OF BOREHOLE AT 9.8m.																

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

METRIC

[illegible]

RECORD OF BOREHOLE No 15-24

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 6 N 4 847 101.5 E 313 828.7 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.23 - 2015.08.23 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa								
169.9	GROUND SURFACE							20	40	60	80	100				
0.0	ASPHALT:(125mm)															
169.6	CONCRETE:(150mm)															
0.3	SAND, trace silt, trace gravel		1	GS												
169.2	Brown															
0.7	Moist (FILL)															
	Silty CLAY, with sand, trace gravel, some sand seams, oxidized stains		1	SS	34		169									
	Hard															
	Brown		2	SS	99/ 0.225		168									
	Moist (TILL)															
			3	SS	100/ 0.250											
			4	SS	96/ 0.275		167									
							166									
			5	SS	100/ 0.250		165									
	Grey						164									
			6	SS	72/ 0.275		163									
	Clayey silt seams		7	SS	87/ 0.250		162									
							161									
			8	SS	41											
	Wet															
160.1																
9.8	END OF BOREHOLE AT 9.8m.															

Continued Next Page

+³, ×³: Numbers refer to Sensitivity
 20
 15
 10
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-24

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 6 N 4 847 101.5 E 313 828.7 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.23 - 2015.08.23 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.04m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug 23/ 15 3.3 166.6 Oct26/2015 2.9 167.0																

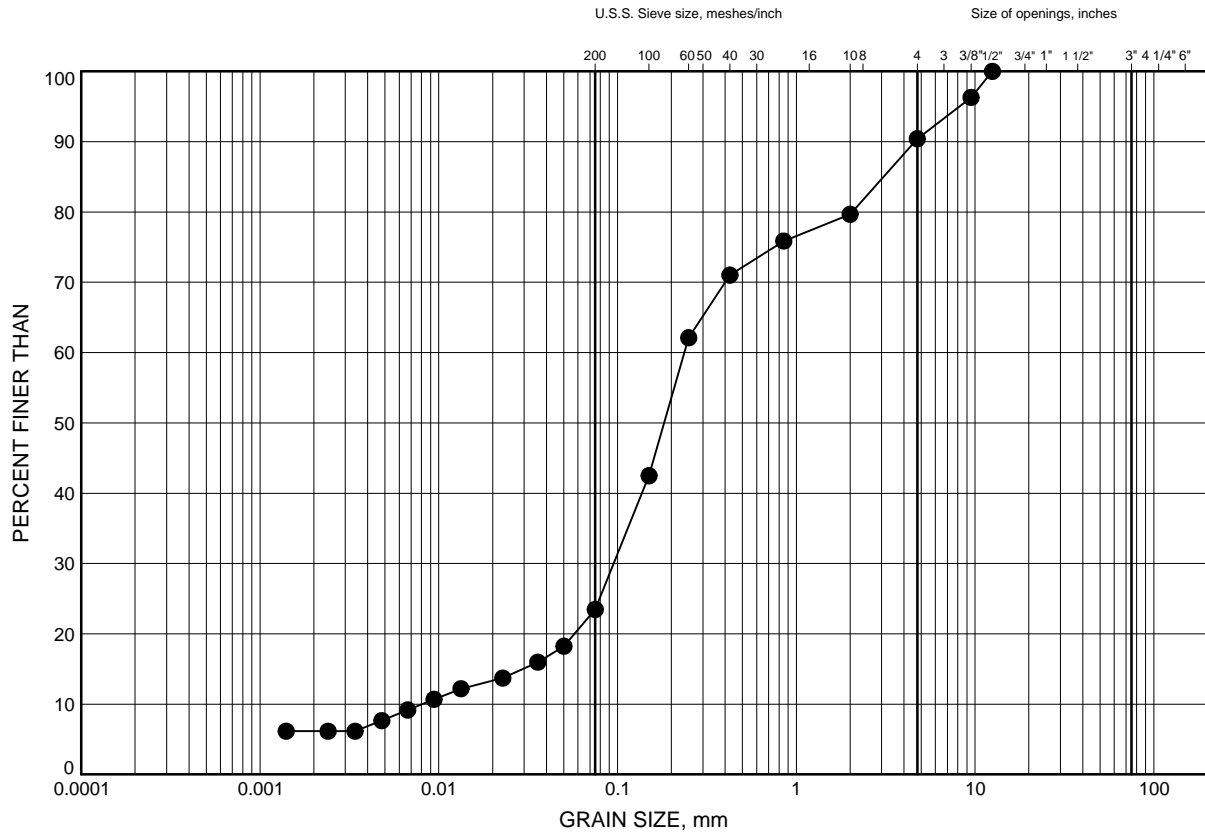
ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE E1

SAND FILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-23	0.46	171.04

Date ..October 2015.....
W.P. ..2074-13-00.....



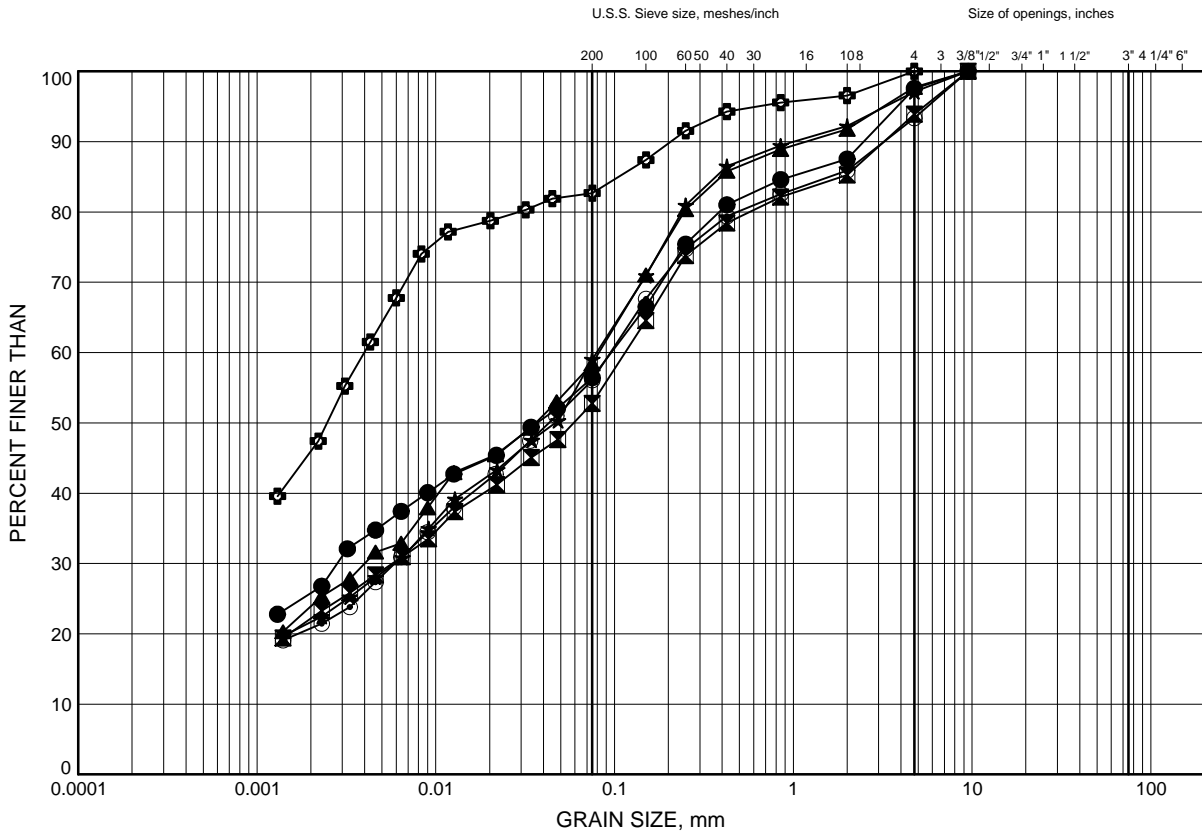
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE E2

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-21	3.35	163.95
⊠	15-21	7.92	159.38
▲	15-22	3.35	164.25
★	15-23	4.88	166.62
⊙	15-24	3.35	166.55
⊕	15-24	6.32	163.58

Date ..October 2015.....
W.P. ..2074-13-00.....



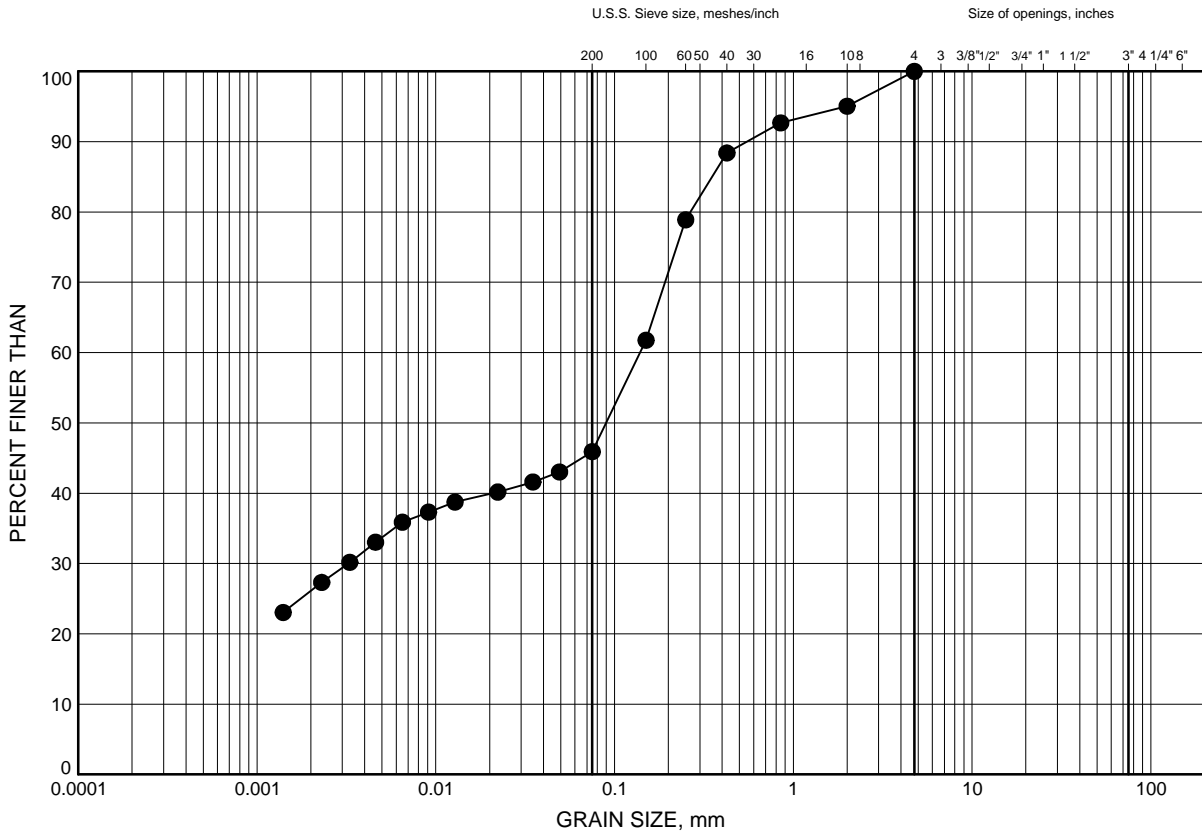
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE E3

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-24	7.92	161.98

Date ..October 2015.....
W.P. ..2074-13-00.....



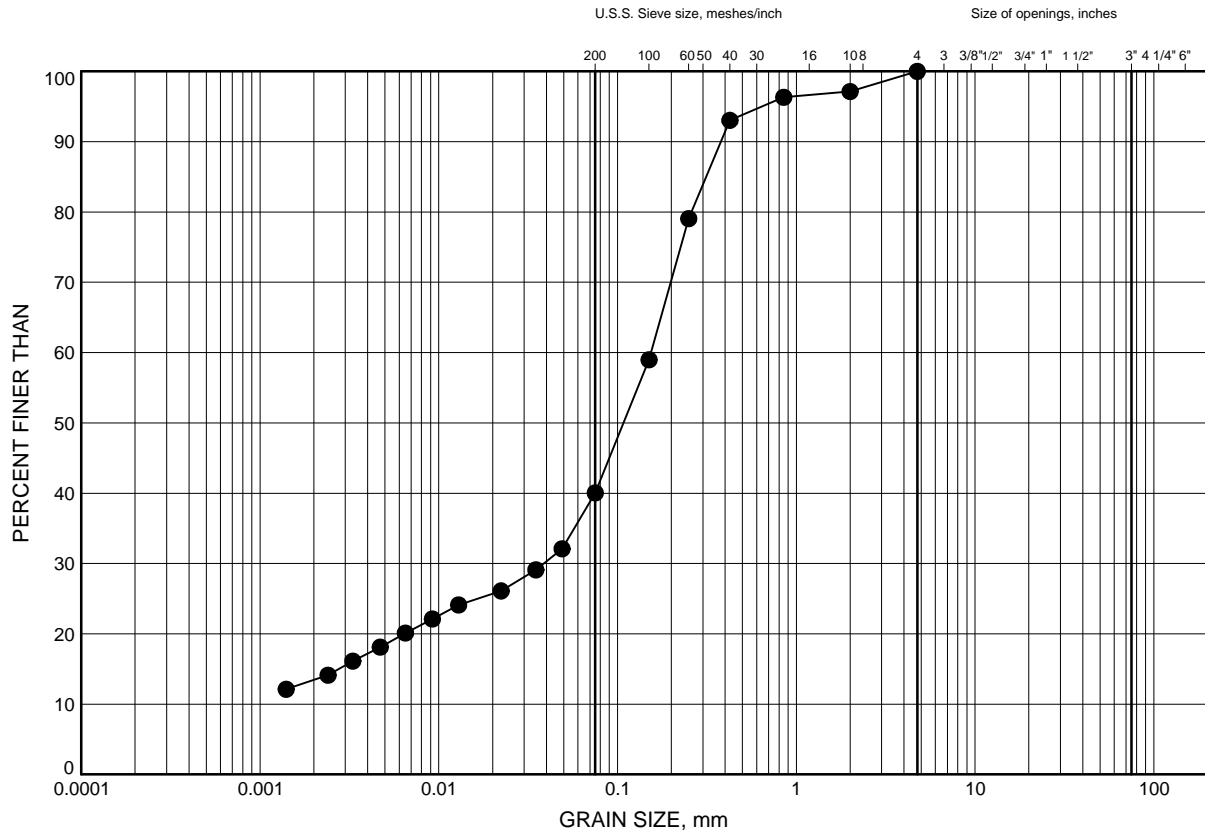
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE E4

Silty SAND



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-22	4.88	162.72

Date ..October 2015.....
W.P. ..2074-13-00.....



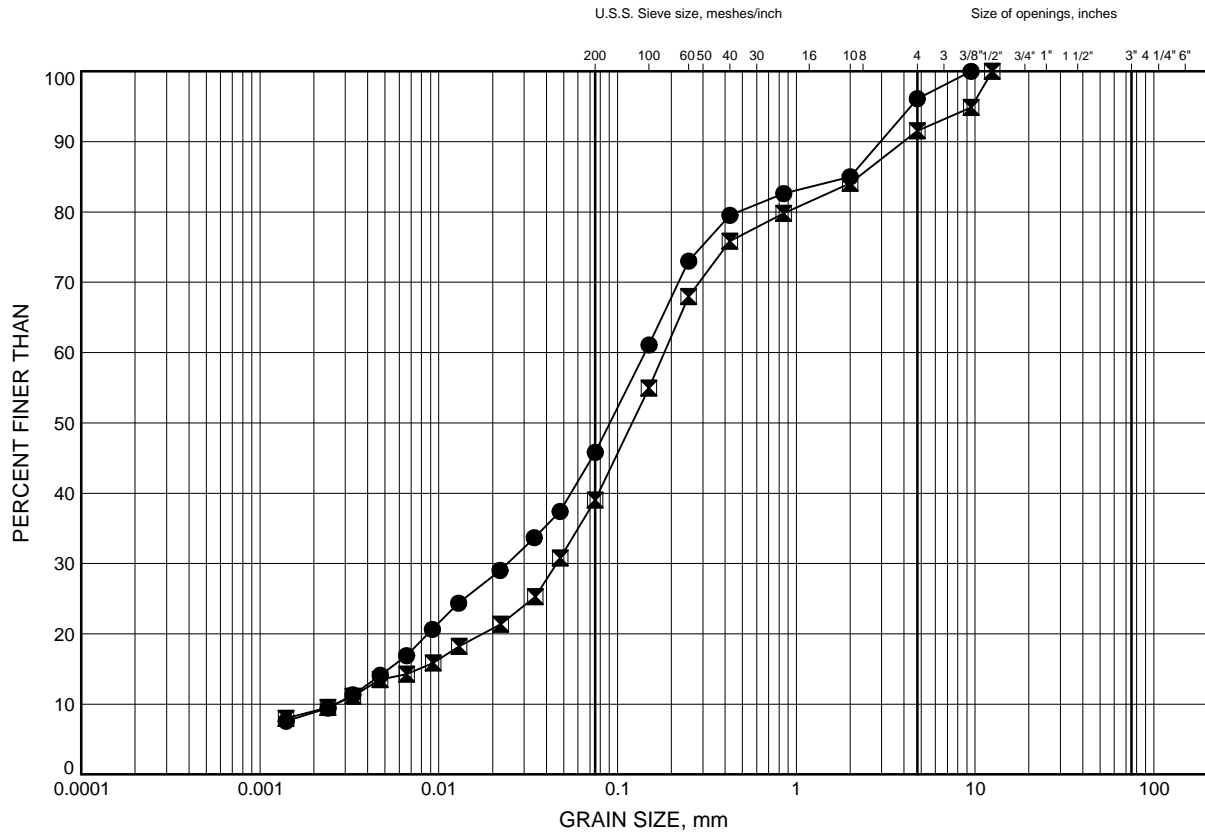
Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE E5

SAND & SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-22	7.92	159.68
⊠	15-23	9.45	162.05

Date ..October 2015.....
W.P. ..2074-13-00.....

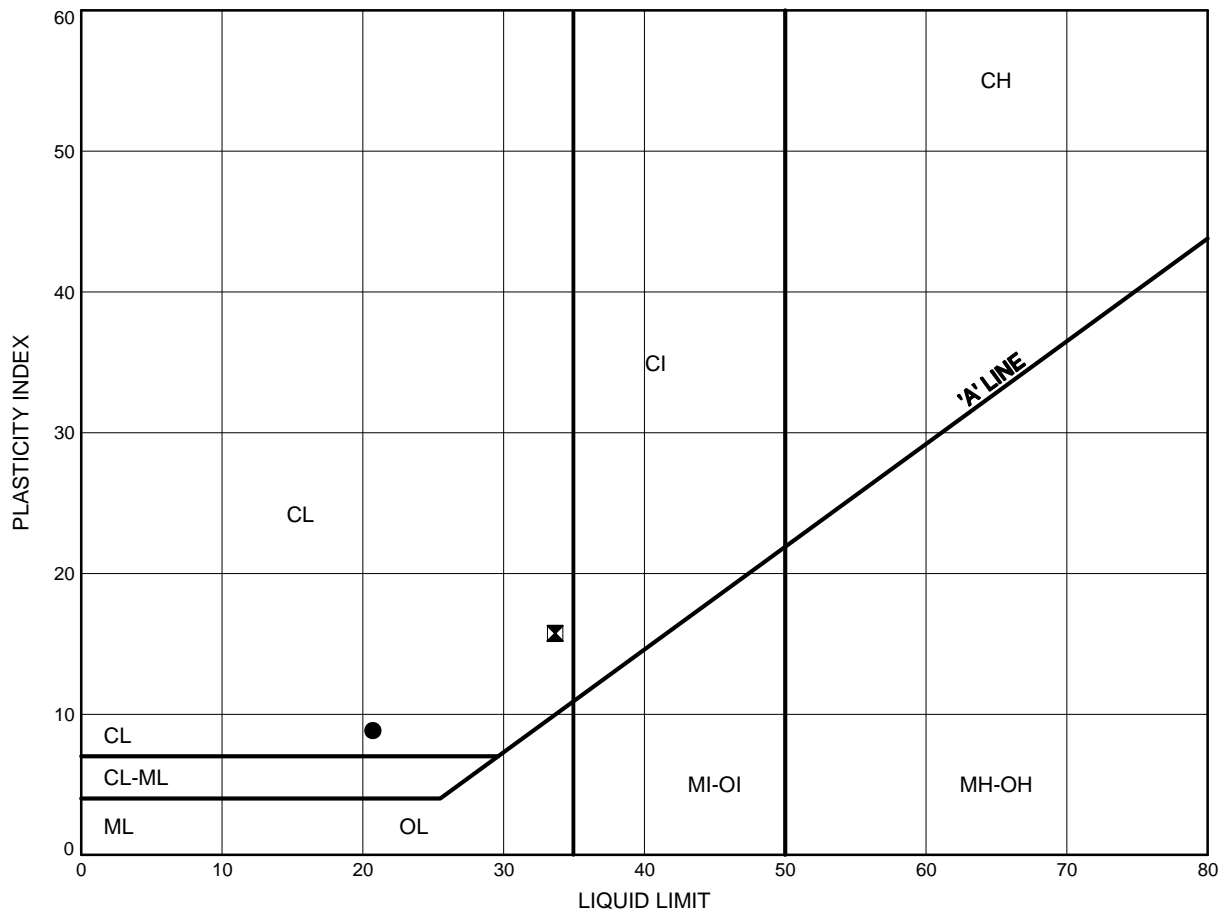


Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE E6

Silty CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-23	4.88	166.62
⊠	15-24	6.32	163.58

Date October 2015
W.P. 2074-13-00



Prep'd AN
Chkd. RPR

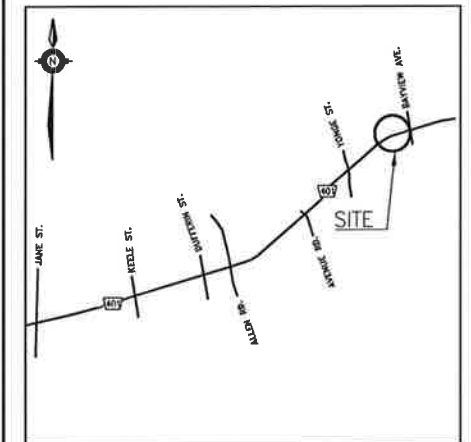
METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

CONT No
GWP No 2074-13-00



HWY 401 WBL COLLECTORS
NOISE BARRIER WALL (SEGMENTS 5 & 6)
WEST OF BAYVIEW AVENUE
BOREHOLE LOCATIONS PLAN

SHEET



KEYPLAN

LEGEND

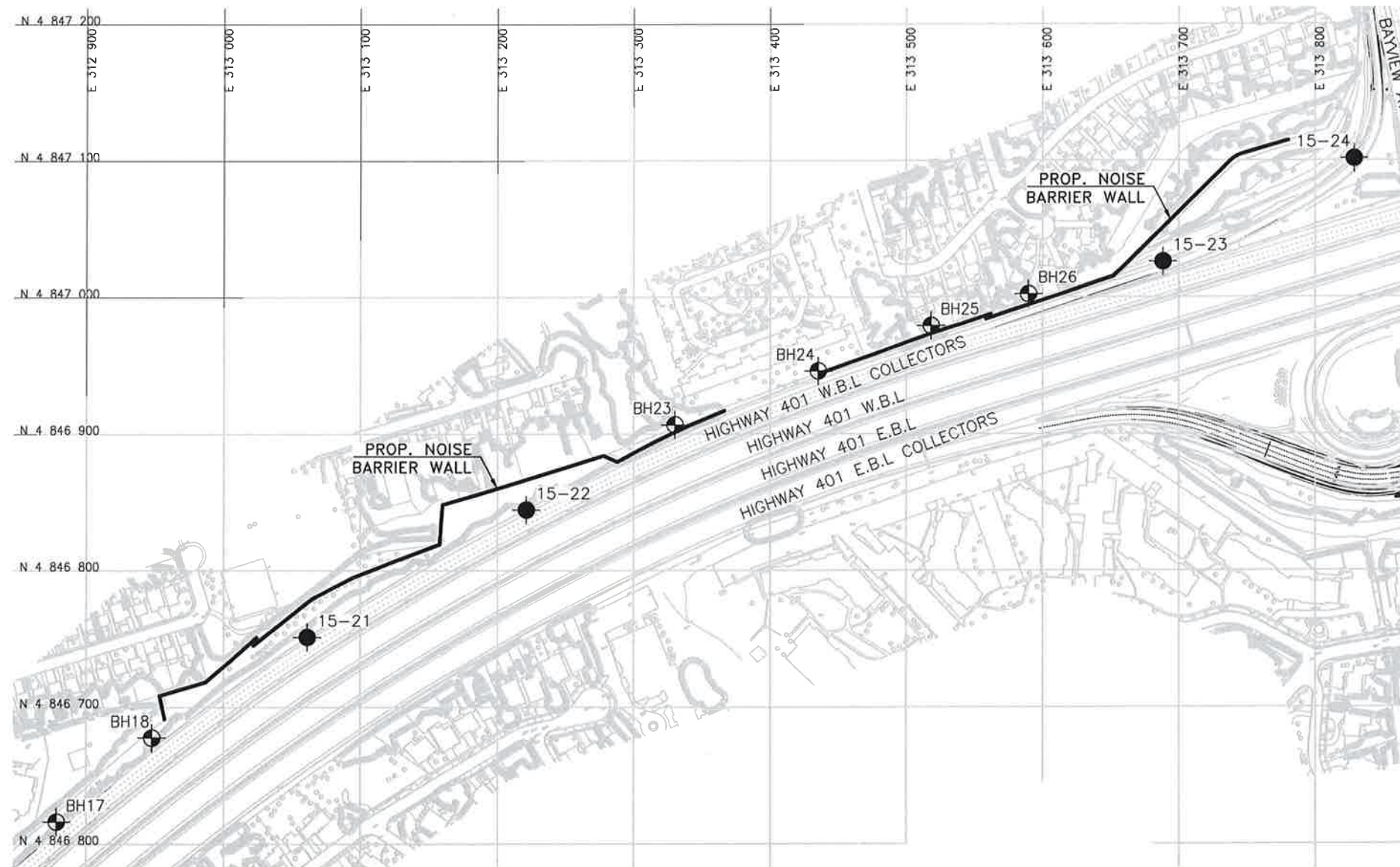
- Borehole (By Thurber)
- ◆ Borehole (By Others)
- N Blows /0.3m (Std Pen Test, 475J/blow)
- CONE Blows /0.3m (60° Cone, 475J/blow)
- PH Pressure, Hydraulic
- ▽ Water Level
- ↑ Head Artesian Water
- ⊥ Piezometer
- 90% Rock Quality Designation (RQD)
- A/R Auger Refusal

NO	ELEVATION	NORTHING	EASTING
15-21	167.3	4 846 751.3	313 061.2
15-22	167.6	4 846 844.4	313 220.9
15-23	171.5	4 847 026.0	313 688.3
15-24	169.9	4 847 101.5	313 828.7
BH17*	167.0	4 846 616.3	312 878.4
BH18*	166.1	4 846 677.7	312 947.7
BH23*	166.1	4 846 906.7	313 330.4
BH24*	166.8	4 846 946.0	313 435.4
BH25*	167.3	4 846 979.2	313 518.3
BH26*	168.6	4 847 002.3	313 589.8

NOTES-

- The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
- * Estimated coordinates.

GEOCRES No. 30M11-259



PLAN



REVISIONS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								
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RECORD OF BOREHOLE NO. 17

FOUNDATION SECTION

JOB 64-F-40 LOCATION Ret. Wall on Hwy 401 N. Side Bown Yonge & Bayview ORIGINATED BY B.M.G.
W.P. 252-61-2 BORING DATE Ch. 37/85 @ 85' It. May 20, 1964. COMPILED BY W.W.K.
OATUM 548.0 BOREHOLE TYPE Pennsylvania Drill CHECKED BY M.D.

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — W.L. PLASTIC LIMIT — W.P. WATER CONTENT — W		REMARKS
		NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	W.P.	W.L.	
<u>548.0</u>	<u>Groundlevel</u>								
<u>0.5</u>	<u>Black org. topsoil.</u>	<u>1</u>	<u>SS 16</u>						
	<u>Clayey silt with</u>	<u>2</u>	<u>SS 24</u>	<u>540</u>					
	<u>sand.</u>	<u>3</u>	<u>SS 30</u>						
	<u>(Silt layer from</u>	<u>4</u>	<u>for 4"</u>						
	<u>El. 536 to El. 534)</u>	<u>5</u>	<u>SS 103</u>	<u>530</u>					
	<u>Very stiff to hard.</u>	<u>6</u>	<u>for 11"</u>						
<u>527.3</u>									
<u>20.7</u>	<u>End of borehole.</u>			<u>520</u>					

W.L.

El. 533.5

Observed in
borehole.

BULK
DENSITY
PCF

WATER CONTENT %

RECORD OF BOREHOLE NO. 18

FOUNDATION SECTION

JOB 64-F-40 LOCATION Ret. Wall on Hwy 401 N. Side Bwn Yonge & Bayview ORIGINATED BY B.M.G.
W.P. 252-61-2 BORING DATE Ch. 40/65 @ 95' Lt. May 20, 1964. COMPILED BY W.V.K.
DAYUM 545.0 BOREHOLE TYPE Pennsylvania Drill CHECKED BY M.D.

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT PLASTIC LIMIT WATER CONTENT		REMARKS
			NUMBER	TYPE			W.P.	W.L.	
545.0	Groundlevel								
0.0	Sandy silt. (layer of clayey silt from El. 533 to El. 531).		1	SS 101 for 11"	540				
			2	SS 100 for 6"					
			3	SS 107 for 6"					
			4	SS 63 for 6"	530				
			5	SS 62 for 6"					
			6	SS 100 for 6"	520				
524.5	Very dense.								
20.5	End of borehole.								

RECORD OF BOREHOLE NO. 23

FOUNDATION SECTION

JOB 64-F-40 LOCATION Ret. Wall on Hwy 401 N. Side Bwn Yonge & Bayview ORIGINATED BY B.M.G.
W.P. 252-61-2 BORING DATE Ch. 49/65 @ 105' Lt. COMPILED BY W.K.K.
DATUM 545.0 BOREHOLE TYPE Pennsylvania Drill CHECKED BY M.D.

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT		BULK DENSITY P.C.F.	REMARKS
			NUMBER	TYPE		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	WL	WP		
545.0	Ground level		1	SS 102 for 9"	540						
0.0	Silty Sand.		2	SS 71							
			3	SS 100 for 4"							
			4	SS 30							
			5	SS 44	530						
			6	SS 55							
523.5					520						
21.5	End of borehole.				510						

W.L.
El. 534.6
Observed in
borehole.

RECORD OF BOREHOLE NO. 24

FOUNDATION SECTION

JOB 64-F-40 LOCATION Ret. Wall on Hwy 401 N. Side Bwn Yonge & Bayview ORIGINATED BY B.M.G.
W P 252-61-2 BORING DATE May 21, 1964. COMPILED BY W.W.K.
DATUM 547.1 BOREHOLE TYPE Pennsylvania Drill CHECKED BY M.D.

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES		ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F.	LIQUID LIMIT PLASTIC LIMIT WATER CONTENT			BULK DENSITY γ P.C.F.	REMARKS
			NUMBER	TYPE				WL	WP	W		
547.1	Groundlevel		1	SS 48 for 6"	540							
0.0	Silty Sand.		2	SS 59 for 6"								
			3	SS 50 for 5 1/2"								
			4	SS 95 for 3"								
			5	SS 40 for 3"	530							
527.1					520							
20.0	End of borehole.											

W.L.

El. 537.1
Observed in
borehole.

RECORD OF BOREHOLE NO. 25

FOUNDATION SECTION

JOB 64-F-40

LOCATION Ret. Wall on Hwy 401 N. Side Btwn Yonge & Bayview

ORIGINATED BY B.M.G.

W.P. 252-61-2

BORING DATE Ch. 55/60 @ 105' Lt. May 21, 1964.

COMPILED BY W.W.K.

DATUM 549.0

BOREHOLE TYPE Pennsylvania Drill

CHECKED BY M.D.

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT PLOT	SAMPLES		ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F.	LIQUID LIMIT PLASTIC LIMIT WATER CONTENT		REMARKS
			NUMBER	TYPE				WL WP	W WL	
549.0	Ground level									
0.0	Clayey silt with sand.		1	SS 63 for 6"						
			2	SS 108 for 9"	540					
			3	SS 40 for 3"						
			4	SS 100 for 9"						
			5	SS 104 for 10"	530					
527.9			6	SS 115 for 8"	520					
21.1	End of borehole.									

W.L.
El. 539.9
Observed in
borehole.

RECORD OF BOREHOLE NO. 26

FOUNDATION SECTION

JOB 64-F-40 LOCATION Ret. Wall on Hwy 401 N. Side Etan Yonge & Bayview ORIGINATED BY B.M.G.
W.P. 252-61-2 BORING DATE Ch. 58660 @ 150' Lt. May 21, 1964. COMPILED BY W.W.K.
DATUM 553.1 BOREHOLE TYPE Pennsylvania Drill CHECKED BY M.D.

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT PLASTIC LIMIT WATER CONTENT		REMARKS
			NUMBER	TYPE		SHEAR STRENGTH P.S.F.	W.P.	W.L.	W	
553.1 Groundlevel										
0 Silty sand.			1	SS 61	550					
	Very dense.		2	SS 60						
			3	SS 63						
542.0										
11.0 Clayey silt with sand.			4	SS 60	540					
	Hard.			for 3"						
			5	SS 40	530					
20.9 End of borehole.				for 5"						

W.L.
El. 536.6
Observed
in borehole

Appendix F

Noise Barrier Wall, Segment 7, East of Bayview Borehole 15-25 (Current investigation) Boreholes 8, 19, 20 (Previous investigation)

- Record of Borehole Sheets
- Laboratory Test Results
- Drawing titled “Borehole Locations”

RECORD OF BOREHOLE No 15-25

1 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 7 N 4 847 226.5 E 314 384.1 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.25 - 2015.08.25 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa						
170.8	GROUND SURFACE							20 40 60 80 100						
0.0	ASPHALT:(300mm)							20 40 60 80 100						
170.5								20 40 60 80 100						
0.3	SAND , trace silt and gravel Brown Moist (FILL)		1	GS			170	20 40 60 80 100						
170.0								20 40 60 80 100						
0.8	Silty CLAY , trace sand and gravel Very Stiff Brown Moist (FILL)		1	SS	28			20 40 60 80 100						
169.3								20 40 60 80 100						
1.5	Silty CLAY , with sand, trace gravel Very Stiff to Hard Brown Moist (TILL)		2	SS	28		169	20 40 60 80 100						
								20 40 60 80 100						
			3	SS	50/ 0.075		168	20 40 60 80 100						Resistance to augering at 2.4m
	Oxidized stains		4	SS	46		167	20 40 60 80 100						0 37 36 27
								20 40 60 80 100						
	Grey		5	SS	60		166	20 40 60 80 100						
								20 40 60 80 100						
			6	SS	22		165	20 40 60 80 100						
								20 40 60 80 100						
							164	20 40 60 80 100						
163.5								20 40 60 80 100						
7.3	SAND and SILT , some gravel, some clay Dense to Very Dense Grey Moist (TILL)		7	SS	42		163	20 40 60 80 100						12 47 30 11
								20 40 60 80 100						
	Wet		8	SS	50/ 0.100		162	20 40 60 80 100						
161.0								20 40 60 80 100						
9.8	END OF BOREHOLE AT 9.8m.							20 40 60 80 100						

Continued Next Page

+³, ×³: Numbers refer to
Sensitivity 20
15 10 5
(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 15-25

2 OF 2

METRIC

W.P. 2074-13-00 LOCATION Noise Barrier Wall Segment 7 N 4 847 226.5 E 314 384.1 ORIGINATED BY AHF
 HWY 401 BOREHOLE TYPE Solid Stem Augers COMPILED BY AN
 DATUM Geodetic DATE 2015.08.25 - 2015.08.25 CHECKED BY RPR

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES			SHEAR STRENGTH kPa									
	Continued From Previous Page																
	Piezometer installation consists of 25mm diameter Schedule 40 PVC pipe with a 3.04m slotted screen. WATER LEVEL READINGS: DATE DEPTH (m) ELEV. (m) Aug 25/ 15 7.9 162.9 Oct26/2015 6.0 164.8																

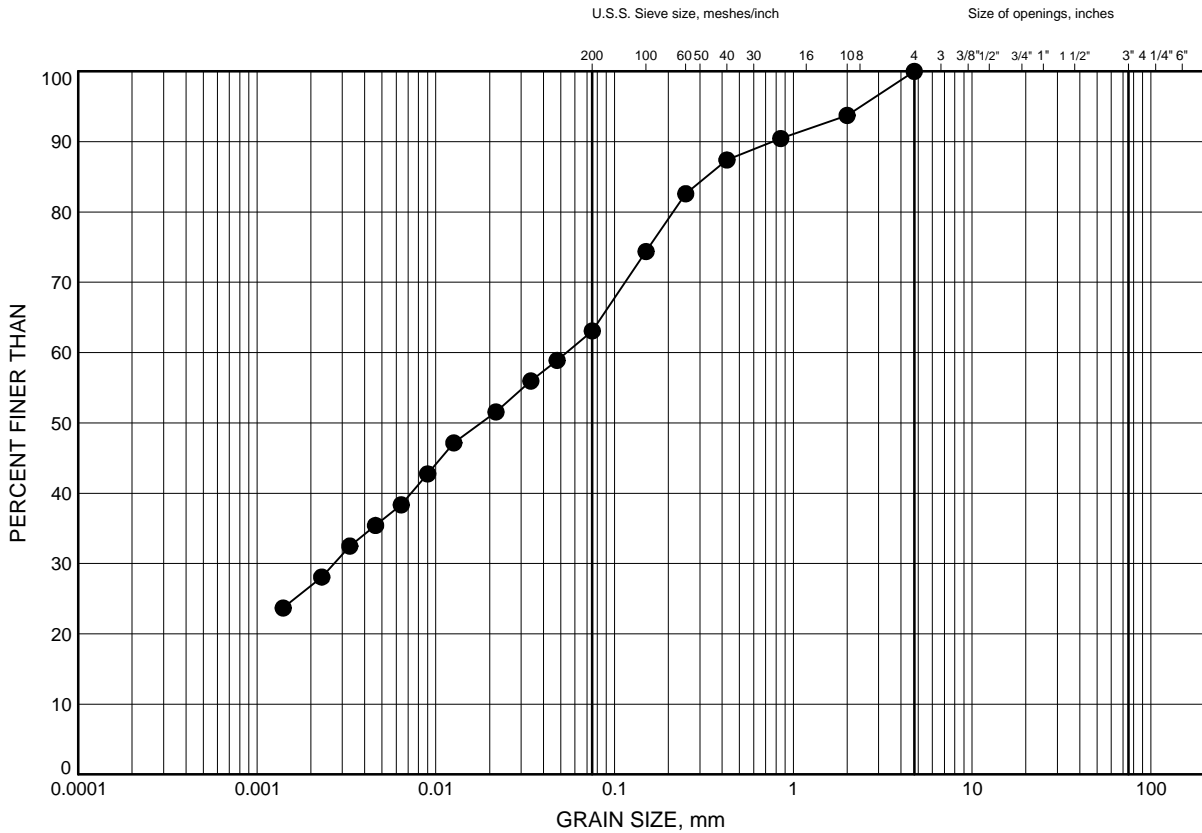
ONTMT4S 19-5161-216.GPJ 2015TEMPLATE(MTO).GDT 12/7/15

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE F1

Silty CLAY TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-25	3.35	167.45

Date October 2015
W.P. 2074-13-00



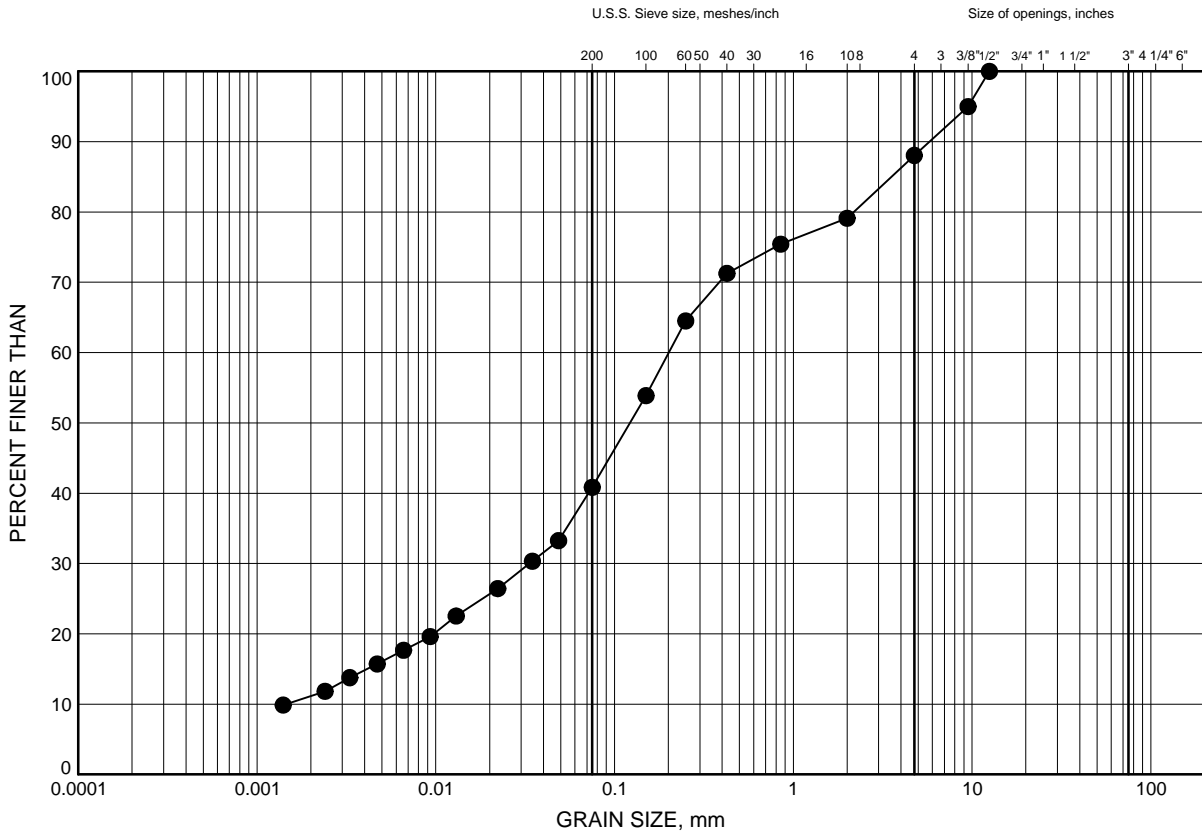
Prep'd AN
Chkd. RPR

Hwy 401 WBL Coll Rehab Bayview to Jane

GRAIN SIZE DISTRIBUTION

FIGURE F2

SAND & SILT TILL



SILT and CLAY	FINE	MEDIUM	COARSE	FINE	COARSE	COBBLE SIZE
FINE GRAINED	SAND			GRAVEL		

LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-25	7.92	162.88

Date ..October 2015.....
W.P. ..2074-13-00.....

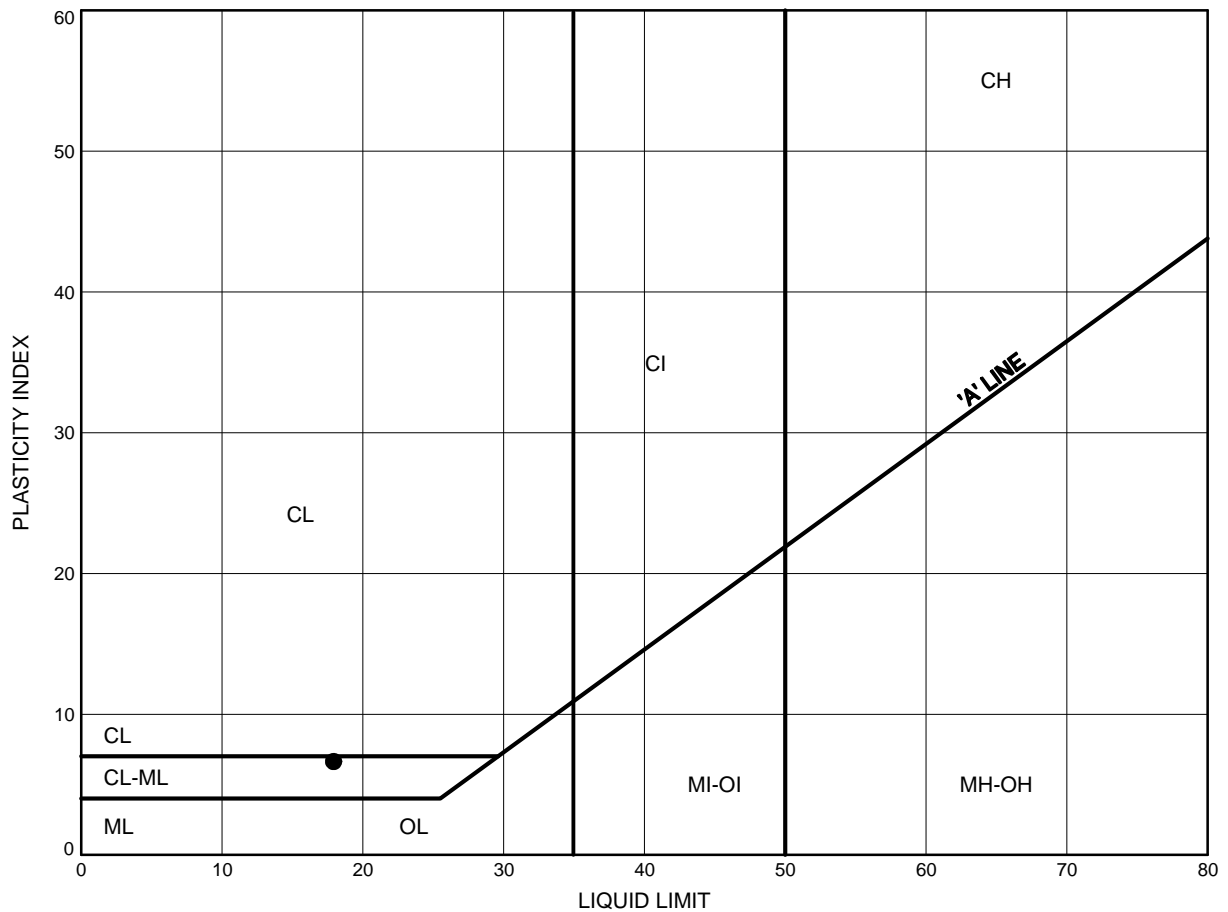


Prep'dAN.....
Chkd.RPR.....

Hwy 401 WBL Coll Rehab Bayview to Jane
ATTERBERG LIMITS TEST RESULTS

FIGURE F3

Silty CLAY TILL



LEGEND

SYMBOL	BOREHOLE	DEPTH (m)	ELEV. (m)
●	15-25	3.35	167.45

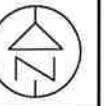
Date October 2015
W.P. 2074-13-00



Prep'd AN
Chkd. RPR

METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

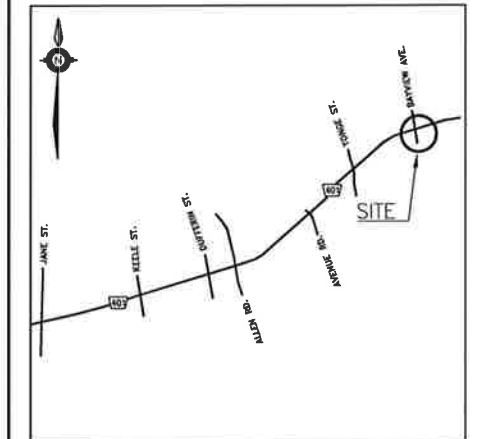
CONT No	(
GWP No 2074-13-00)



SHEET








THURBER ENGINEERING LTD.



KEYPLAN

LEGEND

- | | |
|---|---------------------------------------|
|  | Borehole (By Thurber) |
|  | Borehole (By Others) |
| N | Blows /0.3m (Std Pen Test, 475J/blow) |
| CONE | Blows /0.3m (60° Cone, 475J/blow) |
| PH | Pressure, Hydraulic |
|  | Water Level |
|  | Head Artesian Water |
|  | Piezometer |
| 90% | Rock Quality Designation (RQD) |
| A/R | Auger Refusal |

NO	ELEVATION	NORTHING	EASTING
15-25	170.8	4 847 226.5	314 384.2
BH18*	167.8	4 847 258.9	314 473.9
BH19*	163.3	4 847 241.1	314 456.5
BH20*	163.4	4 847 230.0	314 472.4

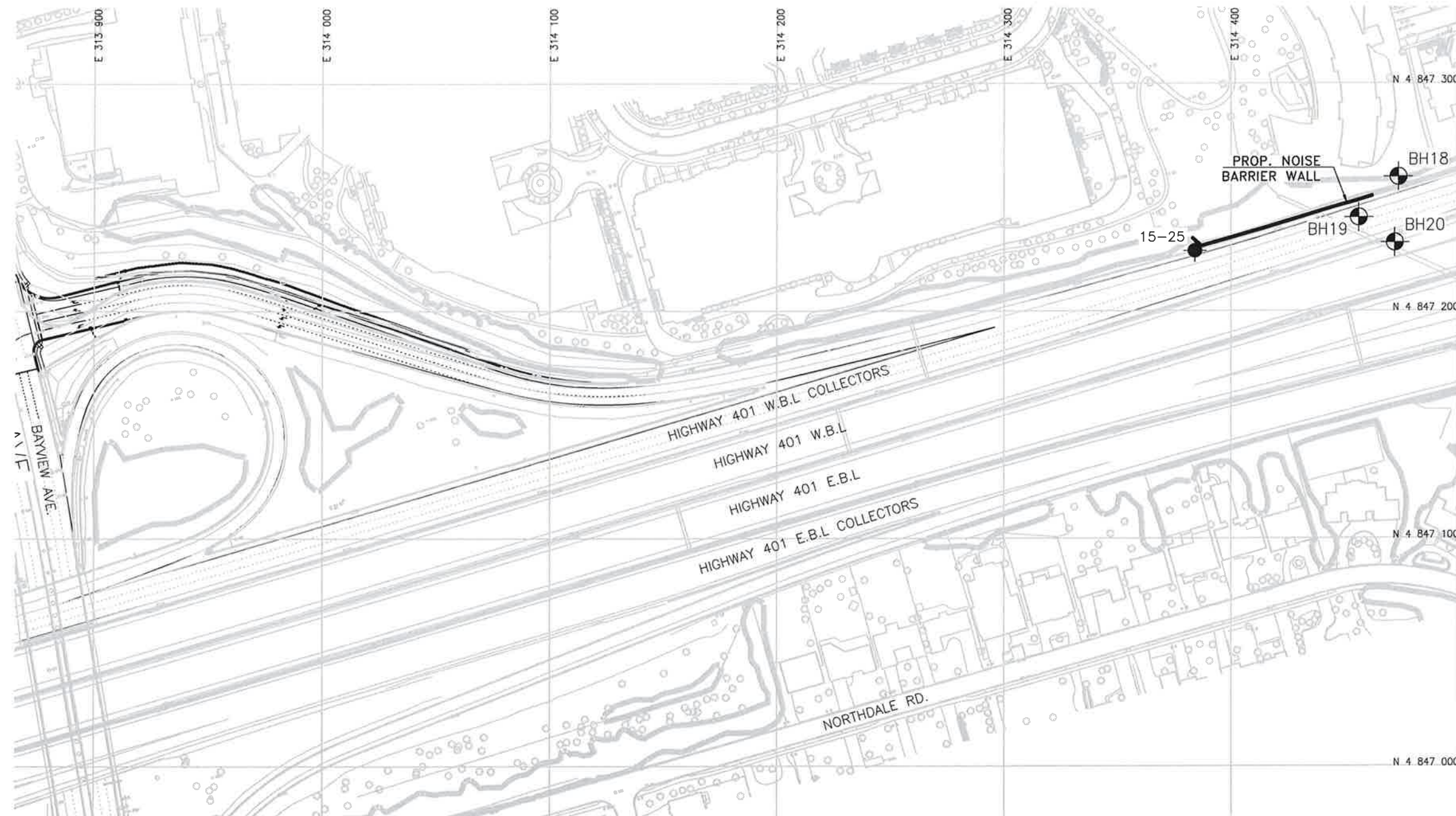
-NOTES-

- 1) The boundaries between soil strata have been established only at Borehole locations. Between Boreholes the boundaries are assumed from geological evidence.
- 2) This drawing is for subsurface information only. Surface details and features are for conceptual illustration.
- 3) * Estimated coordinates.

GEOCRES No. 30M11-259

REVISIONS										
	DATE	BY				DESCRIPTION				
DESIGN	RPR	CHK	RPR	CODE		LOAD		DATE	DEC 2015	
DRAWN	AN	CHK	SKP	SITE		STRUCT	IDWG	6		

DATE 12/11/2015 3:01 PM



PLAN



JOB	64-F-8	LOCATION	Retaining Wall on Hwy. 401 near Leslie St.	ORIGINATED BY	B.M.G.
W.P.	-	BORING DATE	February 20, 1964.	COMPILED BY	B.M.G.
DATUM	G.S.C.	BORING TYPE	Pennsylvania Type Auger - 32"Ø	CHECKED BY	A.G.S.

[illegible]

RECORD OF BOREHOLE NO. 19

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 64-F-8 LOCATION Hwy 401 North Retaining Wall ORIGINATED BY C.K.

W.P. 252-61-3 BORING DATE Feb. 1 & 2, 1965 COMPILED BY C.K.

DATUM G.S.C. BOREHOLE TYPE Washboring (using BX casing) CHECKED BY _____

ELEV DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLT	SAMPLES		ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F.	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY P.C.F.	REMARKS
			NUMBER	TYPE				WP	WL		
535.9					535						
0.0	Glacial Till Clayey silt with traces of sand. (Firm)		1	SS							
530.4					530						
5.5	Silty fine sand. (dense)		2	SS							
			3	SS							
523.4					525						
12.5	Clayey silt to silty clay with traces of sand. (Very stiff)		4	SS							
			5	TW PM							
517.9			6	SS							
18.0	Sandy silt (Hard)				520						
514.4			7	SS							
21.5	End of borehole.				515						

RECORD OF BOREHOLE NO. 20

FOUNDATION SECTION

MATERIALS & TESTING DIVISION

JOB 64-F-8

LOCATION Hwy. 401 North Retaining Wall

ORIGINATED BY C.K.

W.P. 252-61-3

BORING DATE Feb. 2, 1965.

COMPILED BY C.K.

DATUM G.S.C.

BOREHOLE TYPE Washboring. (using BX casing)

CHECKED BY

ELEV. DEPTH	SOIL PROFILE DESCRIPTION	STRAT. PLOT	SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	SHEAR STRENGTH P.S.F.	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY γ P.C.F.	REMARKS
			NUMBER	TYPE				WP	WL		
536.0											
0.0	Glacial Till Clayey silt with traces of sand. (Firm to Hard)		1	SS 4	535						
528.0			2	SS 41	530						
525.0			3	SS 75	525						
11.0	Silty fine sand (Very Dense)		4	SS 75							
522.5											
13.5	End of borehole.				520						

Appendix G

List of Special Provisions Referenced in this Report Suggested Text for NSSP

List of OPSS Documents Referenced in this Report

- OPSS 903

Suggested Text for NSSP on:

“Augered Caisson Construction for Noise Barrier Wall Foundations”

The Contractor is advised that variable types of subsurface materials may be encountered at the locations of the noise barrier wall foundations. Cobbles and boulder amongst other obstructions is potentially present within the fill and the underlying glacial tills. For additional information regarding subsurface conditions, the Contractor is referred to the Foundation Investigation Report.

For bidding purposes, the Contractor shall assume the following:

1. The subsurface conditions at an augered caisson location are the same as those encountered in the borehole closest to the subject caisson location.
2. Cobbles and boulders may be encountered within the glacial till deposits. Obstructions including cobbles and boulders may also be present within the fills. The soil matrix is anticipated to become harder or denser with depth. Caisson installation equipment must be able to dislodge, handle, remove or otherwise penetrate these obstructions and hard layers.
3. Water seepage and/or soil sloughing into the caisson hole will occur from existing fill and cohesionless soils. The cohesionless soils would be susceptible to disturbance under conditions of unbalanced hydrostatic head. Temporary liners shall be available on site, or be made available on very short notice, to support the caisson sidewalls and provide seepage cut-off where required. All concrete shall be placed in the dry.

The Contractor is responsible for constructing the noise barrier wall foundations without disturbing the material at the sides or bases of the foundations.