

**FOUNDATION INVESTIGATION AND DESIGN REPORT
NOISE BARRIER WALLS AND BREAKAWAY SIGN SUPPORTS
BROOKDALE AVENUE TO PITT STREET
HIGHWAY 401
CORNWALL, ONTARIO
G.W.P. 4056-06-00**

31G-234

Submitted

To

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PART 1 FACTUAL INFORMATION

1.0 INTRODUCTION

This report presents the factual data from a foundation investigation carried out by Thurber Engineering Ltd. (Thurber) for the detailed design of noise barrier walls and breakaway sign supports adjacent to the WBL and EBL of Highway 401, from approximately 1 km west of Brookdale Avenue to approximately 200 m east of Pitt Street in Cornwall, Ontario. Thurber has been retained by McCormick Rankin Corporation (MRC) to carry out this investigation under the Ministry of Transportation Ontario (MTO) Purchase Order No. 4006-E-0003.

The purpose of this investigation was to determine the subsurface conditions along the alignments of the proposed walls and, based on this data, to provide a borehole locations drawing, records of boreholes, laboratory test results and a written description of the subsurface conditions.

2.0 SITE DESCRIPTION

The terrain is generally flat in the vicinity of the project area, except for an approximately 350 m long earth berm that runs along the north side of Highway 401, and the approach embankments for the Pitt Street Overpass. The existing grades along the highway, between approximate Stations 22+340 and 23+430, range between approximate Elevations 60 m and 69 m. The grades along the top of the earth berm vary between approximate Elevations 62 m and 64 m.

Within the project limits, there is some residential development on both sides of Highway 401 to the west of Pitt Street/St. Andrews Road. The South Raisin River meanders on the south side of the highway. Between approximate Stations 22+400 and 22+650, the river is located within 100m of the highway embankment.

Based on published geological information, the project area is situated within a physiographic region known as the Lancaster Flats. Located close to the north shore of the St. Lawrence River, this low lying area features glacial-lacustrine clays and sands overlying glacial tills. The till in

this area is known to contain limestone fragments, cobbles and boulders. Drainage at the site is generally toward the St. Lawrence by way of smaller watercourses such as the South Raisin River located just south of the site. Along the highway corridor, vegetation typically consists of grass with isolated small shrubs.

3.0 INVESTIGATION PROCEDURES

3.1 Field Investigation

A borehole investigation program for the project was carried out between April 18 and May 3, 2007 when a total of twenty seven (27) boreholes were advanced along the WBL and EBL shoulders of Highway 401 and along the top of the earth berm on the north side of the highway. Most of these boreholes were terminated at approximately 7.9 to 8.2 m depths, except in Boreholes 07-E3, 07-E8 and 07-E10 where the termination depths ranged from 3.7 to 6.1 m due to auger refusal. Approximate locations of the boreholes are shown on the Borehole Locations Plan immediately following the text and tables.

Subsequent to the initial investigation, further boreholes were drilled on two separate occasions. On June 11, 2007, Boreholes 07-BSS1, 07-BSS3 and 07-BSS4 were drilled at locations of the proposed replacement breakaway signs. These boreholes ranged from 6.1 m to 9.8 m in depths. On September 4, 2007, Boreholes 07-E8a and 07-E10a were drilled and extended to 6.7 and 6.6m, respectively, in order to address MTO's comments on depths of the original Boreholes 07-8 and 07-10.

In these boreholes, soil samples were obtained with a 50 mm outside diameter split spoon sampler driven in accordance with the Standard Penetration Test (SPT). Groundwater conditions in the open boreholes were observed throughout the drilling operations. One standpipe piezometer was installed in each of Boreholes 07-W2, 07-W8, 07-W11, 07-W15, 07-E2, 07-E4, 07-E6 and 07-E9 to permit longer term groundwater level monitoring. The borehole completion details are shown in Table 3.1 below.



Table 3.1 – Borehole Completion Details

Borehole Location	Piezometer Tip Depth / Elevation (m)	Completion Details
07-W1	None Installed	Bentonite for full depth
07-W2	7.6 / 55.8	Sand from 7.6 to 5.7 m, then bentonite grout to surface
07-W3	None Installed	Bentonite for full depth
07-W4	None Installed	Bentonite for full depth
07-W5	None Installed	Bentonite for full depth
07-W6	None Installed	Bentonite for full depth
07-W7	None Installed	Bentonite for full depth
07-W8	7.6 / 52.1	Sand from 7.6 to 5.8 m, bentonite grout to 0.3 m, then drill cuttings to surface
07-W9	None Installed	Bentonite for full depth and granular cap
07-W10	None Installed	Bentonite for full depth and granular cap
07-W11	7.6 / 57.7	Sand from 7.6 to 5.8 m, bentonite grout to 0.2 m, then drill cuttings to surface
07-W12	None Installed	Bentonite for full depth and granular cap
07-W13	None Installed	Bentonite for full depth and asphalt patch
07-W14	None Installed	Bentonite for full depth and asphalt patch
07-W15	7.6 / 60.8	Sand from 7.6 to 5.7 m, bentonite grout to 0.2 m, then drill cuttings to surface
07-W16	None Installed	Bentonite for full depth and granular cap
07-S1	None Installed	Bentonite for full depth
07-E1	None Installed	Bentonite for full depth and granular cap
07-E2	7.6 / 52.7	Sand from 7.6 to 5.8 m, bentonite grout to 0.2 m, then drill cuttings to surface
07-E3	None Installed	Bentonite for full depth and granular cap
07-E4	7.6 / 55.7	Sand from 7.6 to 5.8 m, bentonite grout to 0.2 m, then drill cuttings to surface
07-E5	None Installed	Bentonite for full depth and granular cap
07-E6	7.6 / 59.7	Sand from 7.6 to 5.8 m, bentonite grout to 0.2 m, then drill cuttings to surface
07-E7	None Installed	Bentonite for full depth and asphalt patch
07-E8	None Installed	Bentonite for full depth and asphalt patch
07-E8a	None Installed	Bentonite for full depth and asphalt patch
07-E9	7.6 / 60.8	Sand from 7.6 to 5.7 m, bentonite grout to 0.2 m, then drill cuttings to surface
07-E10	None Installed	Drill cuttings for full depth
07-E10a	None Installed	Bentonite for full depth and granular cap
07-BSS1	None Installed	Bentonite for full depth
07-BSS3	None Installed	Bentonite for full depth
07-BSS4	None Installed	Bentonite for full depth



The field work was supervised on a full-time basis by a member of Thurber's field staff who located the boreholes in the field, cleared borehole locations of underground utilities, directed the drilling, sampling and in-situ testing operations, and logged the boreholes. The soil samples were identified in the field, placed in appropriately labelled containers and transported back to Thurber's laboratory for further examination and testing.

Upon completion of drilling and piezometer installation, all boreholes except Borehole 07-E10 were backfilled with bentonite holeplug. The shallower Borehole 07-E10 was backfilled with drill cuttings. All boreholes located on paved surfaces were capped with cold patch asphalt. Results of field sampling and testing are presented on the Records of Boreholes in Appendix A.

3.2 Laboratory Testing

Geotechnical laboratory testing consisted of natural moisture content determination and visual identification of all soil samples in accordance with the current MTO standards. Grain size distribution analysis and Atterberg Limits tests were conducted on selected samples. All laboratory test results are presented in Appendices A and B.

4.0 SUBSURFACE STRATIGRAPHY

4.1 General

This section presents a generalized summary of the subsurface conditions encountered at the borehole locations. The detailed subsurface soil and groundwater conditions encountered in each of the boreholes are presented on the Records of Boreholes in Appendix A.

In general, the subsurface conditions encountered in the boreholes consist of variable types of fill overlying native silty clay, which is in turn underlain by sand and silt till and clayey silt to silty clay till. The measured groundwater levels ranged between approximately 1 m and 7 m depths below the existing top of berm or highway embankment. These are short term observations in clayey soils and therefore should not be considered as stabilized groundwater levels.



4.2 Topsoil and Pavement Structure

Topsoil was encountered on the earth berm in Boreholes 07-W1, 07-W2, 07-W3, 07-W4 and 07-W5, and at ground surface in Boreholes 07-S1, 07-BSS1 and 07-BSS3. The thickness of topsoil varies from 50 mm to 100mm. Topsoil is anticipated to exist elsewhere within the right-of-way beyond the shoulders and its thickness is expected to vary between locations.

A pavement structure consisting of asphalt over sand and gravel was encountered in Boreholes 07-W13, 07-W14, 07-E7, 07-E8 and 07-E8a on the highway shoulder. The asphalt thickness ranges between 75 mm and 150 mm, while the sand and gravel thickness ranges between 450 and 725 mm. Elsewhere on the shoulder, the sand and gravel was encountered at ground surface with thicknesses typically ranging from approximately 200 to 800 mm, except in Borehole 07-E1 where the thickness is up to 1.3 m. The sand and gravel is typically in a compact to occasionally dense state as indicated by most SPT 'N' values ranging between 12 and 32 blows per 0.3 m penetration. Figure B1 indicates the grain size distribution of a sample of sand and gravel fill. The measured moisture contents were typically in the order of 3% to 5%.

4.3 Berm Fill

Boreholes 07-W1 through 07-W6 were located on top of an existing earth berm adjacent to the highway embankment between approximate Stations 22+340 and 22+740. This fill ranges from 4.1 to 4.6 m in thickness and extends to approximate Elevations 57.9 to 59.3 m in the boreholes. The fill is variable and typically contains random layers of silty sand, sand and silt, sandy silt, clayey silt and silty clay. A 1.1 to 1.3 m thick layer of sand and gravel was encountered near the bottom of the berm fill in Boreholes 07-W5 and 07-W6. This berm fill also contains cobbles, boulders or concrete rubble as inferred by resistance to augering during borehole advance. Figures B2, B3 and B4 present the grain size distribution curves of various samples of fill recovered from the boreholes. Typical SPT 'N' values of 4 to 26 per 0.3 m penetration indicate that this fill has a loose to compact relative density. Higher 'N' values of 32 and 67 blows indicate the presence of occasional dense to very dense zones or cobbles, boulders and concrete rubble. A majority of measured moisture contents ranged between approximately 8% and 10%.



4.4 Highway Embankment Fill

Below the pavement structure on the highway embankment between approximate Stations 22+700 and 23+440, Boreholes 07-W7 through 07-W16 (WBL shoulder) and Boreholes 07-E2 through 07-E10 (EBL shoulder) encountered fill ranging from 0.9 m to greater than 7.4 m in thickness. The base of the fill is present between approximate Elevations 57.3 to 64.9 m in the boreholes. The fill is variable and largely consists of sands and silts, with some clayey silt to occasional silty clay zones. In Borehole 07-BSS1, silty clay fill was found extending from below the topsoil to 1.2 m depth. The presence of cobbles, boulders, rock fill or concrete rubble was inferred by the grinding of augers, and some SPT 'N' values of greater than 50 blows for less than 0.3 m penetration. Elsewhere within the fill, SPT 'N' values ranging from 16 blows to greater than 50 blows per 0.3 m penetration indicate that this fill has a compact to very dense relative density. Figures B5 through B10 present grain size distribution curves of fill samples with varying proportions of sands, silts and clays. Figures B20 and B21 are plasticity charts which show that the sand and silt fill has slight plasticity (group symbol CL-ML) and that the silty clay has high plasticity (group symbol CH), respectively. Measured moisture contents generally ranged between 3% and 12%.

4.5 Silty Clay

Deposits of native cohesive silty clay were encountered below the fill in Boreholes 07-W2 through 07-W9, 07-E1, 07-E2, 07-E4 and 07-E5, and in Boreholes 07-S1 and 07-BSS1. These deposits were approximately 1.1 m to greater than 7.6 m in thickness. The base of the deposits ranges between Elevations 57.8 m to below 51.3 m. The colour of the silty clay is typically mottled brown and grey changing to grey with depth.

Measured SPT 'N' values generally decrease with depth from 27 blows to 1 blow per 0.3 m penetration. These values, in addition to field vane shear strengths of 60 kPa to 20 kPa (obtained within the lower elevations of the deposits) indicate that the silty clay has a generally very stiff consistency near the surface becoming firm to soft with depth.



Figures B11 through B14, and B27 present grain size distribution results for selected silty clay samples. Atterberg limits tests were also conducted on selected samples and the results plotted on plasticity charts shown on Figures B22, B23 and B30. The measured clay contents typically range between 45% and 75%, and this soil is classified as having a high plasticity (CH). A majority of measured moisture contents of these silty clay samples ranged between 30% and 93%.

4.6 Sand and Silt (Till)

A deposit of sand and silt glacial till was encountered below the fill and/or the upper silty clay in Boreholes 07-W1, 07-W4, 07-W9, 07-W12, 07-W14, 07-W15, 07-W16, 07-E8, 07-E8a, 07-E9, 07-BSS3 and 07-BSS4. Silty sand till was encountered in Boreholes 07-E10a and 07-BSS1. All except Borehole 07-BSS3 did not fully penetrate this till. Where encountered, the minimum thickness of this till ranges from 1.0 m to 4.2 m. Measured SPT 'N' values typically vary between 12 and 47 blows per 0.3 m penetration indicating compact to dense relative density. Occasional 'N' values of less than 10 blows or greater than 50 blows indicate the presence of loose or very dense zones, respectively. In Borehole 07-BSS4, 'N' values were greater than 50 blows for 0.3 m or less penetration, indicating a very dense condition throughout and inferring the presence of cobbles or boulders. Glacial tills are known to contain cobbles and boulders.

Figures B15, B16 and B28 show the grain size distribution curves for selected sand and silt till samples. Figures B17 and B29 present the grain size distribution curves for silty sand till samples. Figure B24 presents a plasticity chart showing that this till has a slight plasticity (group symbol CL-ML). Most measured moisture contents lied within the range of 8% and 15%.

4.7 Silty Clay to Clayey Silt (Till)

Deposits of native cohesive silty clay to occasional clayey silt till were encountered below the fill and/or the silty clay in Boreholes 07-W2, 07-W3, 07-W8, 07-W10, 07-W11, 07-W13, 07-W14, 07-W15, 07-S1, 07-E3, 07-E10 and 07-E10a. Clayey silt till was encountered below the sand and silt till in Borehole 07-BSS3. Silty clay till becoming clayey silt till was encountered at ground surface in Borehole 07-BSS4. Where encountered, these glacial tills were approximately 1.1 m to greater than 4.2 m in thickness. Boreholes 07-W2, 07-W3, 07-W8, 07-W10, 07-W11, 07-W13, 07-S1, 07-E3, 07-E10 and 07-BSS3 did not fully penetrate the tills. The base of the deposits



ranges between Elevations 63.6 m to below 50.2 m. The colour of the tills is typically brown becoming grey with depth at some locations.

Measured SPT 'N' values typically range between 10 and 26 blows per 0.3 m penetration indicating a stiff to very stiff consistency. Occasional 'N' values of 3, 5 and 8 blows indicate the presence of soft to firm zones. 'N' values of 50 blows for less than 0.3 m penetration measured in Borehole 07-BSS3 and at some locations elsewhere infer the presence cobbles, boulders or limestone fragments embedded within the till.

Figures B18 and B19 present grain size distribution results for selected silty clay and clayey silt till samples. Atterberg limits tests were also conducted and the results plotted on plasticity charts shown on Figures B25 and B26. The silty clay till is of high plasticity (group symbol CH) and the clayey silt till is of low plasticity. Measured moisture contents of till samples ranged between 6% and 30%.

4.8 Groundwater Conditions

Groundwater conditions were observed during and upon completion of drilling. Free water was found accumulating within the bottom 2 to 4 m in many of the open boreholes upon completion. One standpipe piezometer was installed in each of Boreholes 07-W2, 07-W8, 07-W11, 07-W15, 07-E2, 07-E4, 07-E6 and 07-E9. The depths, elevations and dates of water level readings taken in these piezometers are presented in the following table.

Table 4.8 Water Level Measurements in Piezometers

Borehole	Water Level Depth (m)	Water Level Elevation (m)	Date of Reading
07-W2	4.9	58.5	May 3, 2007
	4.1	59.3	May 8, 2007
07-W8	3.1	56.6	April 24, 2007
	1.2	58.5	May 8, 2007
07-W11	dry	-	April 23, 2007
	5.8	59.5	May 8, 2007
07-W15	dry	-	April 20, 2007
	4.8	63.6	May 8, 2007
07-E2	4.6	55.7	April 18, 2007
	2.1	58.2	May 8, 2007



07-E4	dry 3.8	- 59.5	April 18, 2007 May 8, 2007
07-E6	dry 6.8	- 60.5	April 19, 2007 May 8, 2007
07-E9	dry 4.7	- 63.7	April 19, 2007 May 8, 2007

Based on the readings above and observations during borehole advance, the water levels in these boreholes are generally located at elevations ranging from 52.0 to 63.7 m. These are, however, short term observations within clayey soils and should not be considered as stabilized groundwater levels.

It should be noted that these piezometric levels are based on short term observations and groundwater levels are subject to seasonal fluctuations. It is also anticipated that there is a localized drainage to the nearby South Raisin River, and regional flow in a southerly direction towards the St. Lawrence River.

5.0 MISCELLANEOUS

The borehole locations were located in the field by Mr. George Azzopardi of Thurber. Surveyors from J.D. Barnes Ltd. surveyed the as-drilled locations and provided Thurber with the coordinates and geodetic elevations. Thurber obtained utility clearances prior to drilling.

George Downing Estate Drilling of Hawkesbury, Ontario supplied the drill rig and conducted the drilling, sampling and in-situ testing operations.

The drilling and sampling operations in the field were supervised on a full time basis by Mr. George Azzopardi of Thurber Engineering Ltd. Laboratory testing was carried out by Thurber Engineering Ltd. in its MTO-approved Oakville laboratory.

Messrs. Alastair Gorman, P.Eng. and Tony Harte directed the field operations for the noise barrier walls; Dr. Sydney Pang directed the field operations for the breakaway signs.

Dr. Sydney Pang, P.Eng prepared the report. Dr. P.K. Chatterji, P.Eng., a Designated Principal Contact for MTO Foundations projects, reviewed the report.





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PART 2 ENGINEERING DISCUSSION AND RECOMMENDATIONS

6.0 ENGINEERING DISCUSSION AND RECOMMENDATIONS

6.1 General

This section of the report presents foundation recommendations for the design of the proposed noise barrier walls.

Information on the general alignments of Noise Walls 1, 2 and 3 and locations of the breakaway signs were provided to Thurber by MRC. Twenty six (26) boreholes for this investigation were drilled in close proximity to the proposed wall alignments, while Boreholes 07-S1, 07-BSS1, 07-BSS3 and 07-BSS4 were drilled at the locations of the proposed breakaway signs. It is understood that on the WBL, Noise Wall 1 (about 300 m) will be on top of the earth berm and Noise Wall 2 will be adjacent to the edge of shoulder, with a combined length of approximately 1,035 m. On the EBL, Noise Wall 3 (about 675 m long) will be adjacent to the edge of shoulder with a small length (about 45 m) on the existing Pitt Street structure barrier wall. It is understood that the walls will be about 3.5 m in height.

6.2 Foundation Design Parameters

For design of the noise barrier wall foundations, reference may be made to the following documents.

- Ministry of Transportation, Ontario (2003) "Guidelines for the Design of High Mast Pole Foundations", Third Edition, BRO-006, Engineering Standards Branch, Bridge Office.
- Canadian Highway Bridge Design Code and Commentary (2006). CAN/CSA-S6-06 and S6.1-06.



For design of the breakaway sign supports, reference should be made to the following document.

- Ministry of Transportation, Ontario (2007) "Sign Support Manual", Engineering Standards Branch, Bridge Office.

Noise Barrier Wall Supports

It is anticipated that the proposed noise barrier wall will be supported on conventional augered caissons (i.e. drilled shafts) with typical diameters ranging from 0.6 m to 0.9 m. However, larger diameters may be required at locations of poor foundation conditions. Tables 1, 2 and 3 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 1.6 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. The sloping earth berm and highway embankments in front of a caisson will result in reduced lateral passive resistance that must be taken into account during design.

Where an undrained shear strength, C_u , is provided for a cohesive soil (silty clay, silty clay to clayey silt till), 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.



Breakaway Sign Supports

Typical breakaway signs are built by embedding the steel columns in 450 mm diameter holes filled with concrete, with design depths as indicated in the Sign Support Manual, Figure 5.4.3. This design method is based on lateral soil resistance for the full footing depth without reduction for frost depth, and the soil surrounding the footing is assumed to be cohesive with a shear strength of 50 kPa. It is recommended that the signs to be located at Boreholes 07-BSS3 and 07-BSS4 be designed using this conventional method.

For the sign at Borehole 07-BSS1 where the foundation soil has lower shear strengths than 50 kPa (typically 20 to 30 kPa), it is recommended that the method used for designing the noise barrier wall foundations, as described above, be used. However, this design may be carried out without considering the reduction for frost depth of soil.

Table 4 presents the recommended geotechnical design parameters for the breakaway sign supports. The sloping highway embankment in front of a footing will result in reduced lateral passive resistance that must be taken into account during design. These parameters may also be used to check the sign support design using the Sign Support Manual at Boreholes 07-BSS3 and BSS4.

Where an undrained shear strength, C_u , is provided for a cohesive soil (silty clay, silty clay to clayey silt till), 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.

An equivalent caisson width equal to 3 times the caisson diameter may be assumed for lateral resistance calculations. Appropriate load and resistance factors should be applied for caisson design.



6.3 Caisson Installation

Caisson installation should generally be carried out in accordance with SP 903S01.

At this site, background information indicates that the earth berm located to the north of the highway contains concrete rubble. The resistance to augering at random locations within the fill during the investigation may be attributed to the presence of such rubble, cobbles and boulders.

Caisson installation equipment must be able to dislodge, handle and remove cobbles, boulders, limestone fragments, and to penetrate concrete rubble or other obstructions within the fill, where encountered. Cobbles and boulders may also be present in the glacial till. The contract documents should contain an NSSP alerting the contract bidders of the specific aspects relating to construction for augered caisson foundations at this site.

Groundwater levels are at variable depth below existing ground surface. Soil sloughing and water seepage may occur in unsupported holes especially at depths below the groundwater level. Temporary liners should be available to support the caisson sidewalls and provide seepage cut-off where required.

Suggested wordings for an NSSP to cover the above aspects are provided in Appendix C.

6.4 Construction Concerns

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

6.5 Construction Inspection and Testing

Caisson construction should be monitored by qualified geotechnical personnel (as per SP 903S01) to verify the soil conditions and to confirm that those conditions are consistent with the design assumptions in this report.





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TABLE 1
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL 1 SUPPORTS
HIGHWAY 401 WEST BOUND LANES
BROOKDALE AVE. TO PITT ST., CORNWALL

Station to Station	Nearest Borehole No.	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Grade (m)	Geotechnical Design Parameters					
				C _u (kPa)	φ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K _p	Groundwater Depth (m)
In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.6 m below final grade should be neglected in the foundation design.									
The presence of cobbles, boulders and concrete rubble within the fill berm should be expected.									
22+350 to 22+400 (berm)	07-W1	Fill	1.6 – 5.0	-	30	20	10	3.0	5 (below existing top of berm)
		Sand and Silt Till	5.0 – 8.0	-	30	20	10	3.0	
22+400 to 22+560 (berm)	07-W2 07-W3	Fill	1.6 – 4.0	-	30	20	10	3.0	4 (below existing top of berm)
		Silty Clay/Silty Clay Till	4.0 – 8.0	60	-	20	-	-	
22+560 to 22+630 (berm)	07-W4	Fill	1.6 – 4.0	-	30	20	10	3.0	5 (below existing top of berm)
		Silty Clay	4.0 – 6.0	75	-	20	-	-	
		Sand and Silt Till	6.0 – 8.0	-	30	20	10	3.0	
22+630 to 22+730 (berm)	07-W5 07-W6	Fill	1.6 – 4.0	-	30	20	10	3.0	5 (below existing top of berm)
		Silty Clay	4.0 – 6.0	75	-	20	-	-	
		Silty Clay	6.0 – 8.0	40	-	20	-	-	

Notes: This table must be read in conjunction with the report.
See legend after Table 3 for symbol definitions.

TABLE 2
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL 2 SUPPORTS
HIGHWAY 401 WEST BOUND LANES
BROOKDALE AVE. TO PITT ST., CORNWALL

Station to Station (WBL)	Nearest Borehole No.	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Grade (m)	Geotechnical Design Parameters					
				C _u (kPa)	φ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K _p	Groundwater Depth (m)
In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.6 m below final grade should be neglected in the foundation design.									
22+700 to 22+750 (shoulder)	07-W7	Silty Clay	1.6 – 5.0	50	-	20	-	-	3 (below existing road shoulder)
		Silty Clay	5.0 – 8.0	20	-	20	-	-	
22+750 to 22+825 (shoulder)	07-W8	Silty Clay/Silty Clay Till	1.6 – 8.0	50	-	20	-	-	1 (below existing road shoulder)
22+825 to 22+900 (shoulder)	07-W9	Fill	1.6 – 2.5	-	30	20	10	3.0	3 (below existing road shoulder)
		Silty Clay	2.5 – 4.0	70	-	20	-	-	
		Sand and Silt Till	4.0 – 8.0	-	32	20	10	3.2	
22+900 to 22+975 (shoulder)	07-W10	Fill	1.6 – 4.0	-	30	20	10	3.0	3 (below existing road shoulder)
		Clayey Silt Till	4.0 – 8.0	80	-	20	-	-	

Notes: This table must be read in conjunction with the report.
See legend after Table 3 for symbol definitions.

McCormick Rankin Corporation
Noise Barrier Walls, Cornwall

22+975 to 23+175 (shoulder)	07-W11 07-W12 07-W13	Fill	1.6 – 6.0	-	30	20	10	3.0	4 (below existing road shoulder)
		Silty Clay/Clayey Silt/ Sand and Silt Till	6.0 – 8.0	75	-	20	-	-	
23+225 to 23+375 (shoulder)	07-W14 07-W15	Fill	1.6 – 4.0	-	30	20	10	3.0	4 (below existing road shoulder)
		Silty Clay Till	4.0 – 6.0	90	-	20	-	-	
23+375 to 23+410 (shoulder)	07-W16	Sand and Silt Till	6.0 – 8.0	-	32	20	10	3.2	4 (below existing road shoulder)
		Fill	1.6 – 4.0	-	30	20	10	3.0	
23+375 to 23+410 (shoulder)	07-W16	Sand and Silt Till	4.0 – 8.0	-	32	20	10	3.2	4 (below existing road shoulder)
		Fill	1.6 – 4.0	-	30	20	10	3.0	

c:\Thurber Projects 2007\19-1351-125 Hwy17-417 Arnprior West\191351125 Noise Barrier 2 Footing Design Parameters TABLE 2 jun 07.doc

**TABLE 3
GEOTECHNICAL DESIGN PARAMETERS
NOISE BARRIER WALL 3 SUPPORTS
HIGHWAY 401 EAST BOUND LANES
BROOKDALE AVE. TO PITT ST., CORNWALL**

Station to Station (EBL)	Nearest Borehole No.	Reference Simplified Subsurface Stratigraphy For Design	Depth Below Existing Grade (m)	Geotechnical Design Parameters					
				C _u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K _p	Groundwater Depth (m)
In order to take into account frost action and surficial disturbance, the ultimate lateral passive resistance in front of the caisson within the upper 1.6 m below final grade should be neglected in the foundation design.									
22+700 to 22+750 (shoulder)	07-S1 07-E1	Silty Clay	1.6 – 3.0	30	-	20	-	-	4 (below existing road shoulder)
		Silty Clay	3.0 – 8.0	20	-	20	-	-	
22+750 to 22+825 (shoulder)	07-E2	Fill	1.6 – 3.0	-	30	20	10	3.0	2 (below existing road shoulder)
		Silty Clay	3.0 – 6.0	50	-	20	-	-	
		Silty Sand	6.0 – 8.0	-	30	20	10	3.0	
22+825 to 22+900 (shoulder)	07-E3	Fill	1.6 – 3.0	-	30	20	10	3.0	2 (below existing road shoulder)
		Silty Clay Till	3.0 – 8.0	40	-	20	-	-	
22+900 to 22+975 (shoulder)	07-E4	Fill	1.6 – 5.0	-	30	20	10	3.0	3 (below existing road shoulder)
		Silty Clay	5.0 – 8.0	75	-	20	-	-	

Notes: This table must be read in conjunction with the report.
See legend after Table 3 for symbol definitions.

McCormick Rankin Corporation
Noise Barrier Walls, Cornwall

22+975 to 23+050 (shoulder)	07-E5	Fill Silty Clay	1.6 – 6.0 6.0 – 8.0	- 75	30 -	20 20	10 -	3.0 -	5 (below existing road shoulder)
23+050 to 23+200 (shoulder)	07-E6 07-E7	Fill	1.6 – 8.0	-	30	20	10	3.0	6 (below existing road shoulder)
23+230 to 23+310 (shoulder)	07-E8	Fill Sand and Silt Till	1.6 – 4.0 4.0 – 8.0	- -	30 30	20 20	10 10	3.0 3.0	4 (below existing road shoulder)
23+310 to 23+410 (shoulder)	07-E9 07-E10	Fill Clayey Silt/Silty Clay Till Sand and Silt Till	1.6 – 4.0 4.0 – 6.0 6.0 – 8.0	- 60 -	30 - 32	20 20 20	10 - 10	3.0 - 3.2	4 (below existing road shoulder)

c:\Thurber Projects 2007\19-1351-125 Hwy17-417 Arnprior West\191351125 Noise Barrier Wall 3 Footing Design Parameters TABLE 3 jun 07.doc

Notes: This table must be read in conjunction with the report.
See legend after Table 3 for symbol definitions.

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

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Notes: This table must be read in conjunction with the report.
See legend after Table 3 for symbol definitions.

TABLE 4
GEOTECHNICAL DESIGN PARAMETERS
BREAKAWAY SIGN SUPPORTS
HIGHWAY 401 EAST AND WEST BOUND LANES
CORNWALL, ONTARIO

Approximate Location	Nearest Borehole No.	Reference Simplified Subsurface Stratigraphy for Design	Depth Below Existing Grade (m)	Geotechnical Design Parameters					
				C_u (kPa)	ϕ' (deg.)	γ (kN/m ³)	γ' (kN/m ³)	K_p	Groundwater Depth (m)
Hwy. 401 EBL about 1 km west of Brookdale Ave.	07-BSS1	Silty Clay Fill	0.0 – 1.2	50	-	20	-	-	2 (below existing ground surface)
		Silty Clay	1.2 – 2.5	50	-	20	-	-	
		Silty Clay	2.5 – 5.0	30	-	20	-	-	
		Silty Clay	5.0 – 9.0	20	-	20	-	-	
		Silty Clay Till	9.0 – 10.0	75	-	20	-	-	
Hwy. 401 WBL about 200m east of Pitt St.	07-BSS3	Silty Clay Till	0.0 – 0.6	50	-	20	-	-	2 (below existing ground surface)
		Sand and Silt Till	0.6 – 4.0	-	32	20	10	3.2	
		Clayey Silt Till	4.0 – 6.5	100	-	20	-	-	
Hwy. 401 WBL about 400m east of Pitt St.	07-BSS4	Silty Clay/Clayey Silt	0.0 – 1.5	50	-	20	-	-	2 (below existing ground surface)
		Sand and Silt Till	1.5 – 6.0	-	34	20	10	3.5	
West limit of Noise Barrier Wall #3	07-S1	Silty Clay	0.0 – 3.0	30	-	20	-	-	2 (below existing ground surface)
		Silty Clay	3.0 – 8.0	20	-	20	-	-	

Notes: This table must be read in conjunction with the report.
See legend after Table 4 for symbol definitions.

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

c:\Thurber Projects 2007\19-1351-125 Hwy17-417 Arnprior West\191351125 Noise Barrier 1 Footing Design Parameters jun 07.doc

Notes: This table must be read in conjunction with the report.
See legend after Table 4 for symbol definitions.

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AND/OR MILLIMETRES
UNLESS OTHERWISE SHOWN

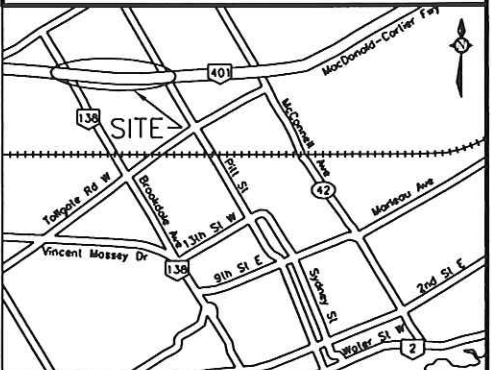
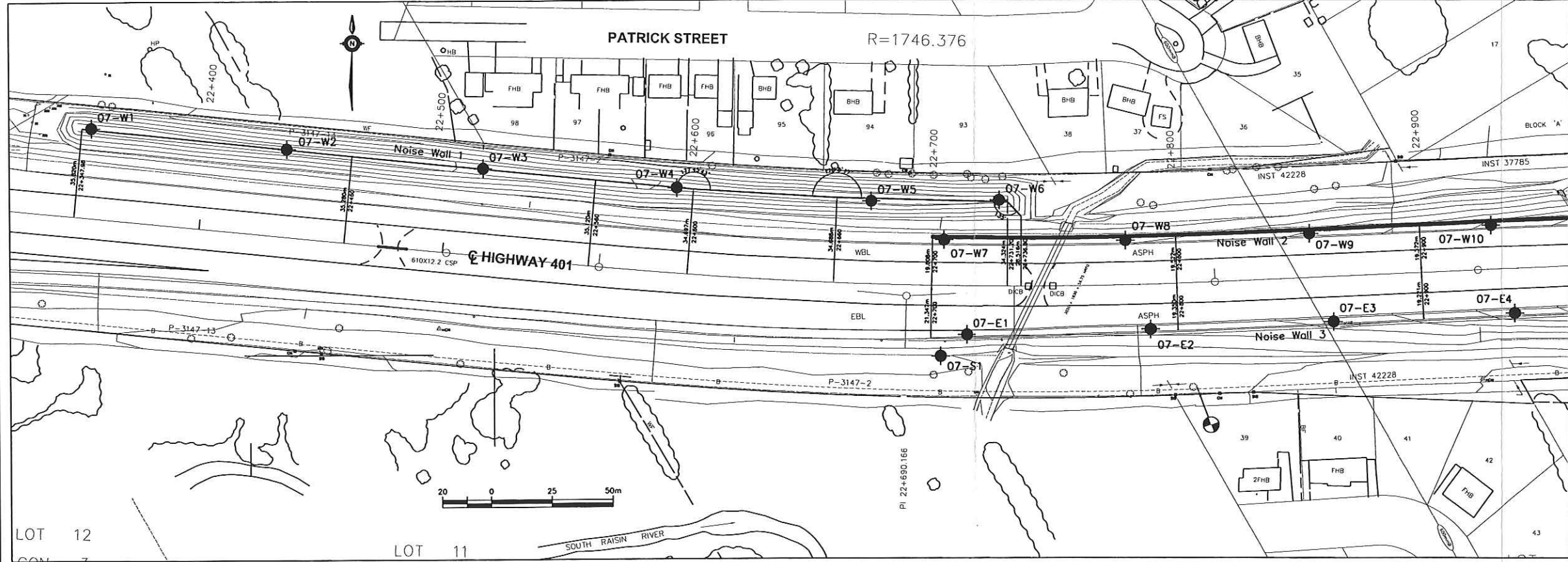
HIGHWAY 401
CONT No
GWP No 4056-06-00

HWY 401
CORNWALL NOISE BARRIER WALLS
BROOKDALE AVE TO PITT STREET
BOREHOLE LOCATIONS PLAN

McCORMICK RANKIN CORPORATION

THURBER ENGINEERING LTD.
GEOTECHNICAL • ENVIRONMENTAL • MATERIALS

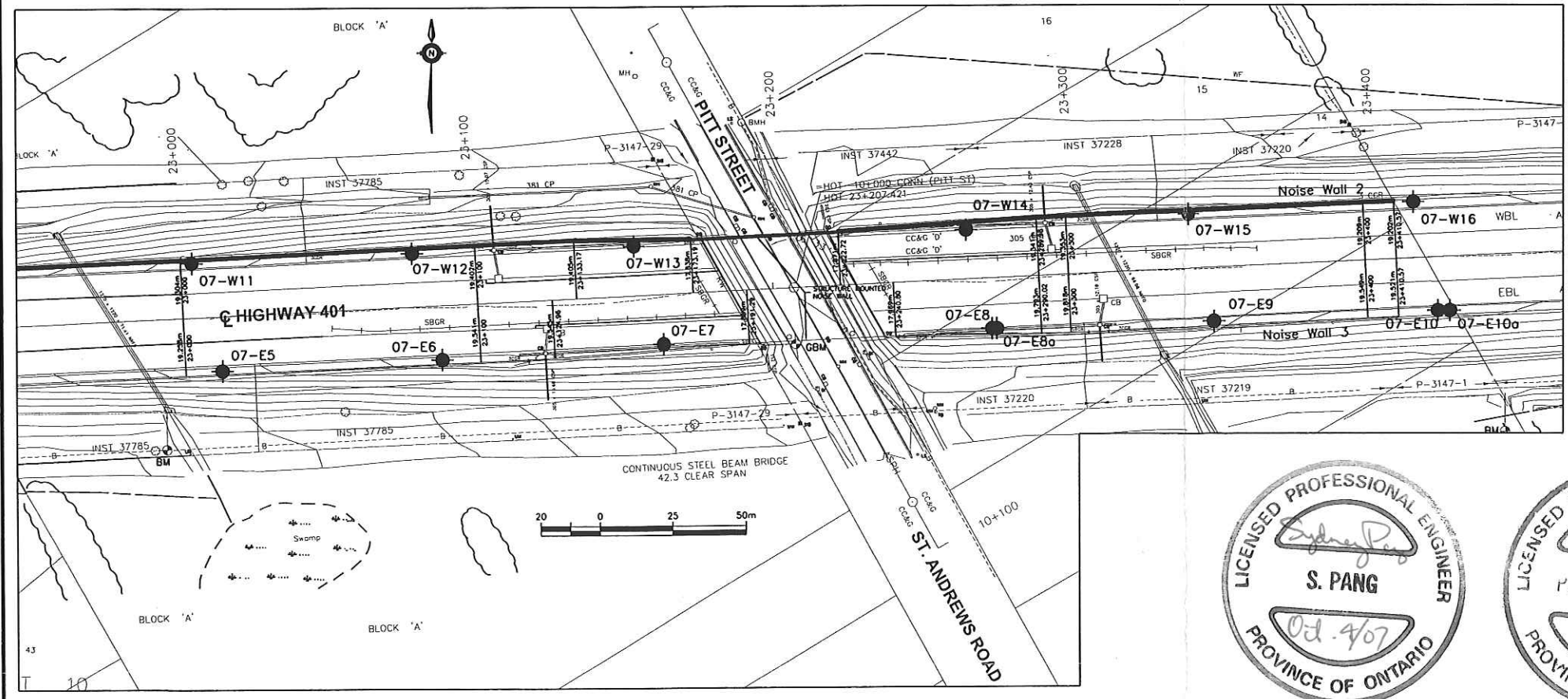
SHEET
35



KEYPLAN

LEGEND

- Borehole
- Borehole and Cone
- 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
- Rock Quality Designation (RQD)
- 90%
- A/R
- Auger Refusal



NO	ELEVATION	NORTHING	EASTING	NO	ELEVATION	NORTHING	EASTING
07-W6	62.2	4 990 762.44	205 406.33	07-S1	58.1	4 990 698.82	205 382.14
07-W7	59.5	4 990 746.39	205 383.53	07-E1	60.1	4 990 707.56	205 392.84
07-W8	59.7	4 990 746.08	205 457.54	07-E2	60.3	4 990 709.79	205 467.92
07-W9	61.0	4 990 748.89	205 532.24	07-E3	61.3	4 990 712.89	205 542.31
07-W10	63.1	4 990 752.27	205 606.76	07-E4	63.3	4 990 716.38	205 616.84
07-W11	65.3	4 990 756.06	205 681.23	07-E5	65.5	4 990 719.84	205 691.39
07-W12	67.2	4 990 759.08	205 756.05	07-E6	67.3	4 990 723.27	205 766.14
07-W13	68.5	4 990 761.23	205 830.85	07-E7	68.6	4 990 728.18	205 841.02
07-W14	69.1	4 990 766.21	205 943.34	07-E8	69.0	4 990 732.96	205 952.22
07-W15	68.4	4 990 771.42	206 018.44	07-E8a	69.0	4 990 732.96	205 953.72
07-W16	67.3	4 990 775.39	206 094.09	07-E9	68.4	4 990 735.21	206 027.34
				07-E10	67.3	4 990 738.74	206 102.54
				07-E10a	67.3	4 990 738.74	206 106.54
				07-W1	63.9	4 990 792.64	205 035.13
				07-W2	63.4	4 990 784.01	205 115.85
				07-W3	62.8	4 990 775.98	205 195.78
				07-W4	63.0	4 990 767.84	205 274.53
				07-W5	62.2	4 990 762.15	205 354.06

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.

GEOCRES No. Not Applicable



REVISIONS

DATE	BY	DESCRIPTION
OCT07	SKP	FINAL
JUN07	SKP	ISSUED IN DRAFT
DATE	BY	DESCRIPTION
DESIGN	TH	CHK PKC CODE
DRAWN	MFA	CHK SKP SITE
		LOAD
		STRUCT
		DWG.
		DATE JUN 2007

Appendix A

Record of Boreholes

19-1351-125



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

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






\overline{Y} 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
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.
<u>TERMS</u>					
Total Core Recovery: (TCR)	Core recovered as a percentage of total core run length.	Weak	5.0 to 25.0	750 to 3,500	Can be peeled by a pocket knife with difficulty
Solid Core Recovery: (SCR)	Percent Ratio of solid core of full cylindrical shape recovered. Expressed with respect to the total length of core run.	Very Weak	1.0 to 5.0	150 to 750	Can be peeled by a pocket knife, crumbles under firm blows of geological pick.
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.	Extremely Weak (Rock)	0.25 to 1.0	35 to 150	Indented by thumbnail
Uniaxial Compressive Strength (UCS)	Axial stress required to break the specimen				
Fracture Index: (FI)	Frequency of natural fractures per 0.3m of core run.				

RECORD OF BOREHOLE No 07-W1

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 792.64 E 205 035.13 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.05.03 - 2007.05.03 CHECKED BY TJH/SKP

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	20 40 60 80 100					
63.9	TOPSOIL: (75mm)		1	SS	7									
0.0 0.1	Clayey SILT, with sand, trace gravel Firm Brown Dry to Wet (FILL) Occasional iron oxide staining		2	SS	5									5 40 42 13
	Becoming sandy, occasional inferred cobbles / boulders or concrete rubble		3	SS	4									
			4	SS	5									
59.3 4.6	Inferred cobble / boulder or concrete rubble at 4.57m		5	SS	50/ .025									
	SAND and SILT, some clay, trace gravel Compact Brown to Grey Wet (TILL)(CL-ML)		6	SS	12									5 47 33 15
			7	SS	16									
55.7 8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG.													
	WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) May3/07 6.3 57.6													

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

ONTMT4S 1125.GPJ 6/8/07

RECORD OF BOREHOLE No 07-W2

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 784.01 E 205 115.85 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.05.03 - 2007.05.03 CHECKED BY TJH/SKP

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			20	40	60	80	100		
63.4	TOPSOIL: (50mm)		1	SS	13		63							
62.6	Clayey SILT, trace to some sand, trace gravel, occasional rootlets Stiff Brown Dry (FILL)		2	SS	12		62							
0.8	SAND and SILT, some clay, some gravel Stiff to Hard Brown Dry (FILL) occasional iron oxide staining		3	SS	17		61							
	occasional inferred cobbles / boulders or concrete rubble		4	SS	32		60							12 46 30 12
59.3	Silty CLAY, trace sand, occasional iron oxide staining Very Stiff Brown Damp		5	SS	16		59							0 5 33 62
57.8	Silty CLAY, some sand, trace gravel Stiff Brown Dry (TILL)		6	SS	13		57							
55.2			7	SS	11		56							
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. Piezometer installation consists of 51mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) May3/07 4.9 58.5 May8/07 4.1 59.3													

ONTMT4S 1125.GPJ 6/15/07

+³ ×³: Numbers refer to
Sensitivity

20
15 0.5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-W4

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 767.84 E 205 274.53 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.05.03 - 2007.05.03 CHECKED BY TJH/SKP

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			20 40 60 80 100	20 40 60 80 100	PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	
63.0													
62.2	TOPSOIL: (50mm) Sandy SILT, occasional clay, trace gravel, occasional inferred cobbles / boulders or concrete rubble Compact Brown Dry to Damp (FILL)		1	SS	10		63						
60.8			2	SS	10		62						11 53 29 7
	Silty SAND, trace clay, some gravel, occasional inferred cobbles / boulders or concrete rubble Compact Brown Damp (FILL)		3	SS	14		61						
			4	SS	13		60						
58.9							59						
4.1	Silty CLAY, occasional rootlets, occasional iron oxide staining Very Stiff Mottled Brown/Grey Damp		5	SS	16		58						
57.5							57						
5.5	SAND and SILT, some clay, trace gravel Compact to Loose Mottled Brown/Grey to Grey Wet (TILL)(CL-ML)		6	SS	17		56						6 45 35 14
			7	SS	8		55						
54.8													
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) May3/07 5.5 57.5												

+ 3 . X 3 : Numbers refer to
Sensitivity 20 15 10 (% STRAIN AT FAILURE

ONTMT4S 1125 GPJ 6/15/07

RECORD OF BOREHOLE No 07-W6

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 762.44 E 205 406.33 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.05.02 - 2007.05.02 CHECKED BY TJH/SKP

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							
								20 40 60 80 100							
62.2															
0.0	Silty SAND , some clay, some gravel, occasional rootlets, occasional inferred cobbles / boulders or concrete rubble Loose Brown Dry (FILL)		1	SS	4										
			2	SS	9										
60.7															
1.5	Clayey SILT , some sand, trace gravel, occasional inferred cobbles / boulders or concrete rubble Stiff to Very Stiff Mottled Brown to Grey Dry to Damp (FILL)		3	SS	15										
59.2															
3.0	SAND and GRAVEL Dense Brown Dry (FILL)		4	SS	32										
	Slow augering at 3.96m to 4.57m.														
57.9															
4.3	Silty CLAY , trace sand, occasional iron oxide staining Very Stiff to Firm Grey Damp to Wet		5	SS	18										
	Wet seam at 5.79m, possible sand and gravel layer.		6	SS	3										
			7	SS	2										
54.0															
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) May2/07 6.7 55.5														

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-W7

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 746.39 E 205 383.53 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.24 - 2007.04.24 CHECKED BY TJH/SKP

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									WATER CONTENT (%)		
								○ UNCONFINED + FIELD VANE		● QUICK TRIAXIAL × LAB VANE									
59.5							20	40	60	80	100	20	40	60					
0.0	SAND and GRAVEL Compact Grey to Brown Dry		1	SS	25														
58.9	(FILL)																		
0.6	Clayey SILT, trace to some sand, trace gravel Very Stiff Brown Dry		2	SS	24														
58.0	(FILL)																		
1.5	Silty CLAY, trace sand, trace gravel, occasional to trace iron oxide staining Very Stiff to Firm Brown Damp (CH)		3	SS	23											1 5 39 55			
	Grey Wet		4	SS	6														
	Becoming Soft		5	SS	3											0 2 39 59			
			6	SS	2														
	Wet		7	SS	7														
51.3																			
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 7.62m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CAPPED WITH CRUSHER RUN NEAR GROUND SURFACE. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April24/07 7.6 51.9																		

ONTMT4S 1125.GPJ 6/15/07

+³, X³: Numbers refer to
Sensitivity 20
15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-W8

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 746.08 E 205 457.54 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.24 - 2007.04.24 CHECKED BY TJH/SKP

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			20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100		
59.7														
0.0	SAND and GRAVEL Compact Grey to Brown Dry (FILL)		1	SS	22									
59.1														
0.6	Clayey SILT, trace to some sand, trace gravel Very Stiff Brown Dry (FILL)		2	SS	19									
58.2														
1.5	Silty CLAY, trace sand, occasional rootlets Very Stiff to Firm Dark Brown to Mottled Grey/Brown Damp (CH)		3	SS	19									0 9 47 44
	Firm Grey Wet		4	SS	6									
55.5														
4.2	Silty CLAY, with sand, trace gravel Soft Grey Damp (TILL)		5	SS	3									4 39 38 19
54.1														
5.6	GRAVEL, some sand, occasional to trace clay Compact Grey Wet		6	SS	23									
52.7														
7.0	Silty CLAY, some sand, trace gravel Very Stiff Grey Wet (TILL)(CL-ML)													
51.5			7	SS	22									
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April 24/07 3.1 56.6 May 8/07 1.2 58.5													

ONTMT4S 1125.GPJ 6/15/07

+³, X³: Numbers refer to Sensitivity 20 15 10 5 10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-W9

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 748.89 E 205 532.24 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.24 - 2007.04.24 CHECKED BY TJH/SKP

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					
61.0							20	40	60	80	100		
0.0	SAND and GRAVEL Compact Grey to Brown Dry (FILL)		1	SS	21								
60.4			2	SS	22								
0.6	Clayey SILT, with sand, trace gravel Very Stiff Brown Dry (FILL)		3	SS	50/ .150								
58.4													
2.6	Silty CLAY, trace sand, occasional rootlets, occasional iron oxide staining Stiff Grey to Mottled Brown/Grey Damp (CH)		4	SS	14								0 3 20 77
56.9													
4.1	SAND and SILT, trace clay, trace gravel Compact to Dense Grey Wet (TILL)		5	SS	15								6 46 41 7
			6	SS	35								
			7	SS	21								
52.8													
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CAPPED WITH CRUSHER RUN NEAR GROUND SURFACE. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April24/07 4.6 56.4												

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-W10

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 752.27 E 205 606.76 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.23 - 2007.04.24 CHECKED BY TJH/SKP

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			20	40	60	80	100		
63.1														
0.0	SAND and GRAVEL Dense Brown Dry (FILL)		1	SS	32		63							
62.5														
0.6	SAND and SILT, some clay, trace to some gravel Compact to Very Dense Brown to Grey Dry (FILL)		2	SS	16		62							10 46 31 13
			3	SS	55		61							
60.1														
3.0	Silty SAND, trace gravel Compact Grey Moist (FILL) Augers grinding at 3.66m.		4	SS	18		60							
59.1														
4.0	Clayey SILT, with sand, trace gravel, occasional iron oxide staining Very Stiff to Stiff Brown Damp to Wet (TILL) Slow augering at 4.57m to 6.10m.		5	SS	21		59							3 43 39 15
			6	SS	26		57							
							56							
			7	SS	10		55							
54.9														
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CAPPED WITH CRUSHER RUN NEAR GROUND SURFACE.													

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-W11

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 756.06 E 205 681.23 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.23 - 2007.04.23 CHECKED BY TJH/SKP

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			20	40	60	80	100		
65.3														
0.0	SAND and GRAVEL Compact Brown Dry (FILL)		1	SS	27		65							
64.7														
0.6	SAND and SILT, some clay, some gravel Compact Grey to Brown Dry (FILL)		2	SS	19		64							13 43 31 13
	Very slow augering and grinding at 1.83m to 2.74m.		3	SS	50/ .100		63							
			4	SS	50/ .150		62							
							61							
	Very slow augering at 5.18m to 6.10m.		5	SS	50/ .150		60							
	Augers grinding at 5.49m to 5.79m.													
59.2														
6.1	Silty CLAY, with sand, occasional rootlets Stiff Grey to Brown Damp (TILL)		6	SS	15		59							0 40 23 37
							58							
			7	SS	10									
57.1														
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April23/07 dry - May8/07 5.8 59.5													

ONTMT4S 1125.GPJ 6/15/07

+³, ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-W12

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 759.08 E 205 756.05 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.23 - 2007.04.23 CHECKED BY TJH/SKP

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						
67.2								20	40	60	80	100		
0.0	SAND and GRAVEL Compact to Dense Brown Dry (FILL)		1	SS	30		67							
66.6														
0.6	SAND and SILT, some clay, trace gravel Compact to Very Dense Brown Dry (FILL)		2	SS	23		66							
			3	SS	57		65							
	becoming Grey		4	SS	44		64							
							63							
	Slow augering at 4.88m to 6.10m.		5	SS	34		62							
	Augers grinding at 5.79m to 6.10m.					61								
61.1														
6.1	SAND and SILT, some clay, trace gravel, occasional rootlets Compact Dark Brown to Brown Dry (TILL)		6	SS	16		61							
59.3			7	SS	50/ .150		60							
7.9	END OF BOREHOLE AT 7.92m. BOREHOLE OPEN TO 7.92m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CAPPED WITH CRUSHER RUN NEAR GROUND SURFACE.													

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-W13

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 761.23 E 205 830.85 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.23 - 2007.04.23 CHECKED BY TJH/SKP

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						
								20 40 60 80 100						
							WATER CONTENT (%)							
							PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT							
							w _p w w _L							
							○ UNCONFINED + FIELD VANE							
							● QUICK TRIAXIAL × LAB VANE							
68.5														
0.0	ASPHALT: (150mm)													
0.2	SAND and GRAVEL		1	SS	25									
67.9	Compact													
0.6	Brown													
	Dry													
	(FILL)													
	SAND and SILT, some clay, trace gravel		2	SS	22									9 43 34 14
	Compact to Dense													
	Brown													
	Dry													
	(FILL)		3	SS	36									
	Slow augering and augers grinding at 1.52m to 3.05m.													
			4	SS	50/ .150									
			5	SS	24									
63.0														
5.5	Clayey SILT, with sand, trace gravel, occasional rootlets													
	Very Stiff													
	Brown													
	Dry													
	(TILL)(CL-ML)		6	SS	19									1 37 47 15
	Slow augering at 6.10m to 7.62m.													
	Augers grinding at 7.01m to 7.32m.													
			7	SS	26									
60.3														
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND PATCHED WITH ASPHALT AT SURFACE.													

ONTMT4S 1125.GPJ 6/15/07

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-W14

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 766.21 E 205 943.34 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.23 - 2007.04.23 CHECKED BY TJH/SKP

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						
69.1								20	40	60	80	100		
0.0	ASPHALT: (150mm)						69							
0.2	SAND and GRAVEL													
68.5	Compact		1	SS	27									
0.6	Grey to Brown													
	Dry													
	(FILL)													
	Clayey SILT, with sand, trace gravel		2	SS	22		68							5 44 36 15
	Very Stiff													
	Brown													
	Dry													
	(FILL)													
	Slow augering at 1.52m to 3.05m.		3	SS	50/ .150		67							
	Occasional wood fragments at 1.83m to 2.44m													
	Augers grinding at 1.83m to 2.44m.													
	Slow augering at 3.05m to 4.57m.		4	SS	50/ .150		66							
	Augers grinding at 3.35m to 3.96m.													
65.0							65							
4.1	Silty CLAY, with sand, occasional gravel, rootlets													
	Very Stiff		5	SS	25		64							0 37 36 27
	Grey to Dark Grey													
	Dry to Damp													
	(TILL)(CL)													
							63							
			6	SS	50/ .150									
61.9							62							
7.2	SAND and SILT, occasional clay, trace gravel													
	Compact													
	Grey													
	Wet													
	(TILL)(SM)		7	SS	28		61							
60.9														
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND PATCHED WITH ASPHALT AT SURFACE.													

ONTM74S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-W15

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 771.42 E 206 018.44 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.20 - 2007.04.20 CHECKED BY TJH/SKP

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			20 40 60 80 100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	
68.4												
0.0	SAND and GRAVEL, with clay Compact Grey to Brown Dry (FILL)		1	SS	19		68		o	-----		
67.8												
0.6	Silty CLAY, trace to some sand, trace gravel, occasional limestone fragments Very Stiff to Hard Grey Dry (FILL)(CH) Augers grinding at 0.76m to 1.52m. Very slow augering at 1.52m to 2.44m. Inferred cobbles / boulders or concrete rubble at 1.83m to 2.29m		2	SS	64		67		o			
			3	SS	50/ .150		66		o	-----		
	Augers grinding at 3.05m to 4.57m.		4	SS	23		65			o		
64.1												
4.3	Silty CLAY, with sand, trace gravel, occasional to trace rootlets Very Stiff Dark Brown Dry (TILL)(CL)		5	SS	20		64			o		1 37 40 22
62.6												
5.8	SAND and SILT, some clay, some gravel, Dense to Compact Brown Dry (TILL)		6	SS	40		62		o			10 43 37 10
	Augers grinding at 7.01m to 7.32m.											
	occasional clay Grey Damp		7	SS	20		61		o			
60.2												
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY UPON COMPLETION. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April20/07 dry - May8/07 4.8 63.6											

ONTM74S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-W16

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 775.39 E 206 094.09 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.20 - 2007.04.20 CHECKED BY TJH/SKP

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							WATER CONTENT (%)			
67.3							20	40	60	80	100	PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L				
0.0	SAND and GRAVEL Compact to Dense Grey to Brown Dry (FILL)(SP) SAND and SILT, some clay, trace gravel Dense Brown Dry (FILL)(CL-ML) Very slow augering and augers grinding at 1.52m to 3.05m.		1	SS	30													
66.7																		
0.6																		
			2	SS	37													
			3	SS	50													
			4	SS	50/ .150													
63.3																		
4.0	SAND and SILT, some clay, trace gravel Dense to Compact Brown Dry (TILL) Slow augering at 6.10m to 7.62m.		5	SS	40													
					6	SS	15											
			7	SS	15													
59.1																		
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CAPPED WITH CRUSHER RUN NEAR GROUND SURFACE.																	

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-E1

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 707.56 E 205 392.84 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.18 - 2007.04.18 CHECKED BY TJH/SKP

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 (%)		
								○ UNCONFINED + FIELD VANE											
								● QUICK TRIAXIAL × LAB VANE											
60.1						20	40	60	80	100	20	40	60						
0.0	SAND and GRAVEL Compact Grey to Brown Dry to Damp (FILL)		1	SS	18											43 45 12 (SI+CL)			
58.8			2	SS	12														
1.3	Silty CLAY, trace to some sand, trace gravel, some rootlets Firm to Soft Grey Damp to Wet (CH)		3	SS	6											1 10 42 47			
57.5																			
2.6	Stiff		4	SS	12														
56.0																			
4.1			5	SS	2											0 0 37 63			
			6	SS	1														
			7	SS	1														
51.9																			
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CAPPED WITH CRUSHER RUN NEAR GROUND SURFACE.																		
	WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April 18/07 7.3 52.8																		

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-E2

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 709.79 E 205 467.92 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.18 - 2007.04.18 CHECKED BY TJH/SKP

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							
60.3								20 40 60 80 100							
0.0	SAND and GRAVEL Compact Grey to Brown Damp (FILL)		1	SS	26		60								
59.5															
0.8	Sandy SILT, trace sand Compact Brown Damp (FILL)		2	SS	22		59								
58.8															
1.5	Clayey SILT, with sand, occasional gravel, trace rootlets Very Stiff Dark Brown to Grey Dry (FILL)		3	SS	26		58								1 43 40 16
57.3															
3.0	Silty CLAY, trace sand Stiff to Firm Brown to Grey Wet		4	SS	13		57								0 2 22 76
							56	2.7							
			5	SS	5		55								
54.8															
5.5	Silty SAND, trace clay, some gravel Compact Grey Wet (SM)		6	SS	25		54								14 54 27 5
							53								
			7	SS	19										
52.1															
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 7.62m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April 18/07 4.6 55.7 May 8/07 2.1 58.2														

ONTMT-4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-E3

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 712.89 E 205 542.31 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.18 - 2007.04.18 CHECKED BY TJH/SKP

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			20	40	60	80	100		
61.3														
0.0	SAND and GRAVEL Compact Grey to Brown Dry (FILL)		1	SS	21		61							
60.5														
0.8	SAND and SILT, some clay, trace gravel, Compact Brown Dry (FILL)		2	SS	20		60							8 46 32 14
	Occasional rock fill at 1.83m to 2.44m, (augers grinding)		3	SS	50/ .075									
58.9							59							
2.4	Silty CLAY, with sand, trace gravel, occasional rootlets Firm Grey Damp (TILL)		4	SS	7		58							0 22 38 40
	Very slow augering at 4.57m to 6.10m.						57							
	Limestone fragments Wet		5	SS	50/ .075		56							
	Occasional inferred boulders or cobbles													
55.2														
6.1	END OF BOREHOLE AT 6.10m. AUGER REFUSAL AT 6.10m, POSSIBLE BEDROCK OR BOULDER. BOREHOLE OPEN TO 6.10m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CAPPED WITH CRUSHER RUN NEAR GROUND SURFACE.													
	WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April 18/07 5.8 55.5													

+³, X³: Numbers refer to Sensitivity 20 15 10 5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-E4

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 716.38 E 205 616.84 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.18 - 2007.04.18 CHECKED BY TJH/SKP

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						
63.3							20 40 60 80 100	20 40 60						
0.0	SAND and GRAVEL Compact Grey to Brown Dry (FILL)		1	SS	26		63							
62.5														
0.8	SILT, some sand, trace to some gravel, trace limestone fragments Dense Brown Dry (FILL)		2	SS	32		62							
61.8														
1.5	Very slow augering at 0.76m to 1.52m. SAND and SILT, some clay, trace gravel Dense Brown Dry (FILL) Slow augering at 1.52m to 3.05m. Very slow augering and occasional grinding at 3.05m to 4.57m.		3	SS	36		61							6 45 34 15
							60							
			4	SS	50/ .125		59							
58.7														
4.6	Silty CLAY, trace sand, occasional rootlets Very Stiff to Stiff Brown to Grey Damp (CH)		5	SS	27		58							0 8 27 65
							57							
			6	SS	22		56							
			7	SS	12									
55.1														
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April 18/07 dry - May 8/07 3.8 59.5													

ONTMT4S 1125GPJ 6/15/07




+³, X³: Numbers refer to Sensitivity
 20
 15 10 5 0
 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-E5

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 719.84 E 205 691.39 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.19 - 2007.04.19 CHECKED BY TJH/SKP

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 (%)		
								○ UNCONFINED + FIELD VANE										○ UNCONFINED + FIELD VANE		
								● QUICK TRIAXIAL × LAB VANE										○ UNCONFINED + FIELD VANE		
65.5							20	40	60	80	100	20	40	60	kN/m ³	GR SA SI CL				
0.0	SAND and GRAVEL Dense Grey to Brown Dry (FILL)		1	SS	31															
64.8																				
0.7	Silty SAND, some clay, some gravel Dense to Loose Brown Dry to Wet (FILL)		2	SS	37												10 52 25 13			
	Wet seam at 1.83m.		3	SS	8															
	Slight grinding at 2.74m to 3.05m.																			
62.5																				
3.0	Sandy SILT, some clay, trace gravel Compact Brown Dry (FILL) Slow augering at 3.05m to 4.57m.		4	SS	27															
			5	SS	25												5 34 50 11			
59.7																				
5.8	Silty CLAY, some sand, trace gravel, occasional rootlets Very Stiff to Stiff Grey to Brown Damp to Wet (CH)		6	SS	22												1 13 35 51			
			7	SS	8															
57.3																				
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND CAPPED WITH CRUSHER RUN.																			

ONTMT4S 1125.GPJ 6/15/07

+³, ×³: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-E6

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 723.27 E 205 766.14 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.19 - 2007.04.19 CHECKED BY TJH/SKP

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						
67.3								20	40	60	80	100		
0.0	SAND and GRAVEL Compact Brown Dry (FILL)(SP)		1	SS	29		67							
66.5														
0.8	SAND and SILT, some clay, some gravel Dense to Very Dense Brown to Mottled Grey-Brown Dry (FILL)(ML) Slow augering and slight grinding at 1.52m to 3.05m.		2	SS	45		66							
			3	SS	74		65							11 43 34 12
	Slow augering at 3.05m to 4.57m.		4	SS	31		64							
							63							
			5	SS	50		62							5 51 33 11
61.7	Occasional grinding at 5.49m to 6.10m.						61							
5.6	Clayey SILT, some sand, trace gravel Very stiff Brown Dry (FILL)(CL-ML)		6	SS	22		60							
59.7														
7.6	Sandy SILT, trace to some gravel Dense Brown Dry to Damp (FILL)(SM)		7	SS	50/ .000									
59.1														
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April 19/07 dry - May 8/07 6.8 60.5													

ONTMT4S 1125.GPJ 6/15/07

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

RECORD OF BOREHOLE No 07-E7

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 728.18 E 205 841.02 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.19 - 2007.04.19 CHECKED BY TJH/SKP

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						
68.6								20	40	60	80	100		
0.0	ASPHALT: (75mm)													
0.1	SAND and GRAVEL Compact Brown Dry (FILL)		1	SS	29									
67.8							68							
0.8	Clayey SILT, some sand, trace gravel Very Stiff Brown Dry (FILL)		2	SS	25									
67.2							67							
1.4	SAND and SILT, some clay, some gravel Compact to Dense Brown Dry (FILL) Slow augering at 1.52m to 3.05m.		3	SS	50/ .150									11 44 33 12
							66							
			4	SS	20		65							
							64							
			5	SS	24		63							
							62							7 43 40 10
			6	SS	43		61							
			7	SS	41									
60.4														
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND PATCHED WITH ASPHALT AT GROUND SURFACE.													

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-E8

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 732.96 E 205 952.22 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.19 - 2007.04.19 CHECKED BY TJH/SKP

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						
69.0								20	40	60	80	100		
0.0	ASPHALT: (75mm)													
0.1														
68.4	SAND and GRAVEL Compact Grey Dry (FILL)		1	SS	15									
0.6														
	SAND and SILT, some clay, trace gravel Dense to Compact Brown (FILL)		2	SS	37									6 46 33 15
			3	SS	28									
	Augers grinding at 2.44m to 2.74m.													
	Becoming Grey													
			4	SS	28									
64.9														
4.1	SAND and SILT, some clay, trace gravel Compact Mottled Brown/Grey Damp (TILL)		5	SS	17									9 47 31 13
63.2														
5.8	END OF BOREHOLE AT 5.79m. AUGER REFUSAL AT 5.79m, POSSIBLE BEDROCK OR BOULDERS. BOREHOLE OPEN TO 5.79m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG AND PATCHED WITH ASPHALT AT GROUND SURFACE.													

+³ × 3: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-E8a

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 732.96 E 205 953.72 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.09.04 - 2007.09.04 CHECKED BY SKP

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											
69.0								20	40	60	80	100							
0.0	ASPHALT: (150mm)																		
0.2	SAND and GRAVEL, trace silt Compact Grey (FILL)		1	SS	14														
68.3																			
0.7	SAND and SILT, trace gravel Loose Brown (FILL)		2	SS	9														
67.6																			
1.4	LIMESTONE fragments, occasional gravel, occasional sand Grey (FILL)		3	SS	58														
66.8																			
2.2	SAND and SILT, trace gravel, trace limestone fragments Very Dense to Compact Mottled Brown/Grey (FILL) Brown		4	SS	68														
			5	SS	25														
64.9																			
4.1	SAND and SILT, some clay, trace gravel Very Dense to Dense Brown (TILL)		6	SS	56														
62.3																			
6.7	END OF BOREHOLE AT 6.7m. BOREHOLE OPEN AND DRY TO 6.7m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.2m, THEN COLD PATCH ASPHALT TO SURFACE.		7	SS	46														

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

RECORD OF BOREHOLE No 07-E9

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 735.21 E 206 027.34 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.19 - 2007.04.19 CHECKED BY TJH/SKP

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								
68.4								20	40	60	80	100				
0.0	SAND and GRAVEL Compact Grey to Brown Dry (FILL)		1	SS	29		68									
67.8																
0.6	Clayey SILT, with sand, trace gravel, occasional iron oxide staining Hard Brown Dry (FILL)		2	SS	37		67									
			3	SS	55											9 45 34 12
							66									
			4	SS	90		65									
	Auger refusal at 3.96m on possible cobble / boulders or concrete rubble, moved 1.5m east and augered to 4.3m.															
64.1							64									4 36 41 19
4.3	Clayey SILT, with sand, trace gravel, occasional rootlets Stiff Brown to Grey Damp (TILL)(CL)		5	SS	10		63									
62.9																
5.5	SAND and SILT, some clay, trace to some gravel Very Dense to Compact Brown (TILL) Hard augering at 6.10m to 7.62m.		6	SS	79		62									
	Occasional clay Becoming Grey		7	SS	22		61									
60.2																
8.2	END OF BOREHOLE AT 8.23m. BOREHOLE OPEN TO 8.23m AND DRY. Piezometer installation consists of 19mm diameter Schedule 40 PVC pipe with a 1.52m slotted screen. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) April 19/07 dry - May 8/07 4.7 63.7															

ONTMT4S 1125.GPJ 6/15/07

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

RECORD OF BOREHOLE No 07-E10

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 738.74 E 206 102.54 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.04.20 - 2007.04.20 CHECKED BY TJH/SKP

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			20	40	60	80	100		
67.3														
0.0	SAND and GRAVEL Compact Grey to Brown Dry (FILL)		1	SS	24		67							
66.7														
0.6	SAND and SILT, some clay, trace gravel Dense Brown Dry (FILL)		2	SS	50/ .150		66							4 50 32 14
			3	SS	35		65							
64.2														
3.1	Silty CLAY, with sand, trace gravel, occasional rootlets, organic odour Stiff		4	SS	12		64							1 39 35 25
63.6	Dark Brown to Grey Dry (TILL)													
3.7	END OF BOREHOLE AT 3.66m. BOREHOLE OPEN TO 3.66m AND DRY UPON COMPLETION. BOREHOLE BACKFILLED WITH CUTTINGS. AUGERS GRINDING BETWEEN 1.2m AND 1.5m. BURIED LIMESTONE ENCOUNTERED AT 1.8m AT FIRST TWO LOCATIONS; MOVED TO THIRD LOCATION AND ADVANCED TO 3.7m. AUGER REFUSAL AT 2.6m AT FOURTH LOCATION.													

+³.X³: Numbers refer to
Sensitivity

20
15
10

(%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-E10a

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 738.74 E 206 106.54 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.09.04 - 2007.09.04 CHECKED BY SKP

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						
67.3								20	40	60	80	100		
0.0								20	40	60	80	100		
0.2	<div>SAND and GRAVEL, occasional silt Dense Grey (FILL)</div> <div>SAND and SILT, trace gravel Compact to Dense Brown Dry (FILL)</div>	<div><div></div></div>	1	SS	35		67							
			2	SS	28		66							
			3	SS	22		65							
			4	SS	34		64							
64.3														
3.0	<div>Silty CLAY, trace to some sand, trace gravel, occasional rootlets Stiff Dark Brown to Brown Dry (TILL)</div>	<div><div></div></div>	5	SS	11		63							
63.2														
4.1	<div>Silty SAND, trace gravel, occasional iron oxide staining Dense to Very Dense Brown Dry (TILL)</div>	<div><div></div></div>	6	SS	44		62							
			7	SS	90		61							
60.7														
6.6	<div>END OF BOREHOLE AT 6.6m. BOREHOLE OPEN AND DRY TO 6.6m. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO 0.2m, THEN SAND AND GRAVEL TO SURFACE.</div>													

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

RECORD OF BOREHOLE No 07-S1

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION Brookdale Avenue to Pitt Street N 4 990 698.82 E 205 382.14 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Solid Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.05.03 - 2007.05.03 CHECKED BY TJH/SKP

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			20	40	60	80	100		
58.1														
0.0	TOPSOIL: (100mm)													
0.1	Silly CLAY, trace sand, occasional rootlets, occasional iron oxide staining Firm to Soft Brown to Grey Damp to Wet (CH)		1	SS	7									0 3 38 59
			2	SS	8									
			3	SS	4									0 1 34 65
			4	SS	2									
			5	SS	2									0 1 29 70
51.7			6	SS	2									
6.4	Silly CLAY, trace to some sand, trace gravel Very Soft to Hard Grey Wet (TILL)(CL)													
			7	SS	50/ .150									
50.2														
7.9	END OF BOREHOLE AT 7.92m. BOREHOLE OPEN TO 7.92m. BOREHOLE BACKFILLED WITH HOLEPLUG. WATER LEVEL READINGS: DATE DEPTH(m) ELEV.(m) May 03/07 4.3 53.8													

ONTMT4S 1125.GPJ 6/15/07

RECORD OF BOREHOLE No 07-BSS1

2 OF 2

METRIC

G.W.P. 4056-06-00 LOCATION EBL approximately 1km west of Brookdale Avenue N 4 991 426.84 E 201 960.29 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.06.11 - 2007.06.11 CHECKED BY SKP

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						
	Continued From Previous Page BOREHOLE OPEN TO 9.75m AND WATER LEVEL AT 3.35m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG TO SURFACE.															

+ 3, x 3: Numbers refer to
Sensitivity

20
15 5
10 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 07-BSS3

1 OF 1

METRIC

G.W.P. 4056-06-00 LOCATION WBL approximately 200m east of Pitt Street N 4 990 788.45 E 206 114.80 ORIGINATED BY GA
 HWY 401 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MFA
 DATUM Geodetic DATE 2007.06.11 - 2007.06.11 CHECKED BY SKP

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						WATER CONTENT (%)		
								○ UNCONFINED		+ FIELD VANE				w _p w w _L		
						20	40	60	80	100	20	40	60			
64.1																
0.0																
0.1	TOPSOIL: (75mm)		1	SS	25						○					
63.5	Silty CLAY, trace to some sand, trace gravel, occasional rootlets															
0.6	Very Stiff										○					
	Brown		2	SS	38											
	Dry															
	(TILL)(CL)															
	SAND and SILT, some clay, trace gravel										○					
	Dense to Very Dense															
	Brown to Mottled Brown/Grey															
	Dry		3	SS	56											
	(TILL)															
	occasional iron oxide staining															
	Brown															
			4	SS	44						○			0 53 35 12		
	Grey															
			5	SS	47						○					
	Increasingly high resistance to augering.															
60.0																
4.1	Clayey SILT, trace to some sand, trace gravel, inferred cobbles/boulders		6	SS	50/.075											
	Hard															
	Grey															
	Dry															
	(TILL)															
			7	SS	100/.075											
57.7																
6.4	END OF BOREHOLE AND AUGER REFUSAL AT 6.40m ON PROBABLE COBBLE, BOULDER OR BEDROCK. BOREHOLE OPEN TO 6.40m AND WATER LEVEL AT 2.74m UPON COMPLETION. BOREHOLE BACKFILLED WITH BENTONITE HOLEPLUG.															

ONTMT4S 1125.GPJ 10/207

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

METRIC

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	20 40 60 80 100			
63.4							SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	WATER CONTENT (%) 20 40 60		GR SA SI CL	

[illegible]

+³, ×³: Numbers refer to Sensitivity

Appendix B

Geotechnical Laboratory Test Results

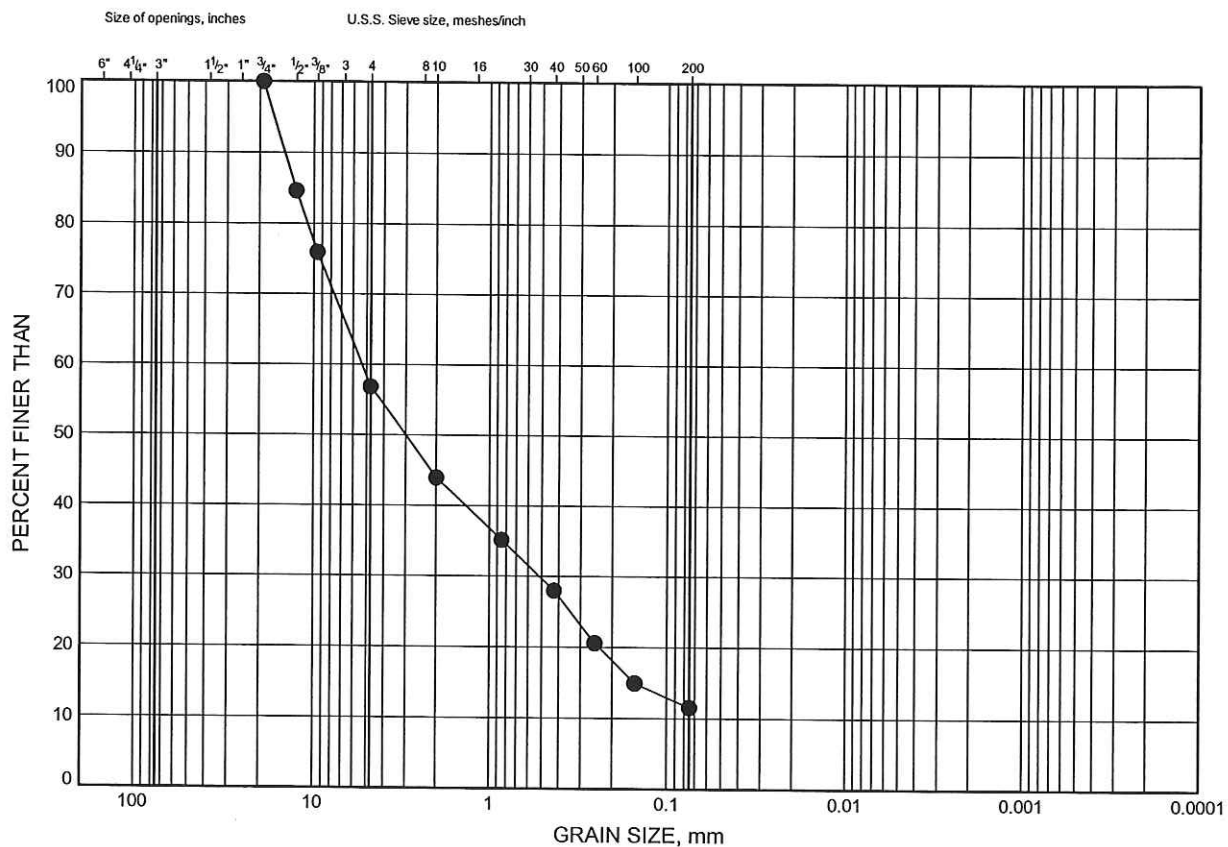
19-1351-125



Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B1

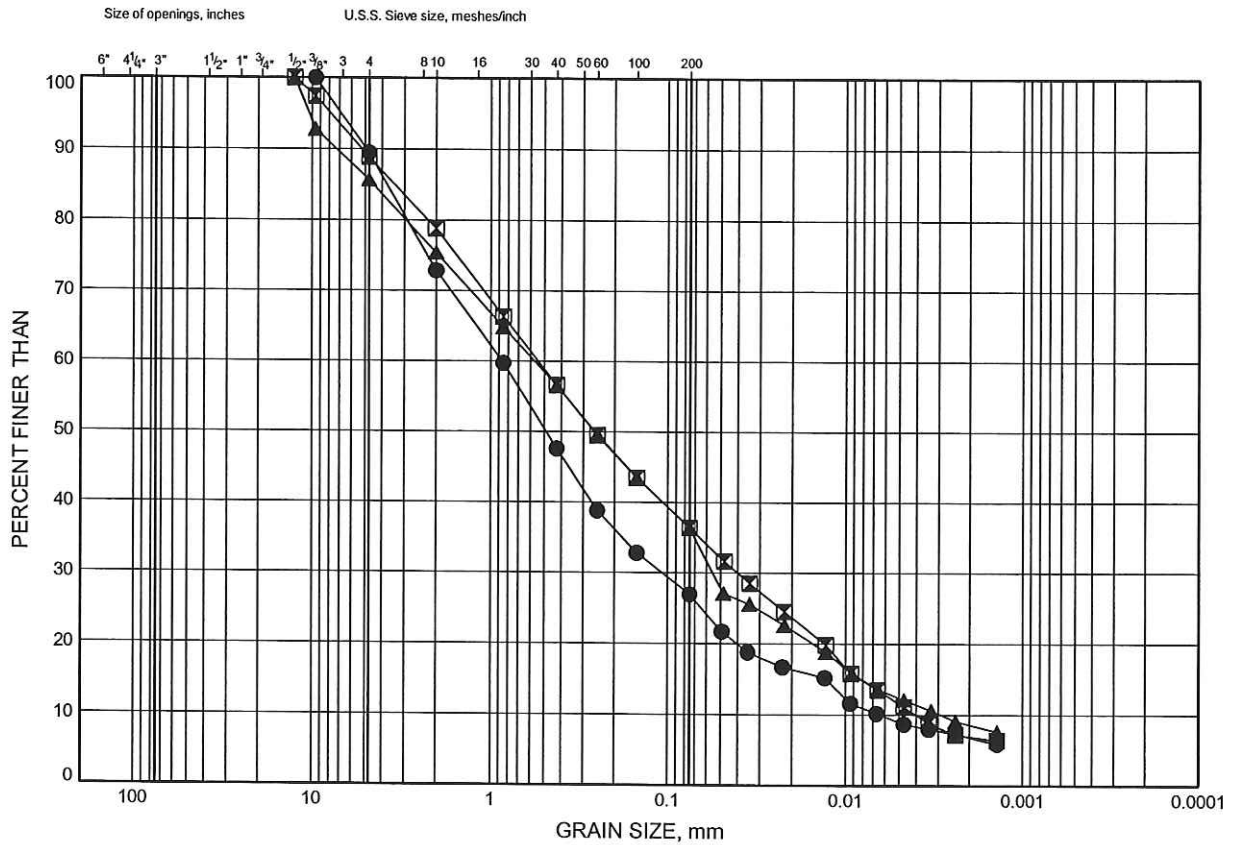
SAND AND GRAVEL (FILL)



Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B2

SILTY SAND (FILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W3	3.35	59.45
⊠	07-W4	1.07	61.93
▲	07-W6	1.07	61.13

Date June 2007
Project 4056-06-00

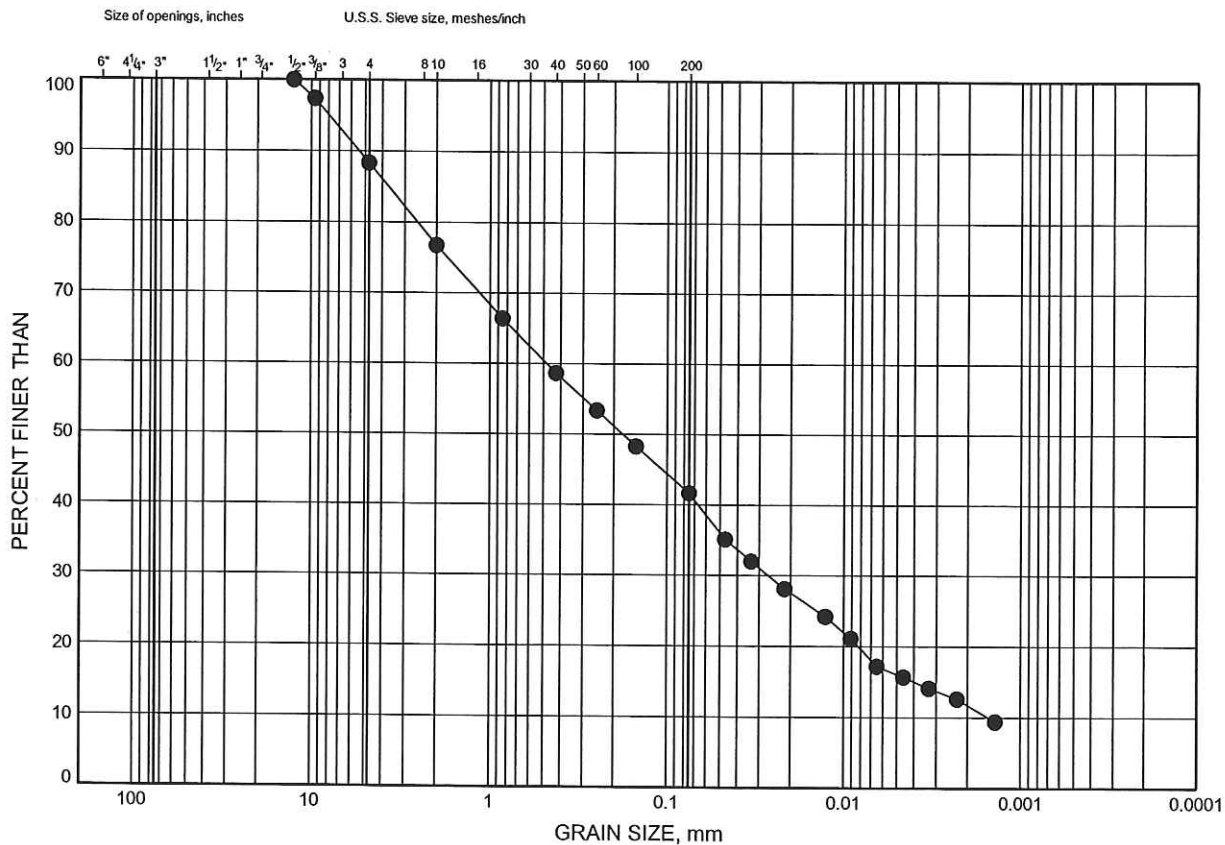


Prep'd MFA
Chkd. SKP

Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B3

SAND AND SILT (FILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W2	3.35	60.05

Date June 2007
 Project 4056-06-00



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 Chkd. SKP

FIGURE B4

Size of openings, inches

U.S.S. Sieve size, meshes/inch

PERCENT FINER THAN

GRAIN SIZE, mm

Grain Size (mm)	Percent Finer (%)
100	100
75	100
60	100
47.5	100
37.5	100
30	100
25	100
20	100
15	100
12.5	100
10	100
7.5	100
6	100
4.75	100
3.75	100
3	100
2.5	100
2	100
1.5	100
1.18	100
0.85	100
0.75	100
0.6	100
0.425	100
0.3	100
0.25	100
0.2	100
0.15	100
0.125	100
0.106	100
0.085	100
0.075	100
0.06	100
0.05	100
0.0425	100
0.0375	100
0.03	100
0.025	100
0.02	100
0.015	100
0.0125	100
0.0106	100
0.0085	100
0.0075	100
0.006	100
0.005	100
0.00425	100
0.00375	100
0.003	100
0.0025	100
0.002	100
0.0015	100
0.00125	100
0.00106	100
0.00085	100
0.00075	100
0.0006	100
0.0005	100
0.000425	100
0.000375	100
0.0003	100
0.00025	100
0.0002	100
0.00015	100
0.000125	100
0.000106	100
0.000085	100
0.000075	100
0.00006	100
0.00005	100
0.0000425	100
0.0000375	100
0.00003	100
0.000025	100
0.00002	100
0.000015	100
0.0000125	100
0.0000106	100
0.0000085	100
0.0000075	100
0.000006	100
0.000005	100
0.00000425	100
0.00000375	100
0.000003	100
0.0000025	100
0.000002	100
0.0000015	100
0.00000125	100
0.00000106	100
0.00000085	100
0.00000075	100
0.0000006	100
0.0000005	100
0.000000425	100
0.000000375	100
0.0000003	100
0.00000025	100
0.0000002	100
0.00000015	100
0.000000125	100
0.000000106	100
0.000000085	100
0.000000075	100
0.00000006	100
0.00000005	100
0.0000000425	100
0.0000000375	100
0.00000003	100
0.000000025	100
0.00000002	100
0.000000015	100
0.0000000125	100
0.0000000106	100
0.0000000085	100
0.0000000075	100
0.000000006	100
0.000000005	100
0.00000000425	100
0.00000000375	100
0.000000003	100
0.0000000025	100
0.000000002	100
0.0000000015	100
0.00000000125	100
0.00000000106	100
0.00000000085	100
0.00000000075	100
0.0000000006	100
0.0000000005	100
0.000000000425	100
0.000000000375	

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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W1	1.07	62.83

Date June 2007
Project 4056-06-00

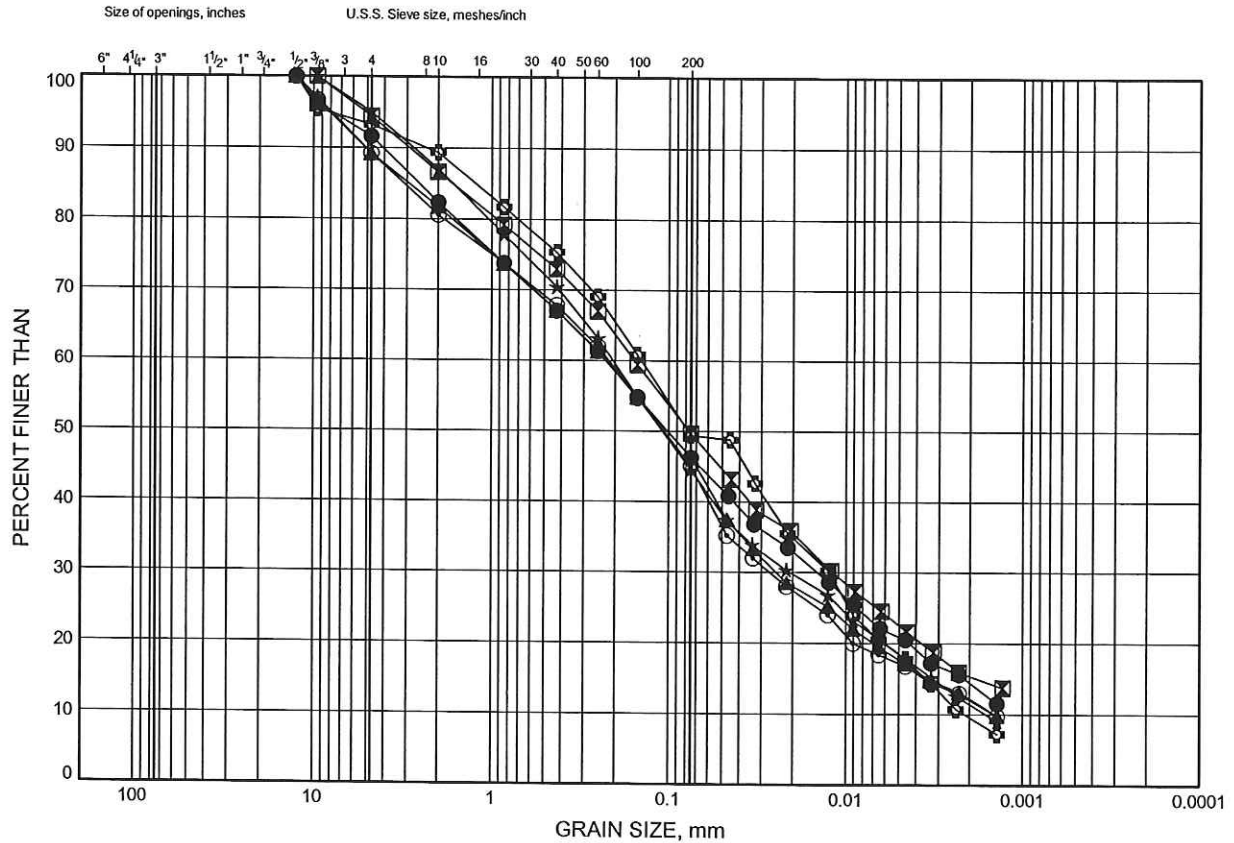


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Cornwall Noise Barrier GRAIN SIZE DISTRIBUTION

FIGURE B5

SAND AND SILT (FILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E3	1.07	60.23
⊠	07-E4	1.83	61.47
▲	07-E6	1.83	65.47
★	07-E6	4.88	62.42
⊙	07-E7	1.83	66.77
⊕	07-E7	6.40	62.20

Date June 2007
Project 4056-06-00



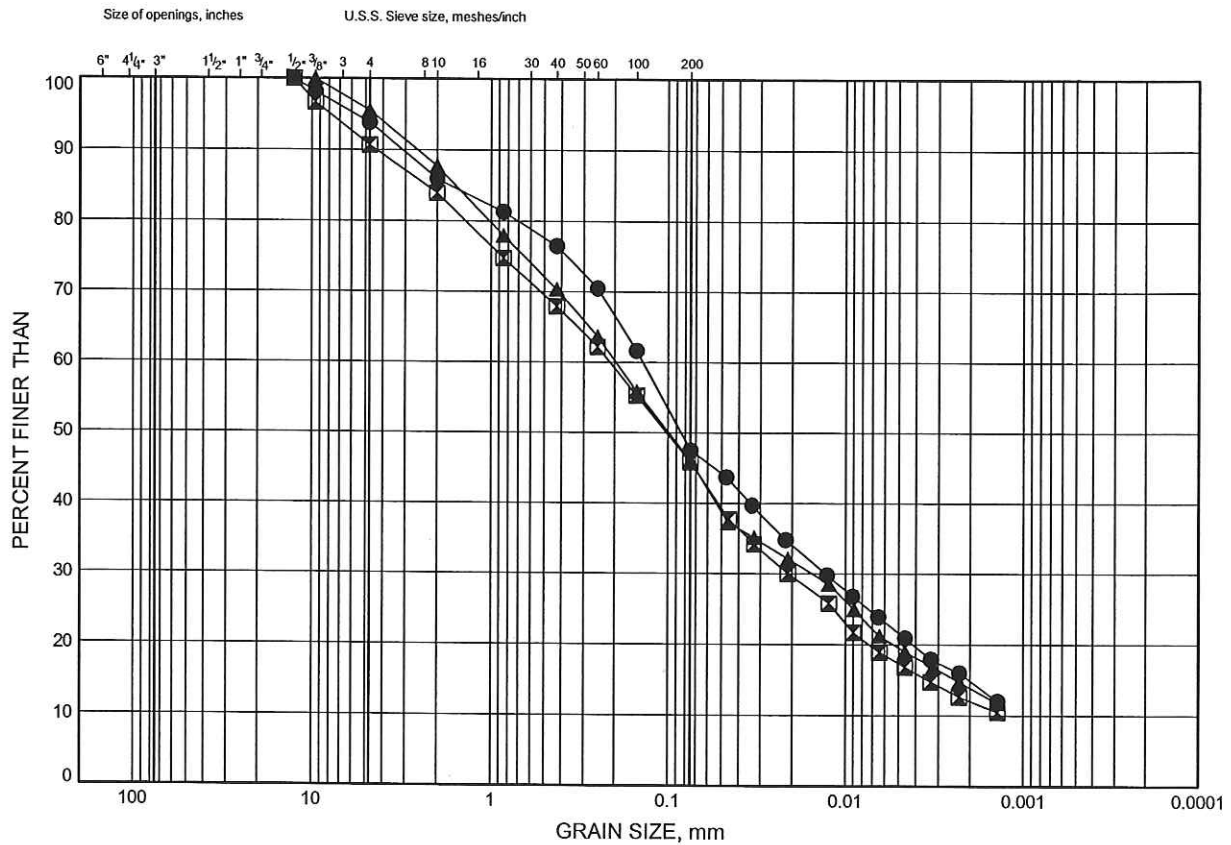
Prep'd MFA
Chkd. SKP

Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B6

SAND AND SILT (FILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E8	1.07	67.93
⊠	07-E9	1.83	66.57
▲	07-E10	1.07	66.23

THURBGSD 1125.GPJ 6/8/07

Date June 2007
Project 4056-06-00

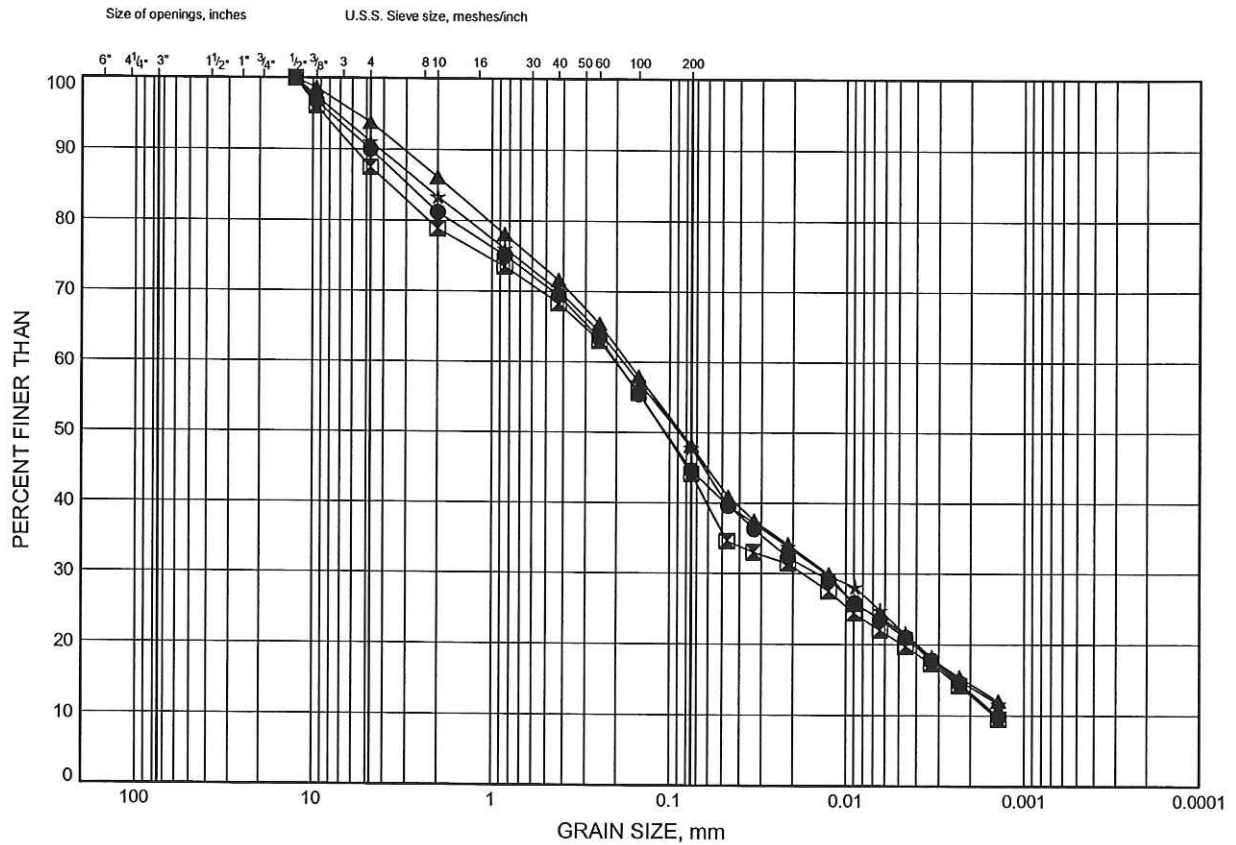


Prep'd MFA
Chkd. SKP

Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B7

SAND AND SILT (FILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W10	1.07	62.03
⊠	07-W11	1.07	64.23
▲	07-W12	1.07	66.13
★	07-W13	1.07	67.43

Date June 2007
 Project 4056-06-00



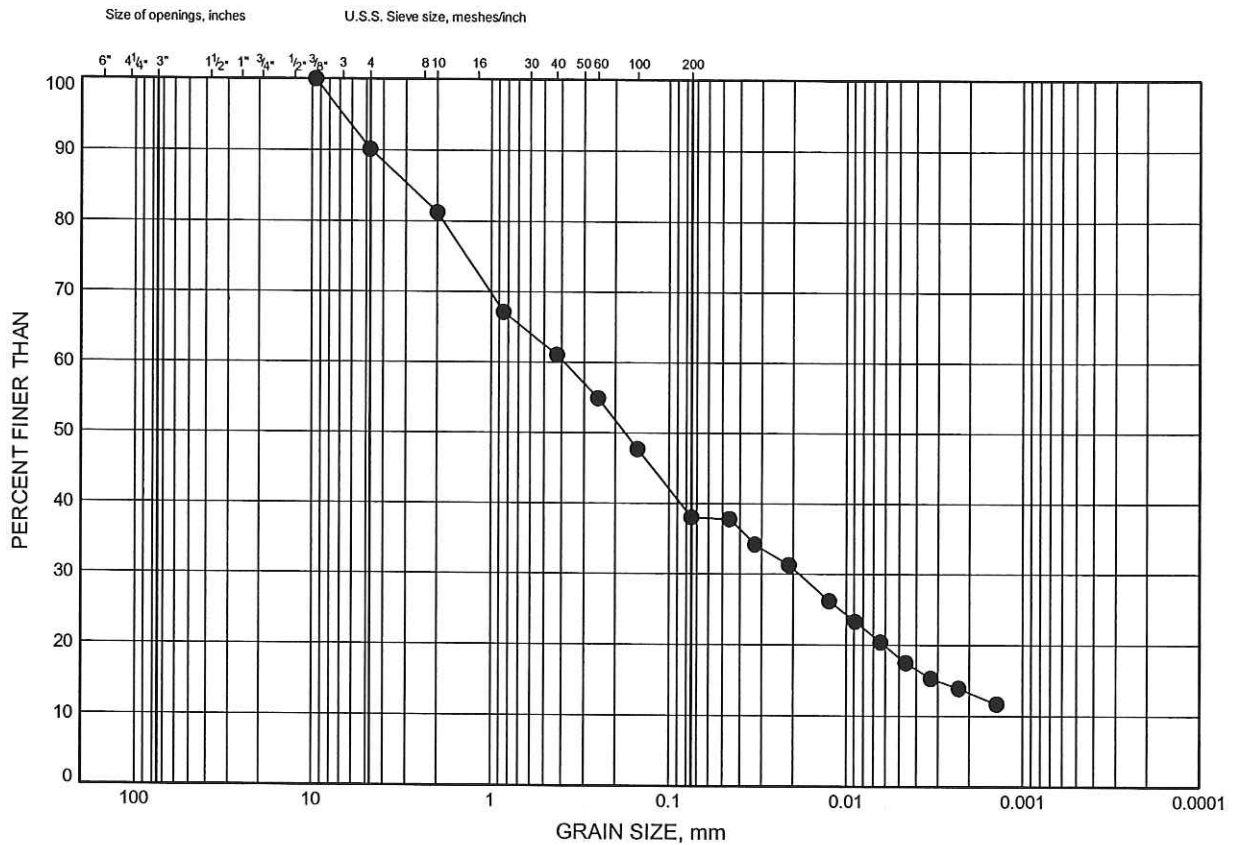
Prep'd MFA
 Chkd. SKP

Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B8

SILTY SAND (FILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E5	1.07	64.43

Date June 2007
Project 4056-06-00



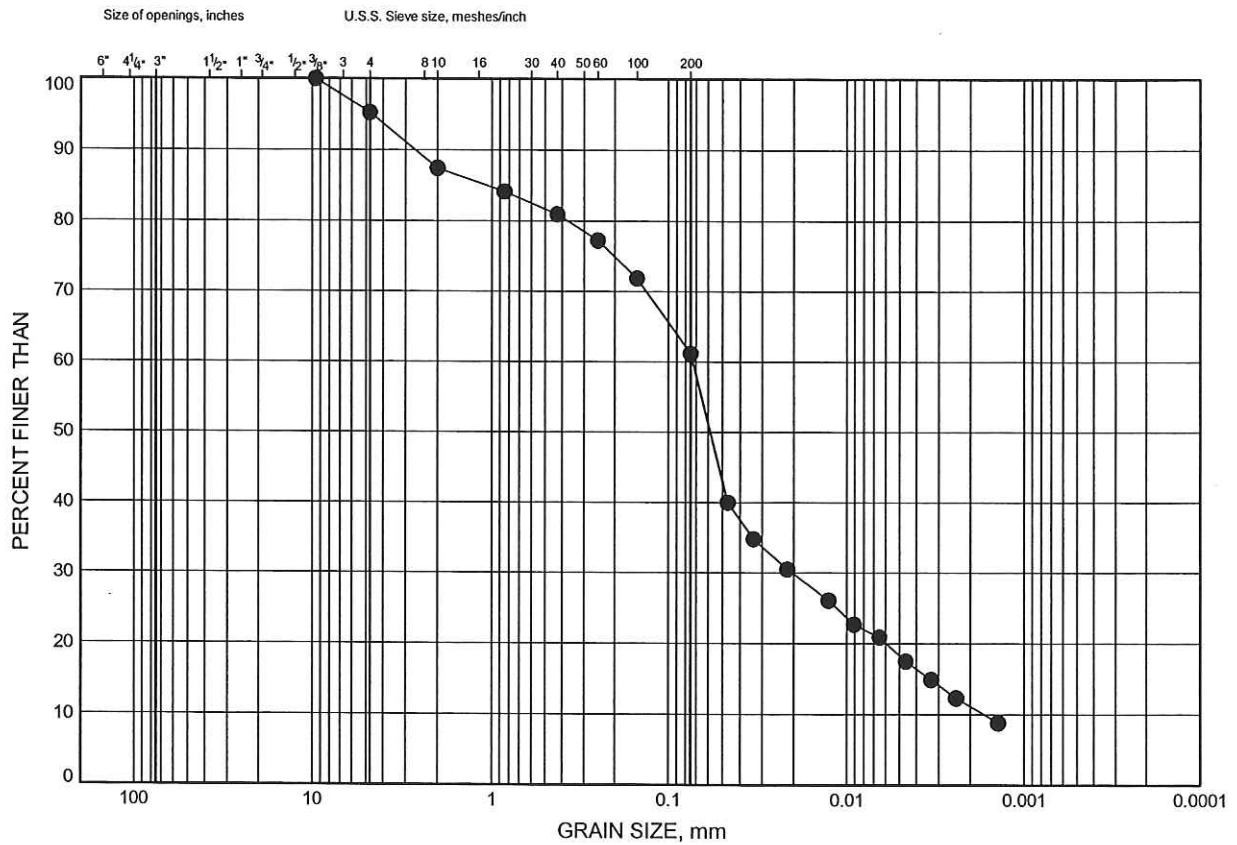
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Chkd. SKP

Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B9

SANDY SILT (FILL)



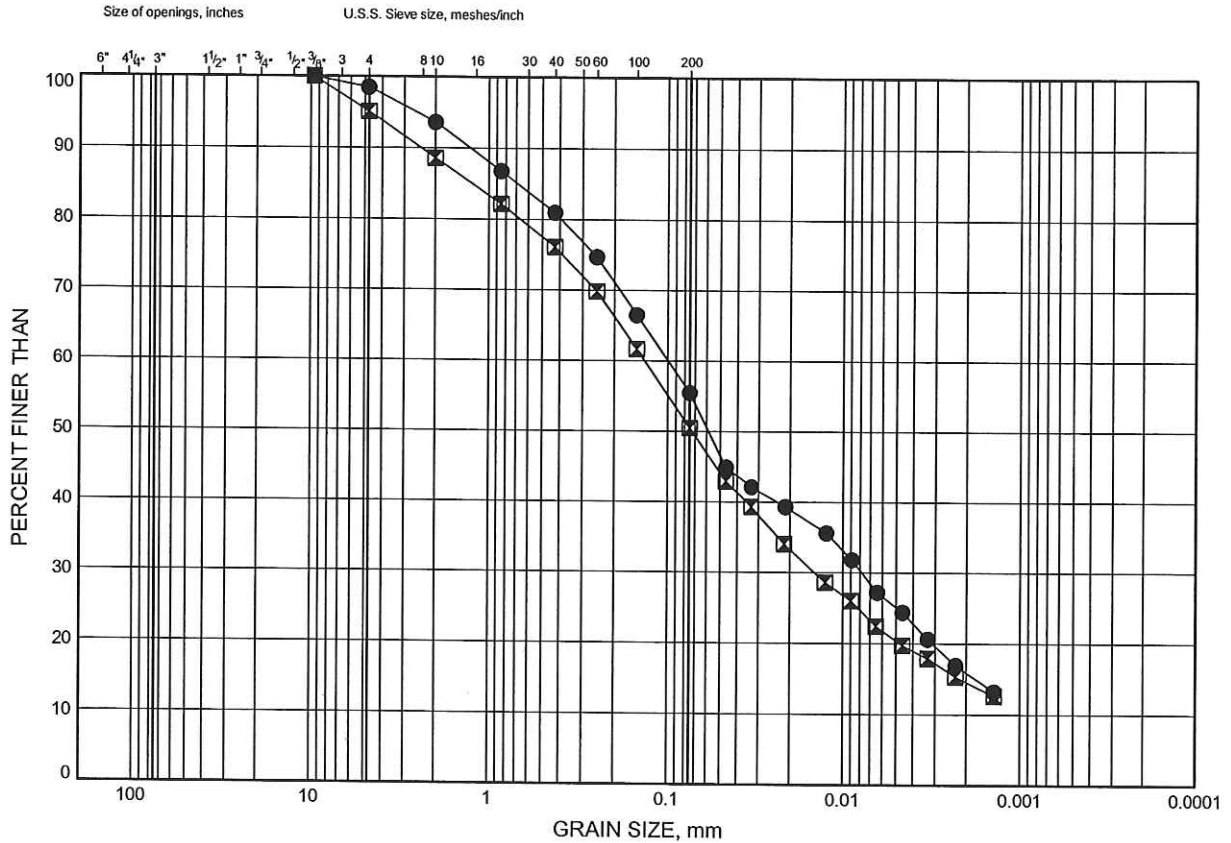
COBBLE SIZE	COARSE	FINE	COARSE	MEDIUM	FINE	SILT and CLAY
	GRAVEL		SAND			FINE GRAINED

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E5	4.88	60.62

Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B10

CLAYEY SILT, WITH SAND (FILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E2	1.83	58.47
⊠	07-W14	1.07	68.03

Date June 2007
 Project 4056-06-00



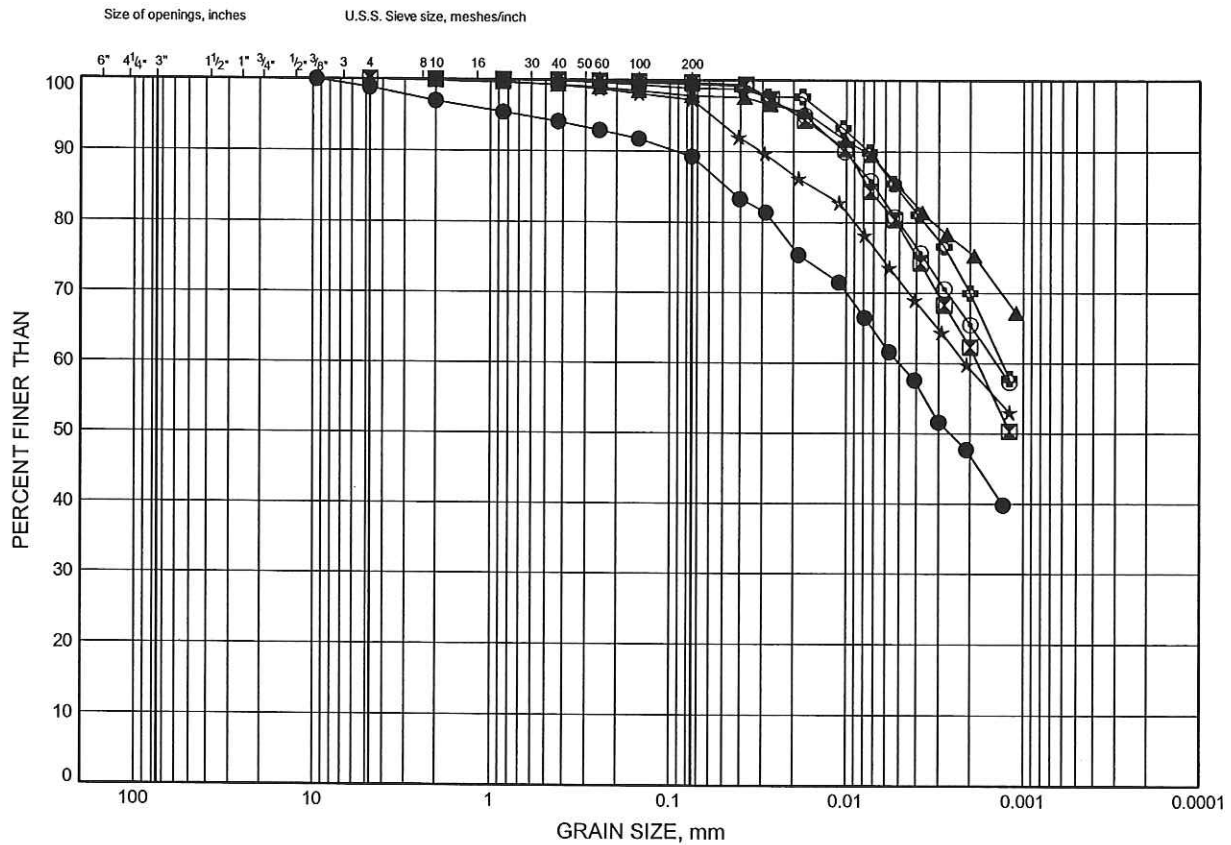
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 Chkd. SKP

Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B11

SILTY CLAY



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E1	1.83	58.27
⊠	07-E1	4.88	55.22
▲	07-E2	3.35	56.95
★	07-S1	0.30	57.80
⊙	07-S1	1.83	56.27
⊕	07-S1	4.88	53.22

Date June 2007
Project 4056-06-00

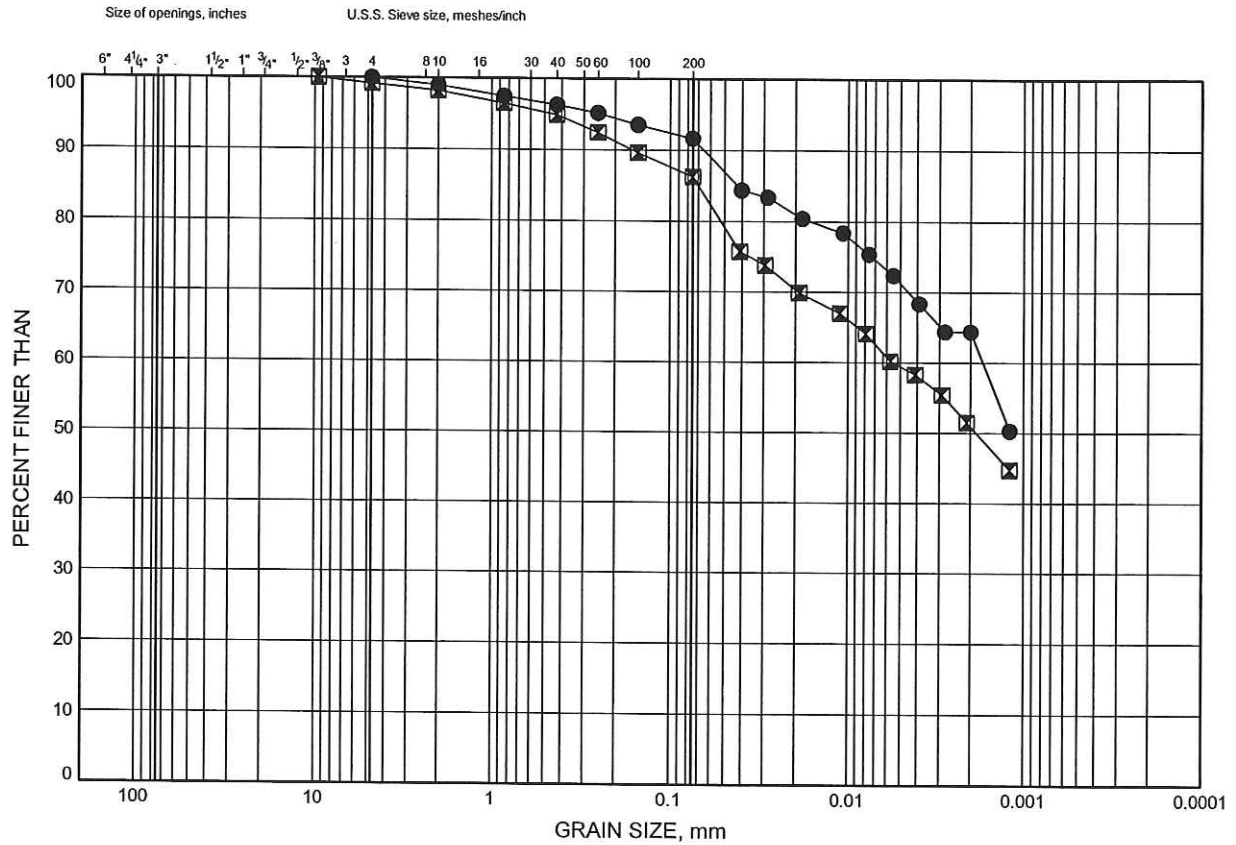


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Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B12

SILTY CLAY



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E4	4.88	58.42
■	07-E5	6.40	59.10

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Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B13

SILTY CLAY

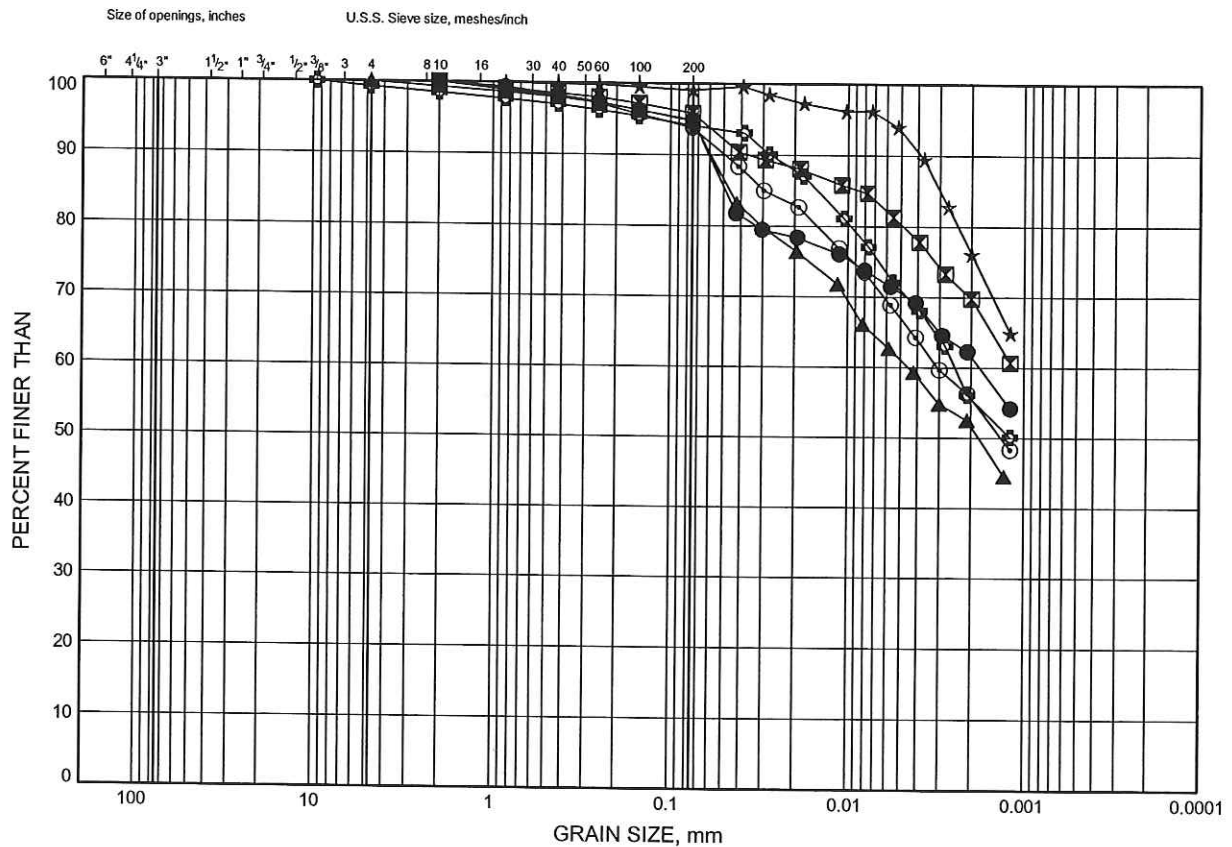


FIGURE B14

Size of openings, inches

U.S.S. Sieve size, meshes/inch

PERCENT FINER THAN

GRAIN SIZE, mm

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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W7	4.88	54.62
☒	07-W8	1.83	57.87
▲	07-W9	3.35	57.65

Date June 2007
Project 4056-06-00



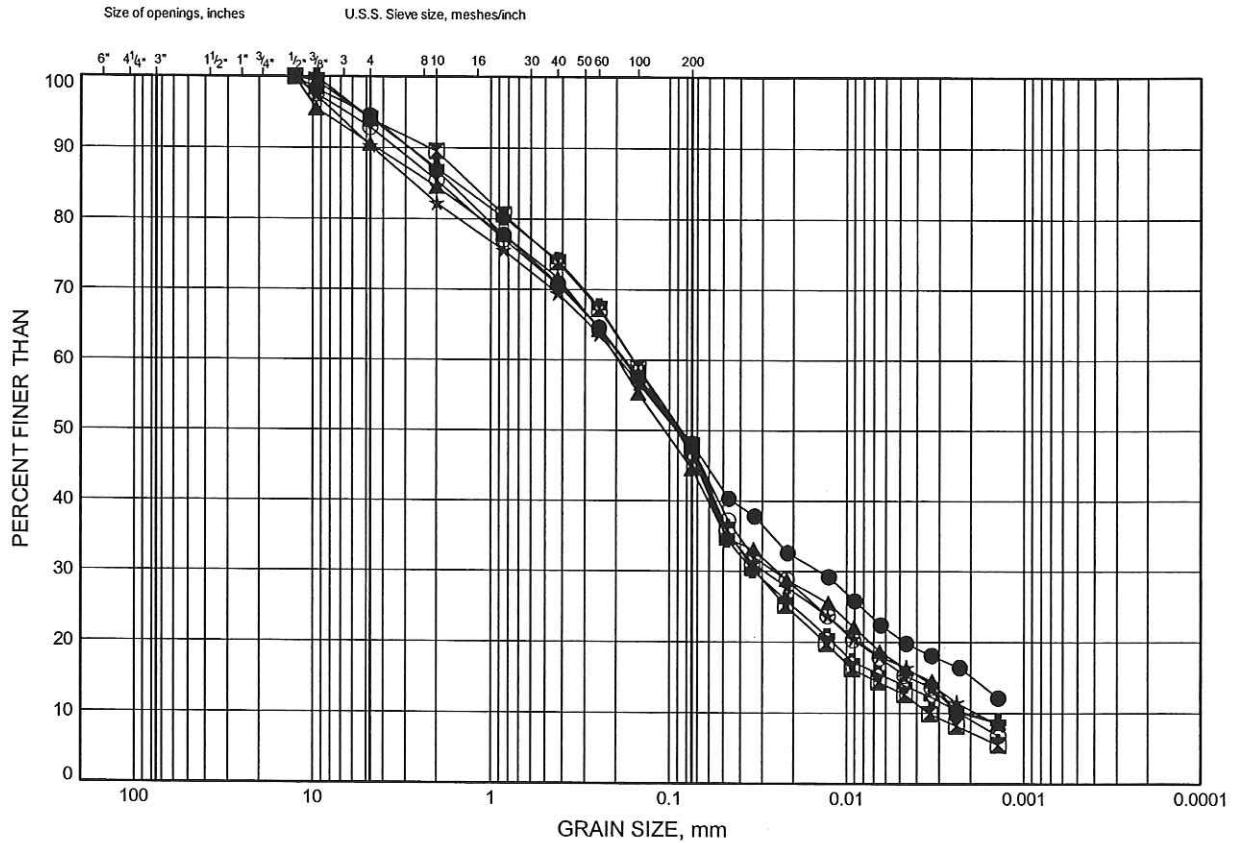
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Chkd.SKP.....

Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B15

SAND AND SILT (TILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W1	6.40	57.50
⊠	07-W9	4.88	56.12
▲	07-W12	6.40	60.80
★	07-W15	6.40	62.00
⊙	07-W16	4.88	62.42
⊕	07-W16	6.40	60.90

Date June 2007
Project 4056-06-00

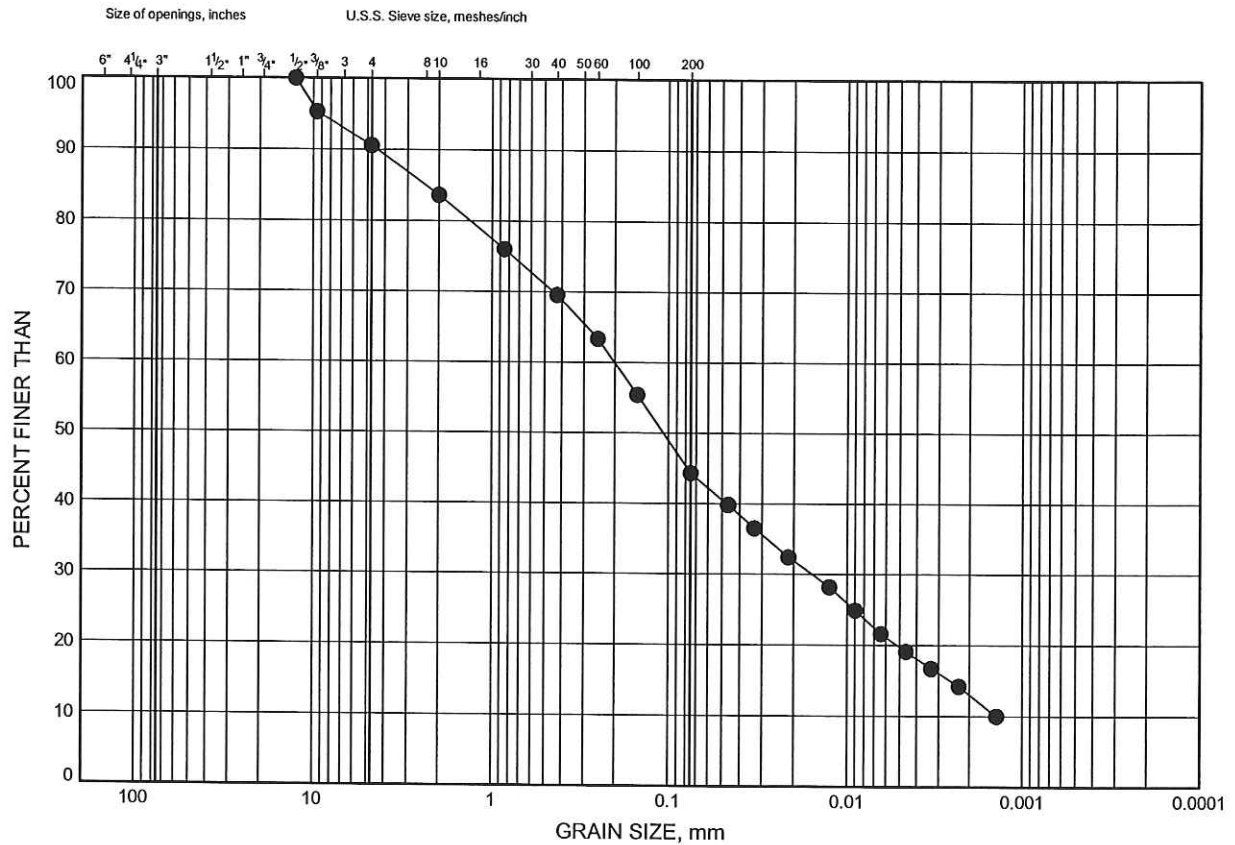


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Chkd. SKP

Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B16

SAND AND SILT (TILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E8	4.88	64.12

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Date June 2007
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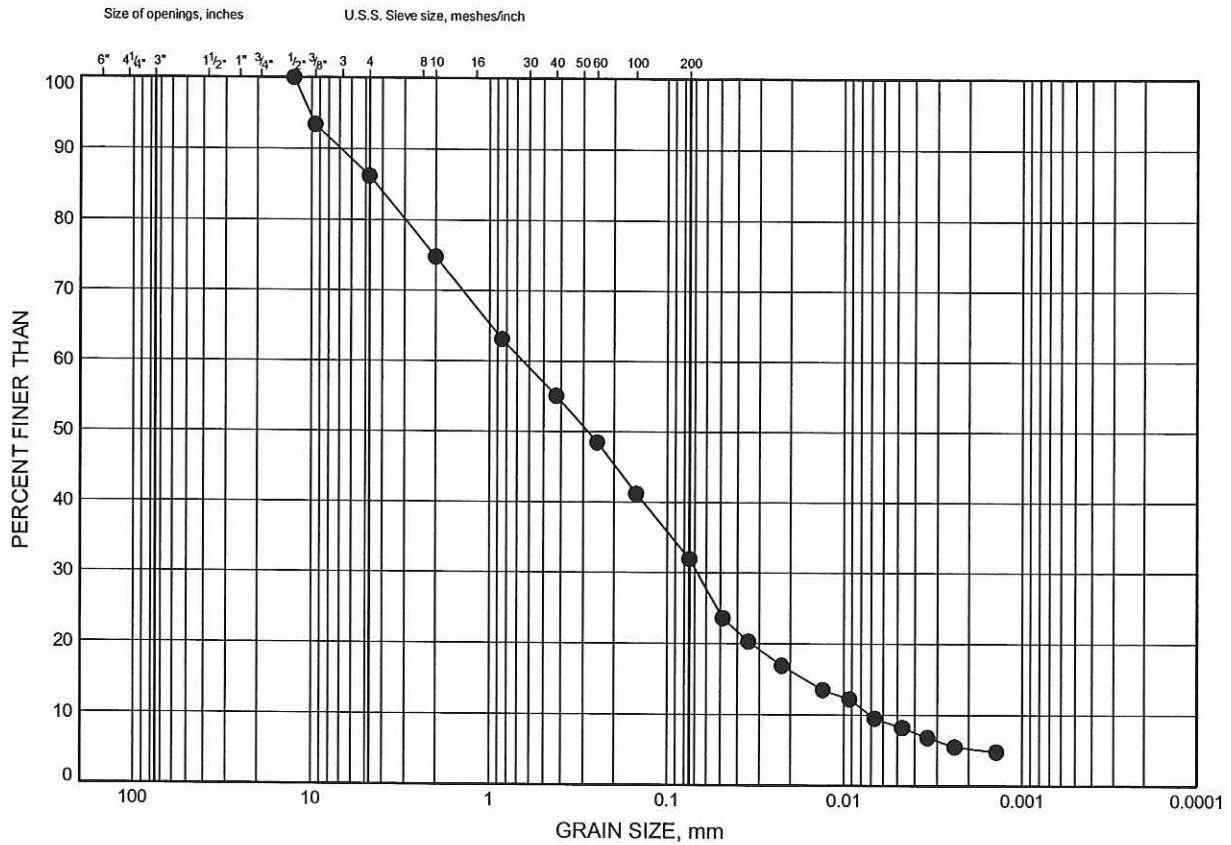


Prep'd MFA
Chkd. SKP

Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B17

SILTY SAND (TILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E2	6.40	53.90

Date June 2007

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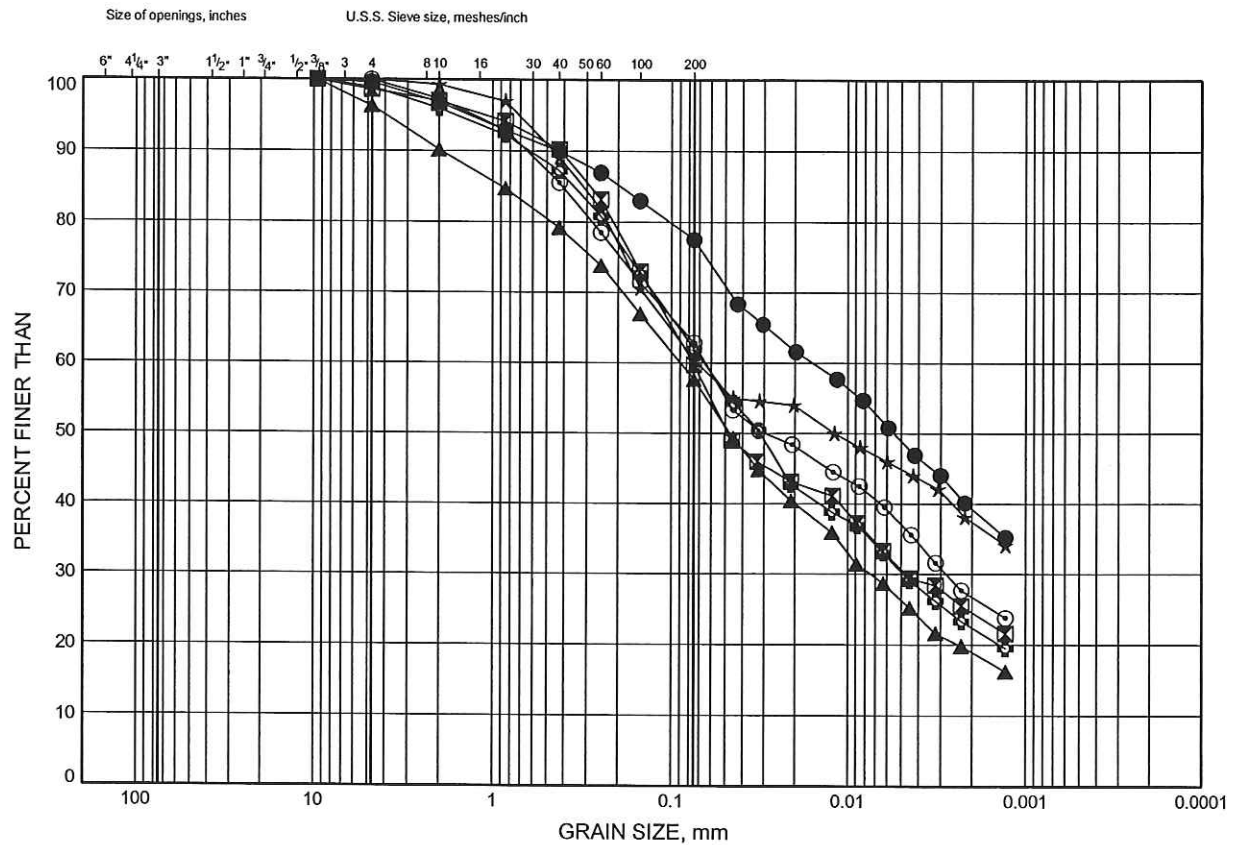
Chkd. SKP

Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B18

SILTY CLAY, WITH SAND (TILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E3	3.35	57.95
⊠	07-E10	3.35	63.95
▲	07-W8	4.88	54.82
★	07-W11	6.40	58.90
⊙	07-W14	4.88	64.22
⊕	07-W15	4.88	63.52

Date June 2007
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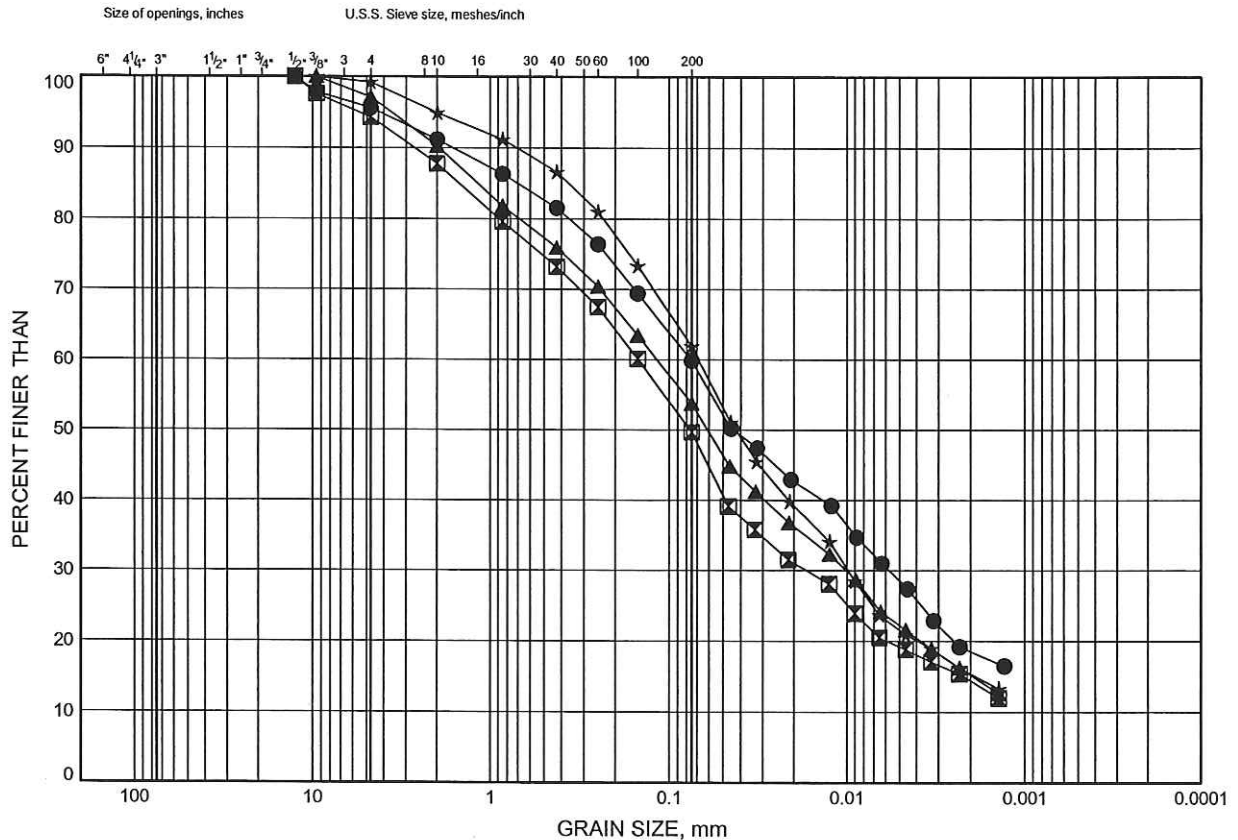


Prep'd MFA
Chkd. SKP

Cornwall Noise Barrier
GRAIN SIZE DISTRIBUTION

FIGURE B19

CLAYEY SILT, WITH SAND (TILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E9	4.88	63.52
⊠	07-W4	6.40	56.60
▲	07-W10	4.88	58.22
★	07-W13	6.40	62.10

Date June 2007

Project 4056-06-00



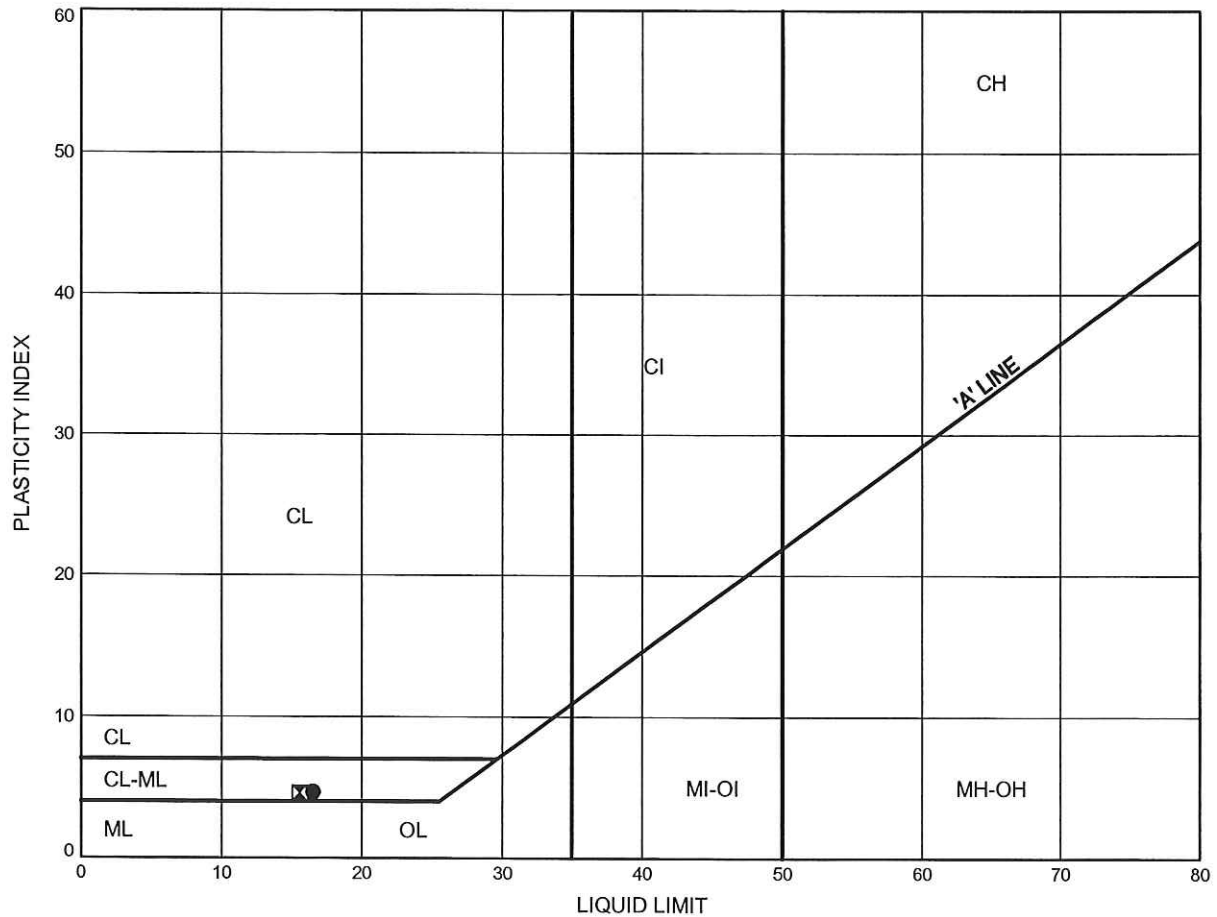
Prep'd MFA

Chkd. SKP

Cornwall Noise Barrier
ATTERBERG LIMITS TEST RESULTS

FIGURE B20

SAND AND SILT (FILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E6	4.88	62.42
☒	07-W16	1.07	66.23

Date June 2007
 Project 4056-06-00

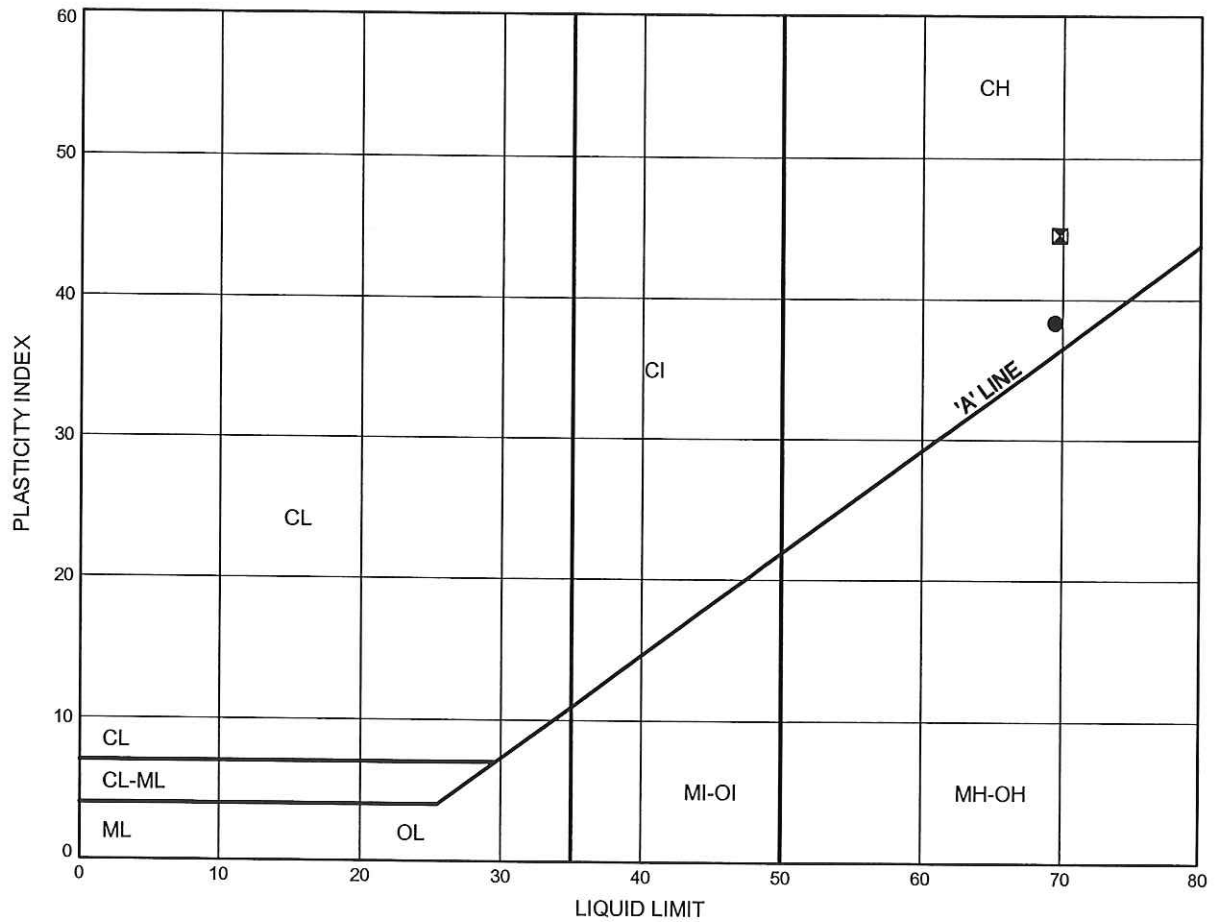


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 Chkd. SKP

Cornwall Noise Barrier
ATTERBERG LIMITS TEST RESULTS

FIGURE B21

SILTY CLAY (FILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W15	0.30	68.10
☒	07-W15	1.83	66.57

Date June 2007
 Project 4056-06-00

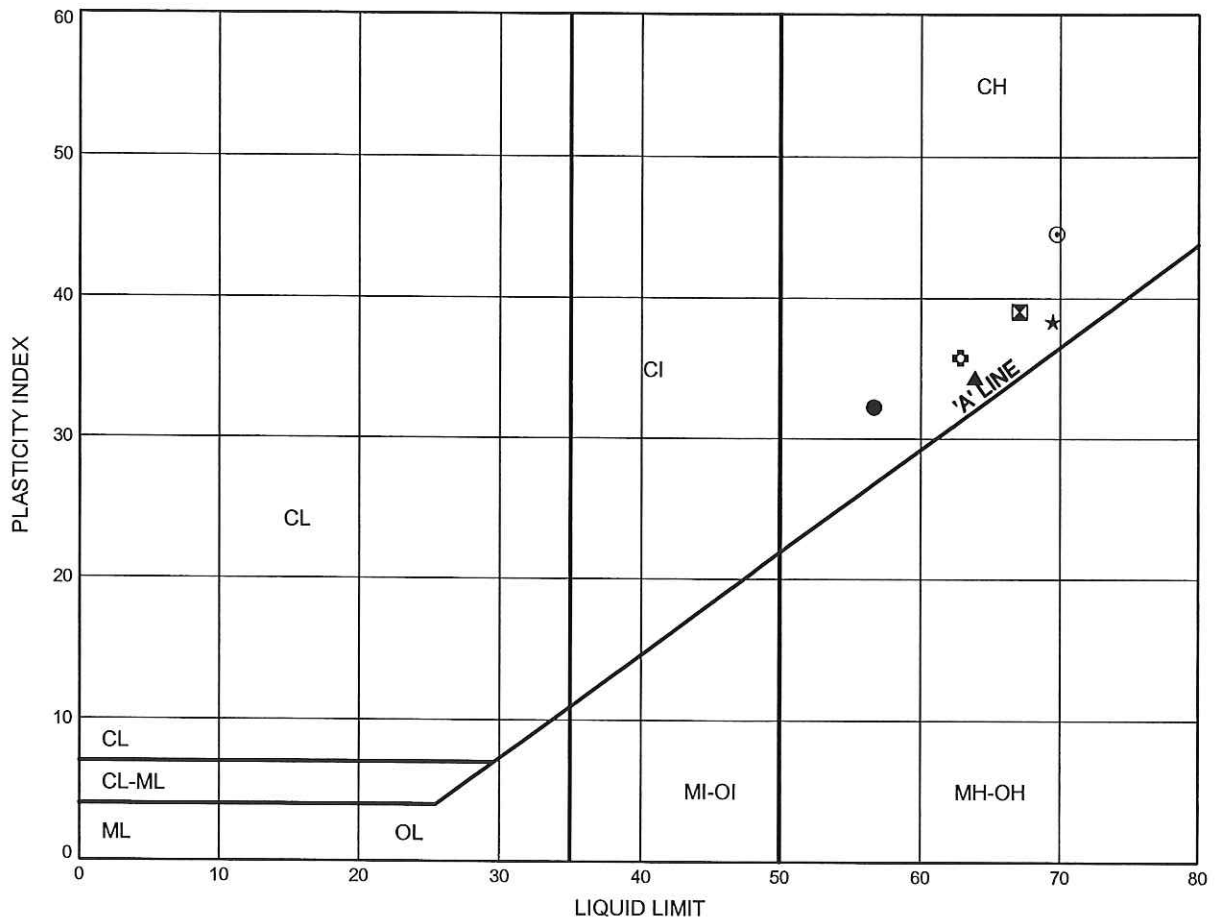


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 Chkd. SKP

Cornwall Noise Barrier
ATTERBERG LIMITS TEST RESULTS

FIGURE B22

SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-E1	4.88	55.22
⊠	07-E4	4.88	58.42
▲	07-E5	6.40	59.10
★	07-S1	0.30	57.80
⊙	07-S1	1.83	56.27
⊕	07-S1	4.88	53.22

Date June 2007
 Project 4056-06-00

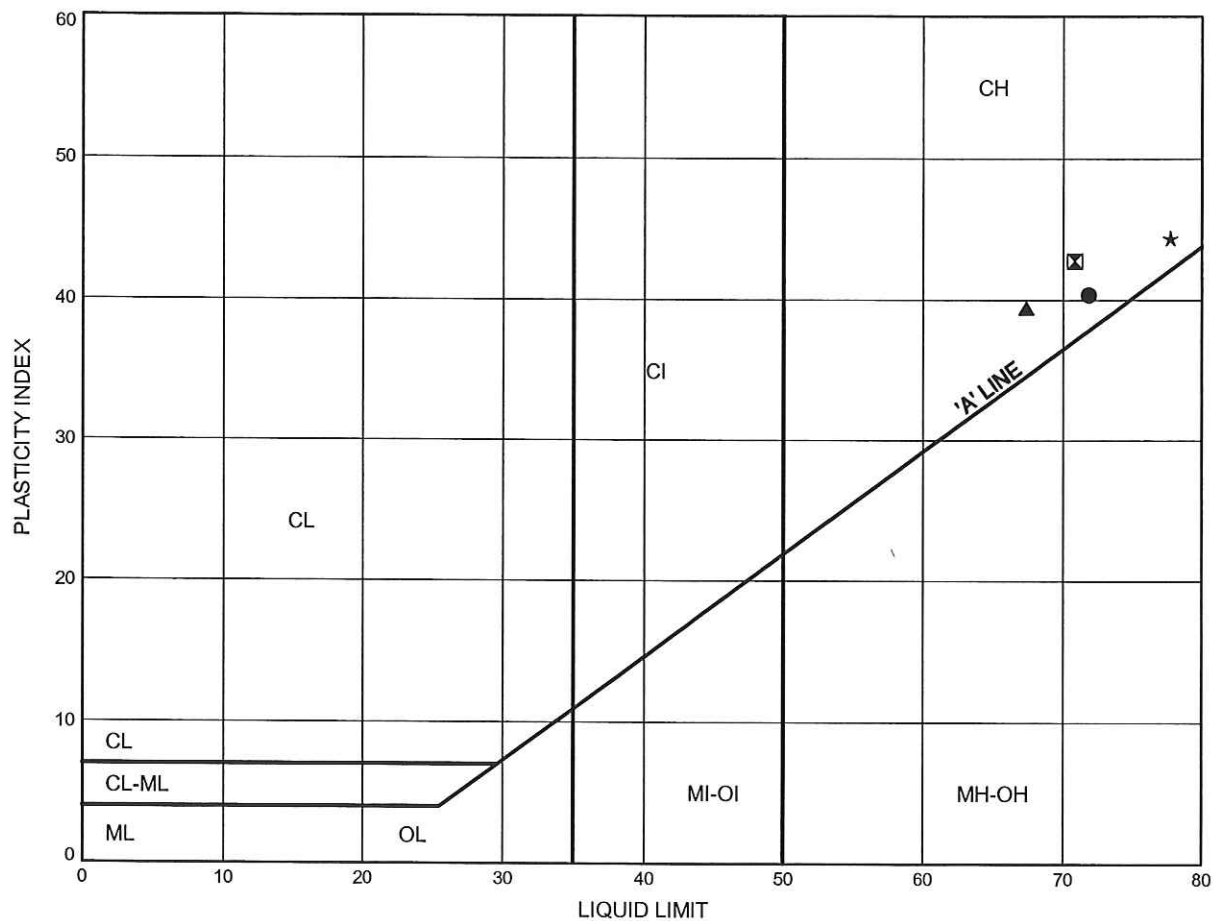


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 Chkd. SKP

Cornwall Noise Barrier
ATTERBERG LIMITS TEST RESULTS

FIGURE B23

SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W3	4.88	57.92
⊠	07-W5	4.88	57.32
▲	07-W5	7.92	54.28
★	07-W9	3.35	57.65

Date June 2007
 Project 4056-06-00

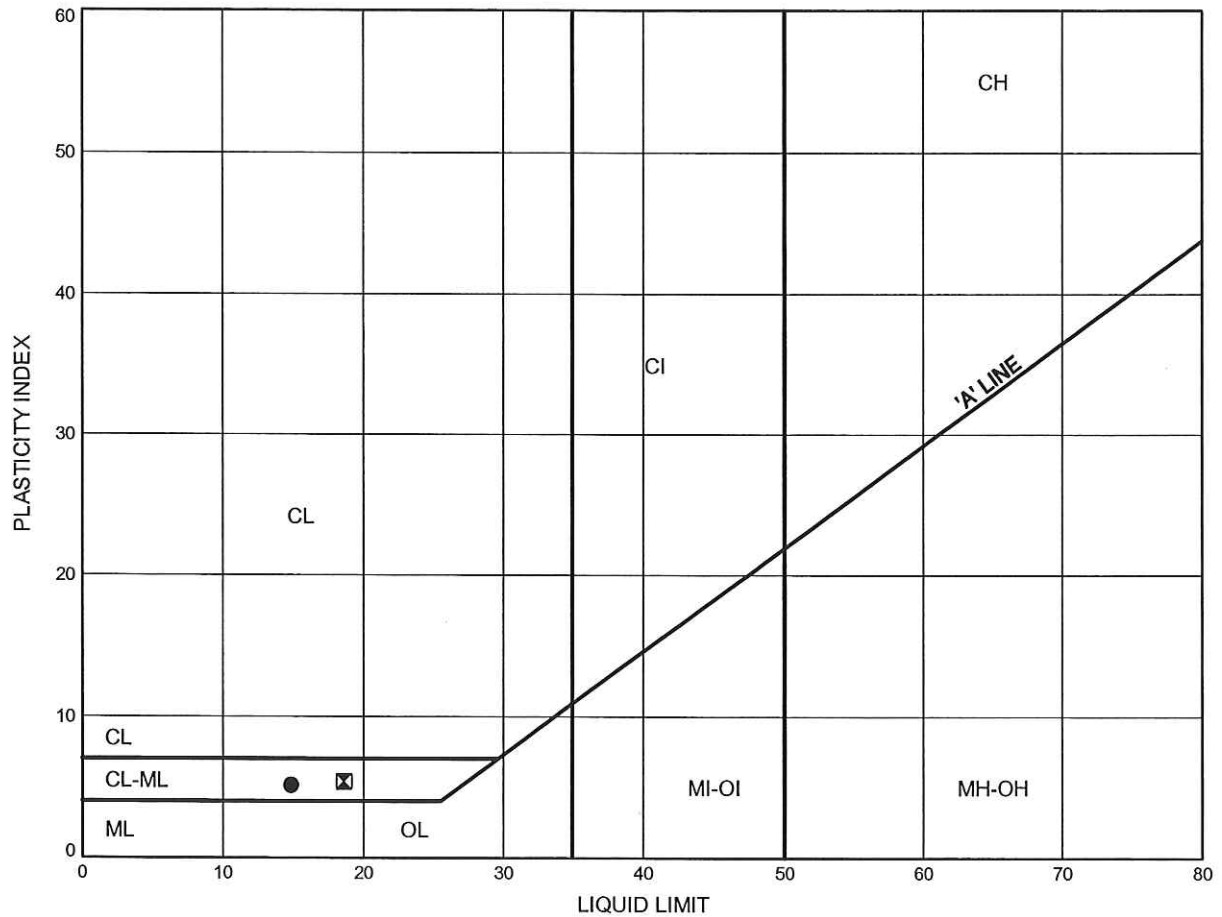


Prep'd MFA
 Chkd. SKP

Cornwall Noise Barrier
ATTERBERG LIMITS TEST RESULTS

FIGURE B24

SAND AND SILT (TILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W1	6.40	57.50
⊠	07-W4	6.40	56.60

Date June 2007
 Project 4056-06-00

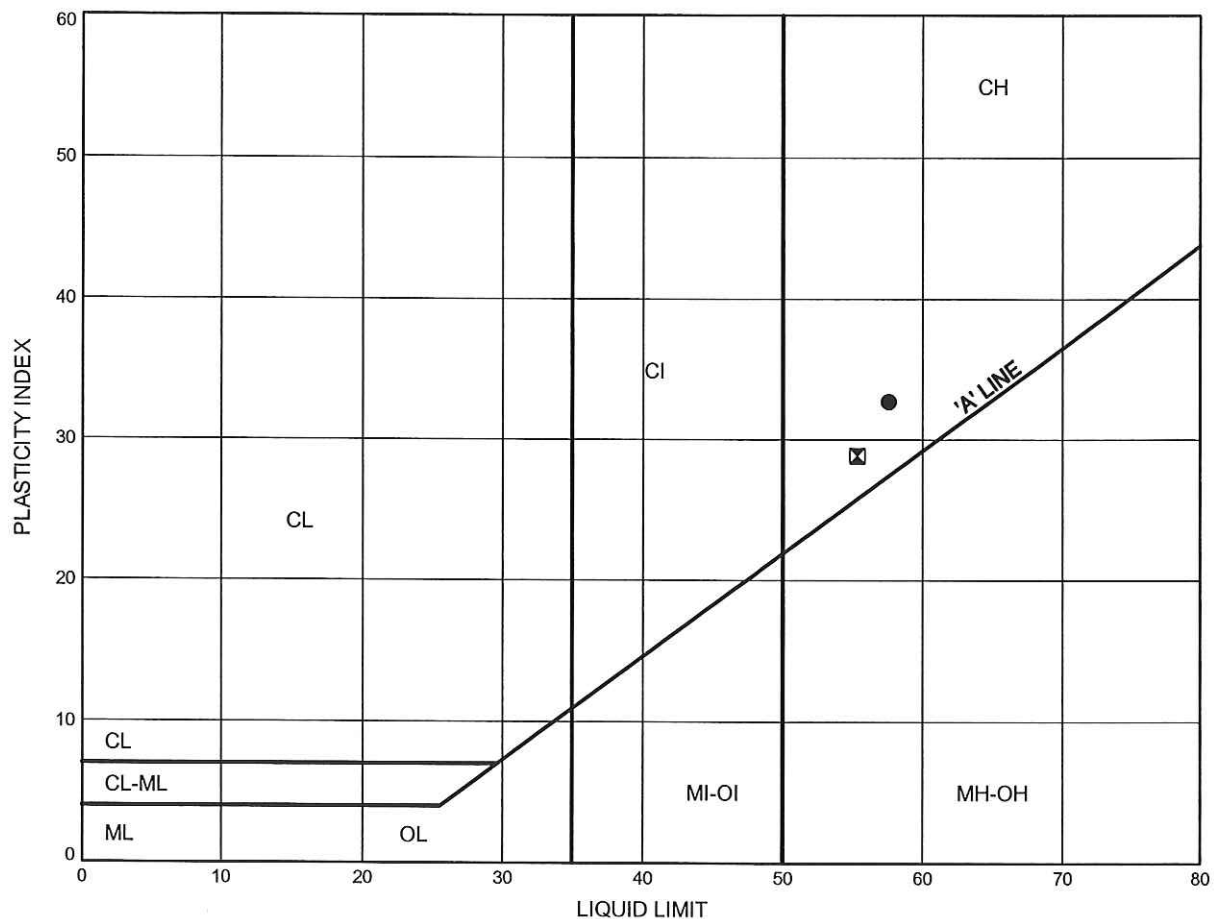


Prep'd MFA
 Chkd. SKP

Cornwall Noise Barrier
ATTERBERG LIMITS TEST RESULTS

FIGURE B25

SILTY CLAY (TILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W7	4.88	54.62
⊠	07-W8	1.83	57.87

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Date June 2007
 Project 4056-06-00

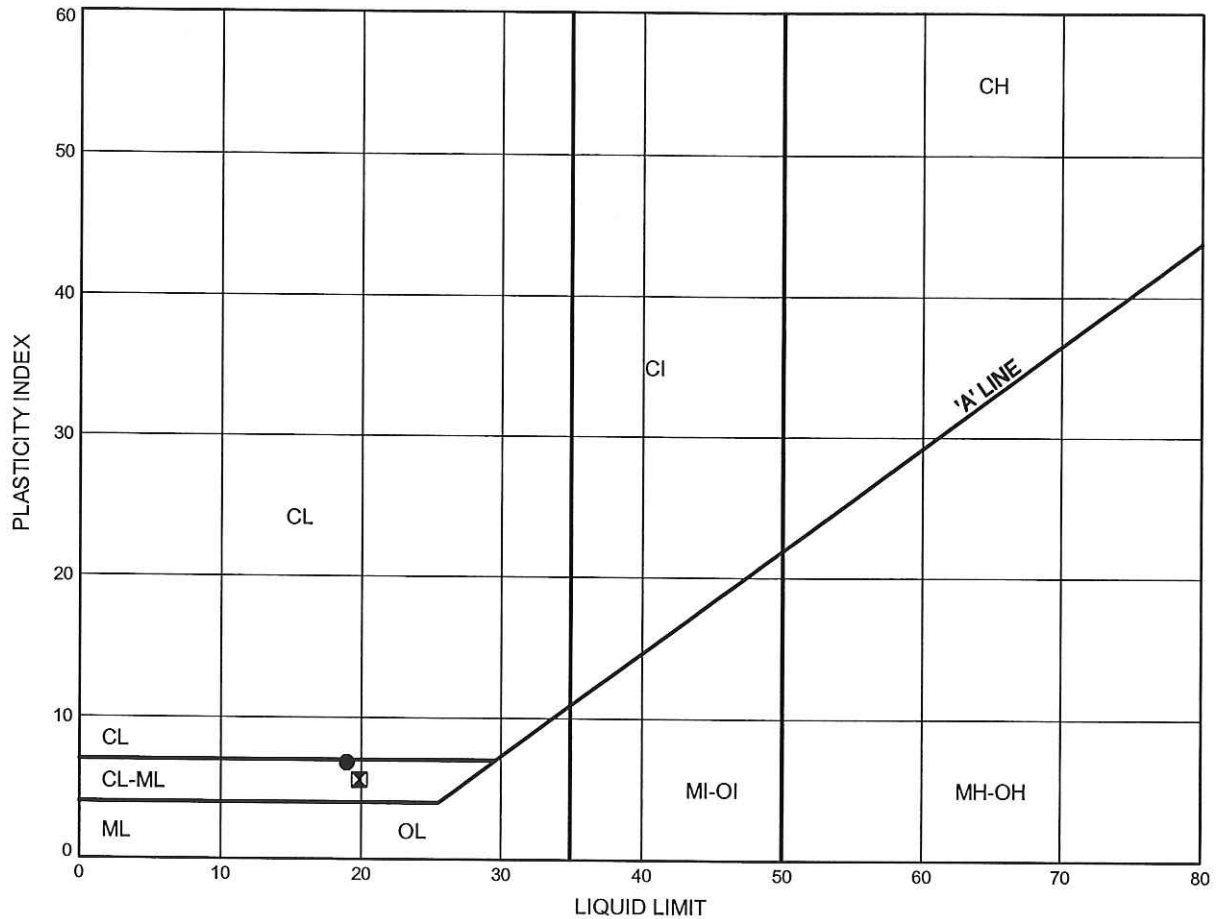


Prep'd MFA
 Chkd. SKP

Cornwall Noise Barrier
ATTERBERG LIMITS TEST RESULTS

FIGURE B26

CLAYEY SILT, WITH SAND (TILL)



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-W10	4.88	58.22
⊠	07-W13	6.40	62.10

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Date June 2007
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 Chkd. SKP

Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B27

SILTY CLAY

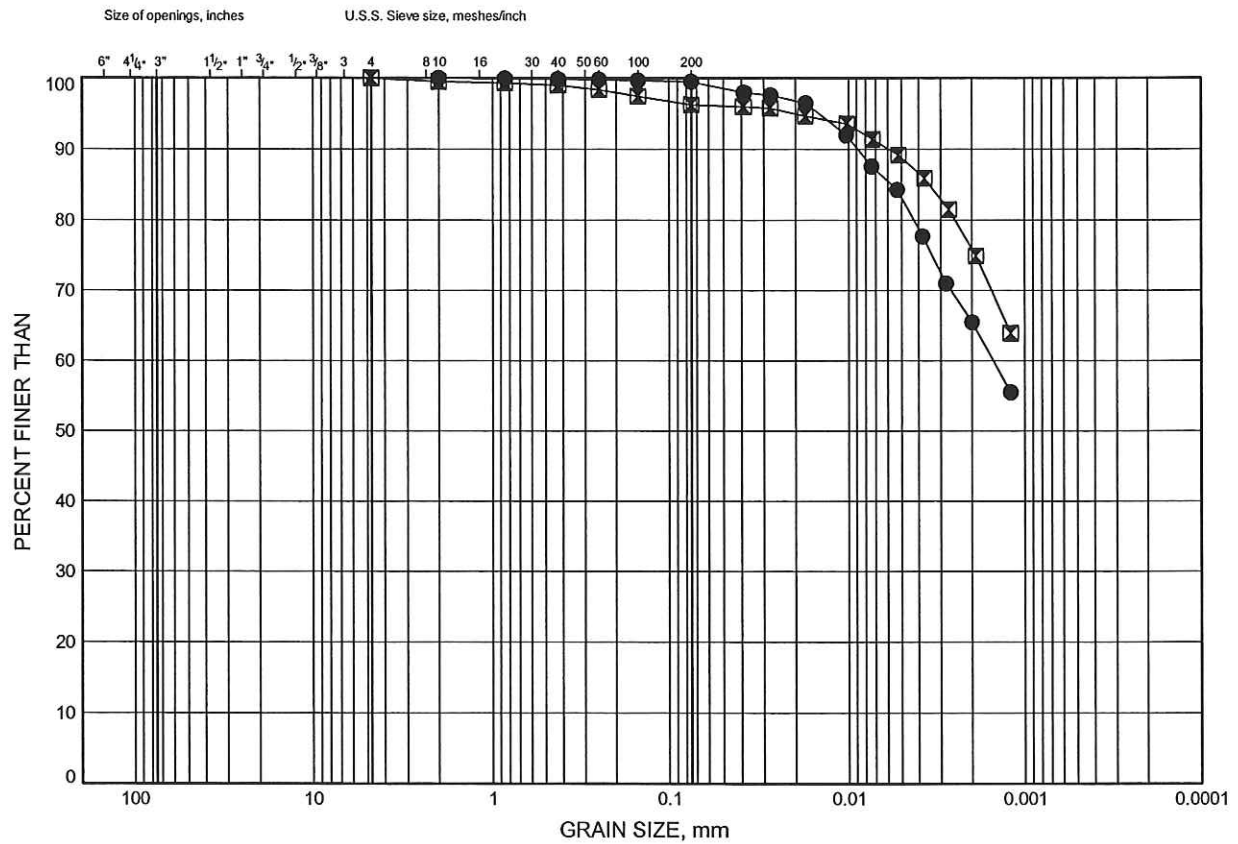


FIGURE B28

Size of openings, inches

U.S.S. Sieve size, meshes/inch

PERCENT FINER THAN

GRAIN SIZE, mm

Grain Size (mm)	Sieve Size	Percent Finer Than (Solid Circles)	Percent Finer Than (Crosses)
100	6"	100	100
75	4 1/4"	100	100
47.5	3"	100	100
37.5	1 1/2"	100	100
30	1"	100	100
25	3/4"	100	100
20	3/8"	100	100
15	10	100	100
12.5	12	100	100
10	20	100	100
7.5	30	98	95
6	40	95	92
4.75	40	80	87
3.75	40	70	83
3	60	63	79
2.5	60	53	71
2	100	46	53
1.5	100	38	38
1.18	150	33	33
0.85	20	29	27
0.75	20	25	22
0.6	30	22	19
0.5	30	17	14
0.425	40	13	11
0.354	40	12	10
0.3	60	10	7

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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-BSS3	2.59	61.51
☒	07-BSS4	1.83	61.27

THURBGSD 1125.GPJ 10/2/07

Date October 2007

Project 4056-06-00



Prep'd MFA

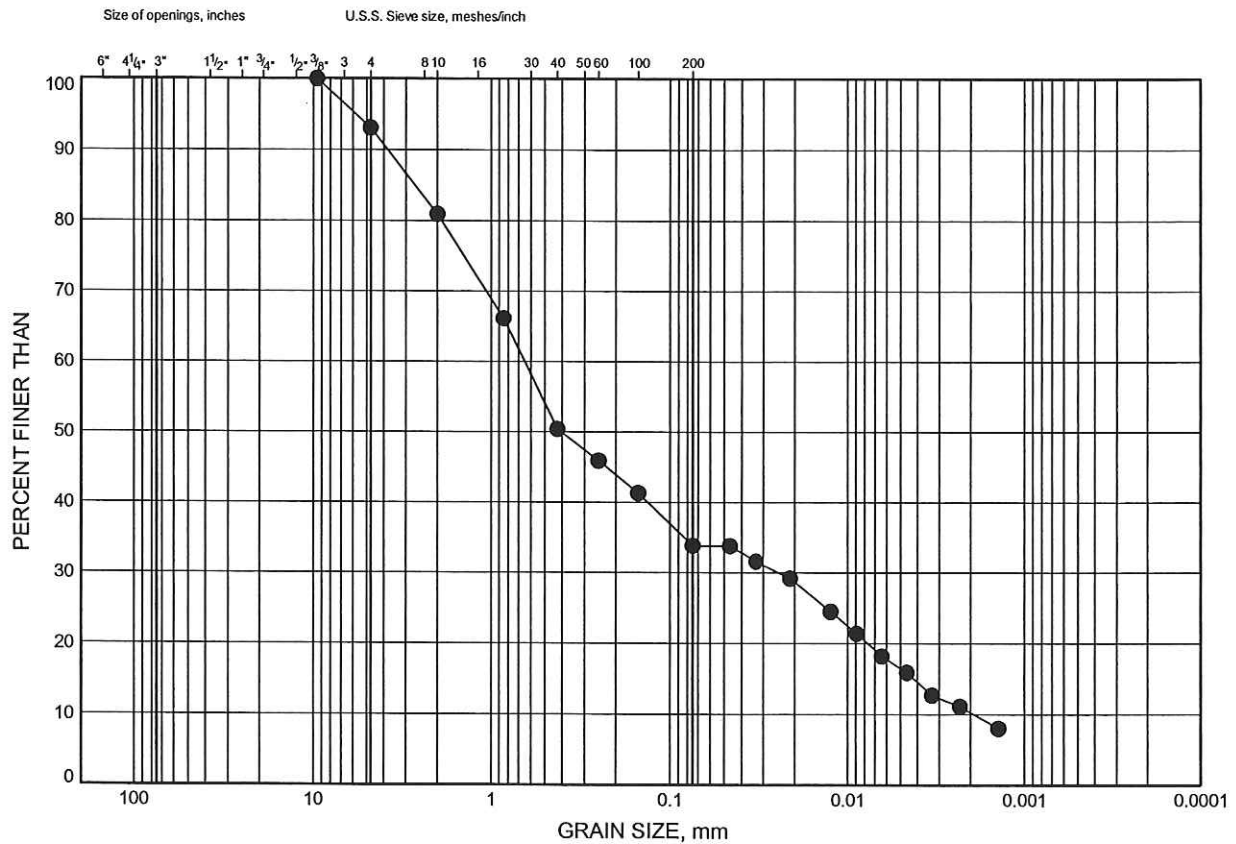
Chkd. SKP

Cornwall Noise Barrier

GRAIN SIZE DISTRIBUTION

FIGURE B29

SILTY SAND (TILL)



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

SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-BSS1	9.45	54.25

Date September 2007
Project 4056-06-00



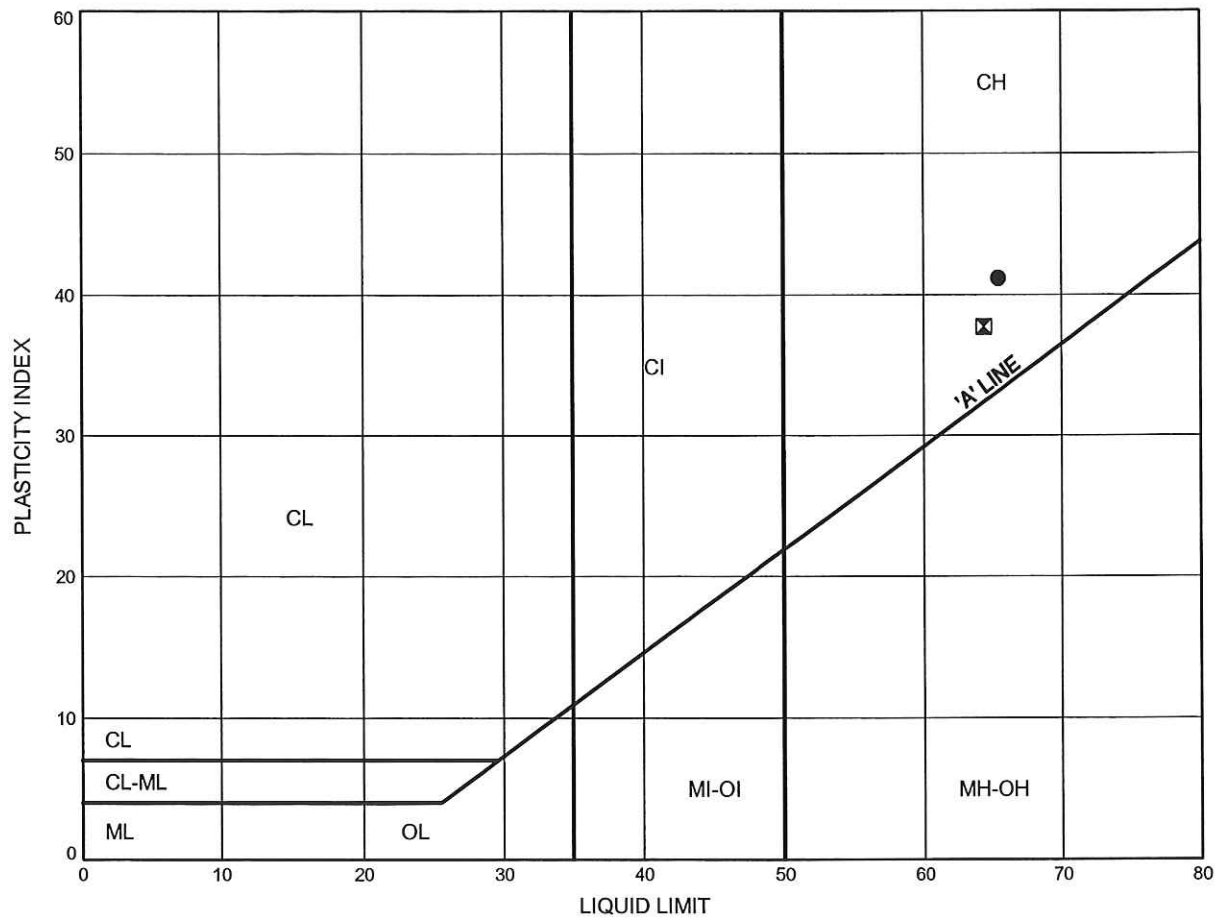
Prep'd MFA
Chkd. SKP

Cornwall Noise Barrier

ATTERBERG LIMITS TEST RESULTS

FIGURE B30

SILTY CLAY



SYMBOL	BH	DEPTH (m)	ELEV. (m)
●	07-BSS1	1.83	61.87
⊠	07-BSS1	6.40	57.30

Date September 2007
Project 4056-06-00



Prep'd MFA
Chkd. SKP

Appendix C
List of Special Provisions
and
Suggested Text for NSSP

19-1351-125



List of Special Provisions Referenced in this Report

SP 903S01

Suggested Text for NSSP on:

“Augered Caisson Construction for Noise Barrier Wall and Breakaway Sign Foundations”

The Contractor is advised that variable types of subsurface materials may be encountered at the locations of the noise barrier wall and breakaway sign foundations. Concrete rubble amongst other obstructions is potentially present within the earth berm. 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. There is a probability that cobbles, boulders and limestone fragments may be encountered within the glacial till deposits. Obstructions including concrete rubble, cobbles and boulders may also be present within the earth berm and other fills. 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 at some locations. 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.

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

