GEOCRES No: 30M3-191

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 2512-90-01 (EB)
2513-90-01 (WB) DIST 4

HWY Q.E.W. STR SITE

Vineland Truck Inspection Stations

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FOUNDATION INVESTIGATION REPORT
For
Vineland Truck Inspection Stations
Q.E.W., G.W.P. 2512-90-00
W.P. 2512-90-01 (EB)
W.P. 2513-90-01 (WB)
District 4, Burlington

INTRODUCTION

This report summarizes the results of a foundation investigation conducted at the proposed Vineland Truck Inspection Stations along the Q.E.W. Eastbound and Westbound. The Truck Inspection Stations will be located north and south of the existing Q.E.W. Westbound and Eastbound lanes respectively. This report describes the subsurface conditions at the site and provides recommendations pertaining to structure foundations and related earthworks.

SITE DESCRIPTION AND GEOLOGY

The site is located in the area bounded by the existing North Service Road to the north and an area within 25 metres south of the existing South Service Road between Maple Grove Road and Cherry Road in the Town of Lincoln, Regional Municipality of Niagara. The existing North and South Service Roads are one lane asphaltic roadways and the Q.E.W. contained within these roadways is a two lane median divided highway.

Two concrete culverts are located within the site area. These culverts transmit the waters of meandering creeks, flowing in a northerly direction, beneath the North and South Service Roads and the Q.E.W. The culverts, 2.24 m wide by 1.2 m high and 2.45 m wide by 1.53 m high, are both rigid frame open footing culverts that are generally in good condition. However, transverse cracking along the service roadways and the Q.E.W. highway above the roofs of the culverts indicate some subsidence at the culverts. In addition, some scouring at the most easterly culvert has produced undermining of its west wall foundation.

The terrain in the site area is generally flat, although drainage ditches and the North and South Service Road embankments accentuate the flat terrain. The land is covered by sparse forest comprising a woodlot south of the existing South Service Road and a combination of forest and fruit trees north of the existing North Service Road.

The site is located in the Niagara Fruit Belt area and hence fruit orchards and vineyards dominate the area. Crops include grapes, peaches, pears and cherries. Residential farm houses are also present in the area.

Physiographically, the site is located in the region known as the "Iroquois Plain". The Iroquois Plain is the product of the advance and retreat of the Wisconsinan ice sheet which covered the area during the Pleistocene epoch (over 12,000 years ago). The lowland bordering Lake Ontario, when the last glacier was receding was inundated by the glacial lake called Lake Iroquois at the site. Conditions in the old lake plain vary greatly within the Iroquois Plain. At the site location, overburden consists of a heterogeneous mixture of clayey silt, sand and gravel with interbedded layers of silt, sand and gravel. The overburden is underlain by shale bedrock of the Queenston Shale Formation at a depth of approximately 8 to 9 m below the existing ground surface.

INVESTIGATION PROCEDURE

The subsurface conditions at the site were determined by field investigation procedures and laboratory analysis conducted. Details of the investigation are given below.

Field Investigation

The fieldwork for the investigation was carried out between 91 04 17 and 91 05 09 and consisted of the advancement of a total of twenty-eight (28) sampled boreholes. Two (2) boreholes were advanced at each weigh scale (both sorter and static) and two additional boreholes were advanced at either approach slab at each of the scales. Two (2) boreholes were also advanced at each truck inspection building.

The boreholes at the scales were advanced to depths ranging from 7.6 to 12.3 m whilst the boreholes at the approach slabs were advanced to depths of 5 m below the ground surface. The boreholes at the buildings were advanced to depths ranging from 7 to 7.9 m.

A track mounted acker drilling unit (equivalent to a CME 75) employing hollow stem augering techniques was used to advance the boreholes in the overburden. In general, subsoil samples were retrieved at 0.7 m intervals for the surficial 6 m and at 1.5 m intervals thereafter at the scale structure and building structure locations. At the scale approach ramps, subsoil samples were retrieved at 0.7 m intervals for the surficial 3 m and at 1.5 m intervals thereafter. In all cases, sample retrieval was conducted in accordance with the Standard Penetration Test (SPT-ASTM D1586).

Rock core samples were also retrieved at one borehole at each scale structure location. Conventional rock coring methods employing BQ and NQ core barrels within the hollow stem augers (casing was not used) was applied to retrieve the rock core samples.

All subsoil samples and rock core samples were identified in the field and then returned to the laboratory for applicable testings. Subsoil samples were transported in plastic lid containers to preserve natural moisture contents and rock core was placed in standard cardboard rock core boxes.

Groundwater levels were obtained by monitoring the levels in the open boreholes throughout the duration of the field investigation. All open boreholes were backfilled at the completion of the fieldwork.

Survey information related to the location and elevation of the boreholes was provided by Central Region Surveys and Plans.

Laboratory Analysis

All subsoil samples were visually examined in the laboratory and to further identify the behaviour, gradation and pertinent properties of the soil, various laboratory tests were performed as identified in Table 1 below.

Table 1 - Laboratory Subsoil Tests

1) Natural Moisture Contents
2) Atterberg Limit Tests
3) Grain Size Distributions
4) Bulk Unit Weights

Rock core samples were logged in the laboratory and physical characteristics were identified.

Laboratory test results have been summarized in the subsequent section of this report entitled "Subsurface Conditions", and are illustrated on corresponding figures and boreholes included in the attached Appendix.

SUBSURFACE CONDITIONS

The surface elevation at the site varies between 86.3 m and 83.0 m, the variation reflecting the presence of the existing Service Road embankments at the site. In general, the subsurface conditions across the entire site area are uniform. A cohesive heterogeneous mixture of clayey silt, sand and gravel (Glacial Till) is the predominant deposit at the site. The deposit exists surficially at the sorter and static scales and truck inspection building locations at the proposed North Truck Inspection Roadway and extends for a thickness ranging from approximately 7.9 m to 9.1 m below the existing ground surface. The material in the deposit has a hard consistency and beyond the surficial metre or so, can be classified as unyielding.

The aforementioned deposit is also predominant at the scales and building sites along the proposed South Truck Inspection Roadway. However, in view of the close proximity of the proposed South Truck Inspection Roadway to the existing South Service Road, the deposit is overlain by some fill material at some locations. The fill material consists of brown, cohesionless sand and gravel, approximately 0.8 m in thickness overlying up to 1.2 m of an irregular mixture of clayey silt, sand and gravel at the locations where the proposed scales intersect the existing South Service Road.

The cohesive heterogeneous mixture of clayey silt, sand and gravel existing beneath the fill material as described above or present surficially elsewhere along the South Truck Inspection Roadway extends for thicknesses ranging from approximately 1.9 m to 9.1 m. In general, the deposit has a thickness approaching the upper limit of this range (7 to 9 m), but at the proposed sorter scale no. 1 along the South Truck Inspection Roadway, the cohesive deposit of glacial till origin is underlain by a second deposit of glacial till origin

consisting of a heterogeneous mixture of silt, sand and gravel. Unlike the upper deposit which exhibits a cohesive behaviour because of the presence of the clayey silt binder material, the lower heterogeneous mixture of silt, sand and gravel is cohesionless. The thickness of this deposit is approximately 5 m.

The overburden at the site is underlain by shale bedrock with interbedded siltstone of the Queenston Formation, generally at depths ranging from approximately 7.6 m to 9.1 m below the existing ground surface (elevation 76.3 m to 74.6 m).

The boundaries between the various soil types, in situ and laboratory test results as well as groundwater levels established at the time of investigation are shown on the attached Record of Borehole sheets in the Appendix. A plan of the site illustrating the locations and elevations of the boreholes and subsoil stratigraphical sections are provided on Dwg. 25129001-A&B & 25139001-A&B also included in the Appendix.

A detailed description of the subsurface conditions encountered is given below.

Sand and Gravel (Fill Material)

A brown, cohesionless sand and gravel with a trace of silt exists as the base material for the existing South Service Road and was encountered at boreholes advanced in conjunction with Sorter Scale No. 1 and the Static Scale along the proposed South Truck Inspection Roadway (Boreholes D1 series and S1). The thickness of this granular material is approximately 0.8 m.

Irregular Mixture of Clayey Silt, Sand and Gravel (Fill Material)

Underlying the cohesionless sand and gravel fill material at the locations described above, a cohesive fill material consisting of an irregular mixture of clayey silt, sand and gravel exists. Traces of black organic inclusions are also present within the brown fill material. This fill material has a thickness ranging from approximately 0.6 m to 1.5 m.

Grain size distribution curves as determined by hydrometer and mechanical sieve analysis on samples of the fill material are shown in Figure 1 in the Appendix.

The gradations reveal that approximately 80-85% of the material is finer than 75 micrometres.

Atterberg Limit Tests were carried out on the fine grained portion of the Fill Material (less than 75 micrometres) to define the behaviour and plasticity of the material. The results of tests carried out on two(2) samples reveal a liquid limit (w_L%) ranging from 34% to 35% and a plasticity index (Ip) of 13% and 14%, as illustrated on Figure 2 in the Appendix. Consequently, the fine grained material is classified as a clayey silt of low plasticity. The natural moisture content of the material is approximately 25%.

The 'N' values as determined by the Standard Penetration Test (SPT) revealed a range of 7 blows/0.3 m to 21 blows/0.3 m indicating that the material has a firm to very stiff consistency.

Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)

Underlying the fill material as described above and present surficially elsewhere across the site, the predominant deposit across the entire site consists of a native heterogeneous mixture of clayey silt, sand and gravel. This deposit of glacial till origin also contains boulders and cobbles as inferred by augering grinding during the borehole advancement. In addition, shale fragments are generally present in the lower metre or so of the deposit, where the deposit is underlain by bedrock. This is generally the case, except at the proposed Sorter Scale No. 1 location along the South Truck Inspection Roadway, where the deposit is underlain by a cohesionless heterogeneous mixture of silt, sand and gravel as discussed later below. Random layers of sand and gravel up to 0.3 m in thickness are also present within the deposit.

The upper thickness of the deposit has been oxidized and is generally brown in colour, although on occasion was also reddish-brown in colour. The depth of oxidization within the deposit ranges from 1.4 m to 4.5 m, but on average is generally in the 3 m range. Beneath the oxidized depth, the material is grey and then exhibits a red hue immediately above the bedrock, where the bedrock underlies this deposit. The red coloured material is up to approximately 2 m above the bedrock surface.

The main component of this unsorted, unstratified deposit is the clayey silt material. This material essential binds the coarser sands and gravels within the deposit. A grain size distribution envelope for the deposit as determined by mechanical sieve and hydrometer analyses is given in Figure 3 in the Appendix. The envelope includes particle sizes up to 75 mm (coarse gravel) and hence excludes the boulder and cobble sizes. The envelope does reveal that the fine grained portions (less than 75 micrometres) contribute approximately 50 to 80% of the deposit.

Atterberg Limit Tests were carried out to define the behaviour and plasticity of the fine grained portion of the soil and the results are plotted in Figure 4. A summary of the indices is provided in Table 1 below. Bulk Unit Weights are also included in the Table.

Table 1 - Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)

	Range	# of Tests
Natural Moisture Content (w%)	7-16	18
Liquid Limit (w_L%)	17-26	18
Plasticity Index (Ip%)	6-13	18
Unit Weight (kN/m^3)	22.8-27.5	11

The test results reveal that the fine grained portion of the deposit is of low plasticity and hence is classified as clayey silt. Natural moisture contents are generally less than the plastic limit of the soil indicating that the material is in a plastic to semi-solid state.

Standard Penetration Tests carried out in this deposit revealed 'N' values ranging from 14 blows/0.3 m to 63 blows/0.3 m for the upper 1 to 2 m of the deposit, indicating a stiff to hard consistency. Below this upper thickness of the deposit, 'N' values are consistently over 100 blows/0.3 m revealing the hard consistency of this overconsolidated material.

Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till)

At the proposed Sorter Scale No. 1 at the South Truck Inspection Roadway, a cohesionless heterogeneous mixture of silt, sand and gravel underlies the aforementioned cohesive heterogeneous mixture of clayey silt, sand and gravel. In addition, random interbeds of this material approximately 1 m in thickness is found within the cohesive deposit. At the Sorter Scale No. 1 location, the deposit, which is also a glacial till, exists at a depth of 3.8 m to 4.6 m below the existing ground surface (elevation 82.5 to 80.5 m) and extends for a thickness ranging from 5 m to 5.3 m. The deposit is grey in colour and as inferred by auger grinding, boulders and cobbles are also present within this deposit.

A grain size distribution envelope determined by mechanical sieve and hydrometer analyses is given in Figure 5 in the Appendix. Boulder and cobble sizes are not illustrated on the figure.

Standard Penetration Tests carried out in this deposit revealed 'N' values exceeding 100 blows/0.15 m indicating that the deposit has a very dense denseness.

Bedrock

The overburden across the site is underlain by Shale bedrock with interbedded Siltstone of the Queenston Shale Formation. Hence, the bedrock is overlain by the heterogeneous mixture of clayey silt, sand and gravel except at Sorter Scale No. 1 (South Truck Inspection Roadway) where it is overlain by the heterogeneous mixture of silt, sand and gravel. The depth to bedrock ranges from 7.6 m to 9.1 m below the existing ground surface, equivalent to elevations ranging from 77.3 m to 74.3 m. The bedrock surface appears to be generally flat and horizontal across the site.

Bedrock was cored in both BQ and NQ size in thicknesses ranging from 1.5 m to 3.0 m.

The shale bedrock is generally greyish red and has randomly interbedded greenish grey layers ranging from approximately 25 mm to 0.5 mm in thickness. The rock is horizontally bedded and is extremely friable material. The rock contains close to extremely closed spaced fractures that are generally flat, planar to undulating and smooth. The rock has been moderately weathered at most locations, except at the north static scale location (BH S4) where the rock is slightly weathered to unweathered. Core recoveries and Rock Quality Designations (RQD) were determined in situ and also in the laboratory to evaluate the competence and integrity of the rock. Core recoveries ranged from 50% to 100% and RQD's were in the 0 to 53% range. RQD's, however were generally less than 15%. These results, in addition to visual examination, suggest that the rock quality is very poor and the rock is weak to very weak in strength.

A detailed description of the characteristics and properties of the rock as determined by the logging of the rock core in the laboratory is attached in the Appendix under the heading "Rock Core Descriptions".

GROUNDWATER CONDITIONS

Observation of the groundwater level was carried out by measuring the water level in the open boreholes throughout the duration of the field investigation. The water levels determined at each structure location are summarized in Table 2 below.

Table 2 - Groundwater Levels

Roadway	Structure	Depth (w)	Elevation (m)
South Truck Inspection	Sorter Scale No. 1	2-2.4	84.3-83.9
	Sorter Scale No. 2	1.5-3.4	82.8-80.9
	Static Scale	Dry-1.5	<78.5-81.8
	Building	6.4	77.3
North Truck Inspection	Sorter Scale No. 1	Dry	-
	Sorter Scale No. 2	2-4.3	81-78.7
	Static Scale	4.3	79.7
	Building	3.7	80.4

The water level depths reflect a large variation across the site. The water levels observed at shallow depths (1.5 to 2.5 m) illustrate the effect of the subartesian condition of either cohesionless sand and gravel layers confined within the cohesive heterogeneous mixture of clayey silt, sand and gravel deposit or the cohesionless heterogeneous mixture of silt, sand and gravel confined between the bedrock and the heterogeneous mixture of clayey silt, sand and gravel. At the locations where these materials were not encountered, the boreholes were dry or the water level was at depths ranging from 3.5 m to 6.4 m.

Groundwater levels, in general, are subject to seasonal fluctuations and hence can vary from the values given in this report.

DISCUSSION AND RECOMMENDATIONS

It is proposed to construct truck inspection stations along the Q.E.W. Eastbound and Westbound between Maple Grove Road and Cherry Road within the Town of Lincoln. This project will include the widening of the existing Q.E.W. from 4 lanes to 6 lanes and will necessitate the relocation of the existing North and South Service Road to facilitate the Truck Inspection roadways. The Truck Inspection Roadways will be located between the Q.E.W. and the North Service Road and also between the Q.E.W. and the South Service Road.

Each truck inspection station will consist of two sorter scales, a static scale and a building. The sorter scales are dynamic "weigh-in-motion" scales that contains a scale vault, approximately 10 metres in length by 4 metres in width and 1 metre depth and approach slabs on grade. The static scale pit typically has dimensions of approximately 25 m length, 4.5 m width and 2.5 m deep. Approach ramps are located at either end of the static scale pit for a length of 5 m and a 10 m levelling pad are to be designed and constructed beyond the approach slab. The building is a single storey dwelling with a 2.75 m basement below finished grade. The building has a vertical height of 2.9 m to the underside of the roof truss and consists of reinforced concrete basement walls and timber framing with brick veneer above ground level.

The proposed profile grade for the South and North Truck Inspection Roadways ranges from approximately 85 to 86 m. Existing ground surface elevations range from approximately 83.5 m to 85 m. Consequently, embankment fills up to 2.5 m will be required in the construction of these roadways.

Recommendations pertaining to the following foundation and geotechnical considerations are included in the scope of this report.

1) Structure Foundations
2) Lateral Earth Pressure on Scale Pit Walls
3) Approach Slabs and Levelling Pads
4) Construction Considerations
5) Other Considerations

1) STRUCTURE FOUNDATIONS

In view of the sound, competent nature of the heterogeneous mixture of clayey silt, sand and gravel deposit spread across the site, all structure foundations can be founded on conventional spread footings within this deposit. Recommendations pertaining to the soil bearing capacities and founding elevations are summarized for each structure below. Should the alternative of supporting the foundation on a compacted Granular 'A' pad placed on the competent native heterogeneous mixture of clayey silt, sand and gravel provide an economical and technically feasible option, this design can also be considered as described below.

SPREAD FOOTINGS ON NATIVE SOIL

Truck Inspection Buildings

The truck inspection buildings at both the North and South Truck Inspection Roadways can be founded within the native heterogeneous mixture of clayey silt, sand and gravel at a depth below the natural ground surface that satisfies the frost penetration criteria equivalent to 1.2 m at the site. For purposes of the O.H.B.D.C., recommended bearing capacities are provided in Table 3 below at or below the given elevations.

Table 3 - Bearing Capacities -
Truck Inspection buildings

Truck Inspection Building	Finished Ground Floor (m)	Basement Floor Elevation (m)	Existing Ground Elevation (kPa)	Bear. Capacity at S.L.S. Type II (kPa)	Fact. Capacity at U.L.S. (kPa)	Founding Elevation (m)
South	85.11	82.36	83.7	N/A	1000	82.9
North	85.21	82.46	83.8-84.0	N/A	1000	83.0

In view of the unyielding nature of the native subsoil at the site location, pressures that will produce 10 mm of settlement will exceed the factored capacity at U.L.S., and consequently will not govern the foundation design.

Any softened and/or organic material present at the founding elevation shall be removed and replaced with mass concrete or compacted granular material. In addition, it is recommended that a concrete working slab be provided following excavation to protect the bearing surface from the effects of weathering and construction disturbances.

Slab-on-grade construction can be employed on the native soil provided that all softened and/or organic material at the subgrade surface is removed. Total and differential settlements will be negligible because of the unyielding property of the soil.

A vapour barrier consisting of at least 200 mm of 20 mm clear crushed stone or equivalent free-draining material shall be installed under the floor slab. The vapour barrier material shall be placed and compacted in accordance with OPSS 501 series which indicates a target compaction of 100% of the maximum dry density.

Under slab and perimeter foundation drainage is recommended even though the amount of seepage water to be collected is expected to be minimal. The drainage system can consist of a drainage tile (100 m diameter weeping tile or equivalent perforated pipe) surrounded by a suitable soil filter or geotextile filter fabric. The perforated pipe is to drain to a positive sump and since the water can develop its own gradient, a minimum drain slope should suffice.

Foundation walls should be damproofed using an applied bitumen membrane or equivalent. The backfill to the foundation walls shall be free draining materials such as MTO Granular 'A' or Granular 'B' and compacted to 98% Standard Proctor density. Hand controlled light compaction equipment shall be used.

Underslab drains and perimeter foundation drains shall be designed as separate systems and hence shall not be connected.

Scales

Spread Footings on Native Soil

Static and sorter scales can also be founded within the native heterogeneous mixture of clayey silt, sand and gravel deposit. For purposes of the O.H.B.D.C., bearing capacities and founding elevations have been summarized in Table 4 below to facilitate the foundation design. In all cases, frost penetration depth criteria must be satisfied (1.2 m).

Table 4 - Bearing Capacities - Scales

Truck Inspection Roadway	Scale	Final Grade Elevation (m)	Existing Ground Elevation (kPa)	Bear. Capacity at S.L.S. Type II (kPa)		Fact. Capacity at U.L.S. (kPa)	Founding Elevation (m)
				10 mm	25 mm		
South	Static	84.8	83.3-84.9	N/A	N/A	1000	82.5
	Sorter#1	86.4	86.3	N/A	N/A	1000	84.0
	Sorter#2	85.2	84.5	N/A	N/A	1000	83.0
North	Static	84.9	84.2	N/A	N/A	1000	83.0
	Sorter#1	84.4	83.4	N/A	N/A	1000	82.0
	Sorter#2	84.9	83.0	450	550	825	81.0

In most cases, the bearing capacity at the serviceability limit state (S.L.S. Type II) will not govern the foundation design because the pressures required to produce 10 mm or 25 mm of settlement will exceed the factored capacity at U.L.S. However, at Sorter Scale No. 2 for the North Truck Inspection Roadway, weaker subsoil conditions dictate that the serviceability condition be considered. Consequently, bearing pressures that will produce 10 mm (450 kPa) and 25 mm (550 kPa) have been given.

As previously recommended at the Truck Inspection Buildings, all softened and/or organic material present at the founding elevation shall be removed and replaced

with mass concrete or compacted granular material. A concrete working slab is also recommended to preserve the founding soil.

The scale pit slab-on-grade shall be designed as previously discussed in conjunction with at the Truck Inspection Building. A vapour barrier consisting of at least 200 mm of 20 mm clear crushed stone or equivalent free draining material shall be installed beneath the slab. The vapour barrier material shall be placed and compacted in accordance with OPSS 501 series which indicates a target compaction of 100% of the maximum dry density.

Under slab and perimeter foundation drainage is recommended even though the amount of seepage water to be collected is expected to be minimal. The drainage system for the scale pits should be designed as previously discussed in conjunction with the Truck Inspection Buildings.

Spread Footings on Compacted Granular 'A'

Sections and details of Standard Static Scale Pits and Sorter Scale Pits reveal depths of approximately 2.5 m and 1.0 m respectively. A comparison of these depths and the resulting elevations with the recommended founding elevations as identified in Table 4 is summarized below in Table 5.

Table 5 - Scale Pit Soffit Elevations

Truck Inspection Building	Scale	Final Grade Elevation (m)	Pit Soffit Elevation (kPa)	Founding Elevation (m) (as given in Table 4)
South	Static	84.8	82.3	82.5
	Sorter#1	86.4	85.4	84.0
	Sorter#2	85.2	84.2	83.0
North	Static	84.9	82.4	83.0
	Sorter#1	84.4	83.4	82.0
	Sorter#2	84.9	83.9	81.0

The results reveal that the pit soffit elevation for all the sorter scales are above the founding elevations for foundations within the native heterogeneous mixture of clayey silt, sand and gravel (Glacial Till). The elevation difference can be eliminated by placing a compacted Granular 'A' pad on the native subsoil and in turn supporting the scale pit on the compacted Granular 'A' material, as illustrated in Figure 6. The Granular 'A' pad shall extend a minimum 1 m edge distance from the top of footing in both longitudinal and transverse directions and contain 1H:1V slopes in all directions. The backfill beyond the Granular 'A' material can consist of acceptable borrow material as defined in OPSS 212.05. The Truck Inspection Roadway embankments beyond the granular core should be constructed with 2H:1V slopes and protected against erosion using conventional procedures.

The Granular 'A' pad shall be placed and compacted in accordance with OPSS 501 series to achieve 100% maximum dry density.

All existing fill material, organic or deleterious material shall be removed prior to the placement of the Granular 'A' material. After removal of this material, the exposed subgrade surface should be proof-rolled by suitable compaction equipment. Any wet or softened areas observed during proof-rolling shall be removed.

For the conditions described above, the Sorter Scale Pit Foundations can be designed using the bearing capacities as summarized in Table 6 below. The Table also includes estimated subexcavation depths and Granular 'A' pad thicknesses.

Table 6 - Spread Footings on Granular 'A'

Truck Inspection Building	Scale	Subexcavation Depth (m)	Subexcavation El. (m)	Granular 'A' Pad Thicknesses (m)	Bearing Capacity at S.L.S. Type II (kPa)		Factored Capacity at U.L.S. (kPa)
					10 mm	25 mm	
South	Sorter#1	2.3	84	2.4	250	350	900
	Sorter#2	1.0	83.5	1.7	250	350	900
North	Sorter#1	0.9	82.5	1.9	250	350	900
	Sorter#2	2.0	81.0	3.9	250	350	900

Two different bearing capacities have been given at the serviceability limit state, representing the bearing pressures expected to produce indicated settlements of 10 mm and 25 mm. These settlements will be the result of the recompression of the native soil and hence will be elastic in nature.

Under slab and perimeter foundation drainage should be designed as previously discussed for the spread footings in the native soil.

2) LATERAL EARTH PRESSURES ON SCALE PIT WALLS

The at-rest earth pressure condition shall be used in the computation of lateral pressures on the scale pit walls. Soil parameters to facilitate this computation are given in Table 7 below.

Table 7 - Lateral Earth Pressures

Soil	Bulk* Unit Weight (kN/m^3) γ	Unfactored Angle of Internal Friction (ϕ)	At Rest Earth Pressure Pressure Coefficient S.L.S. Type II	U.L.S.
Granular 'A'	22.8	35°	0.43	0.5
Het.Mix. of Clayey Silt, Sand and Gravel	23.0	35°	0.43	0.5

*Buoyant Unit Weights applicable below groundwater table.

3) APPROACH SLABS AND LEVELLING PADS

To avoid differential settlements between the scales and the approach ramps, it is prudent that all existing fill material, topsoil and other organic or deleterious materials and any softened material within the proposed approach slabs and levelling pads be removed prior to the construction. Anticipated depths of subexcavation at each of the scales are summarized in Table 8 below.

Table 8 - Subexcavation at Approach Ramps

Truck Inspection Roadway	Scale	Depth of Subexcavation (m)
South	Static	up to 2.3
	Sorter#1	2.3
	Sorter#2	Surficial Softened Material and/or Fill Material
North	Static	Surficial Softened Material
	Sorter#1	Surficial Softened Material
	Sorter#2	1.5

The table reveals larger magnitudes of subexcavation at the proposed South Truck Inspection Roadway scales. This is primarily the result of the presence of fill material that comprises the existing South Service Road. The proposed South Truck Inspection Roadway intersects the existing South Service Road at Sorter Scale No. 1 and is adjacent and parallel to the existing South Service Road at Sorter Scale No. 2 and the Static Scale.

Upon removal of any existing fill material, and any organic or deleterious materials within the proposed ramps, the exposed subgrade surface should be proof-rolled by suitable compaction equipment. Any wet or softened areas during proof-rolling should be removed.

New fill material placed on the proof-rolled subgrade and beneath the approach ramps shall consist of Granular 'A' or Granular 'B' material. The material shall be placed and compacted in accordance with OPSS 501 series.

4) CONSTRUCTION CONSIDERATIONS

Dewatering

In view of the impervious nature of the native heterogeneous mixture of clayey

silt, sand and gravel and the fact that most of the work is anticipated above the groundwater table anyway, no dewatering problems are anticipated during the construction of the truck inspection stations. Any localized seepage or surface runoff can be readily discharged and controlled employing conventional sump pump techniques.

Temporary Excavations

Any temporary excavation to facilitate the construction of the truck inspection stations shall be carried out no steeper than 1½:1V.

5) OTHER CONSIDERATIONS

It appears that the proposed South Sorter Scale No. 2 and South Static Scale may conflict with an existing sanitary forcemain that is located primarily within the existing South Service Road embankment slope. Consequently, it is essential that the implications of this conflict be adequately addressed. Under no circumstance shall the proposed scale be placed on the sanitary forcemain trench backfill material.

There is no additional settlement anticipated beneath the sanitary forcemain as a result of imposed additional loadings due to the competent native subsoil conditions present at the site, provided that the sanitary sewer bedding material was appropriate and properly placed.

It is recommended that this office be contacted once the details of the proximity of the proposed scales and the existing forcemain are finalized so that their relative influence can be accurately assessed.

MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of T. Sangiuliano, Foundation Engineer utilizing equipment owned and operated by Longyear Canada Inc.

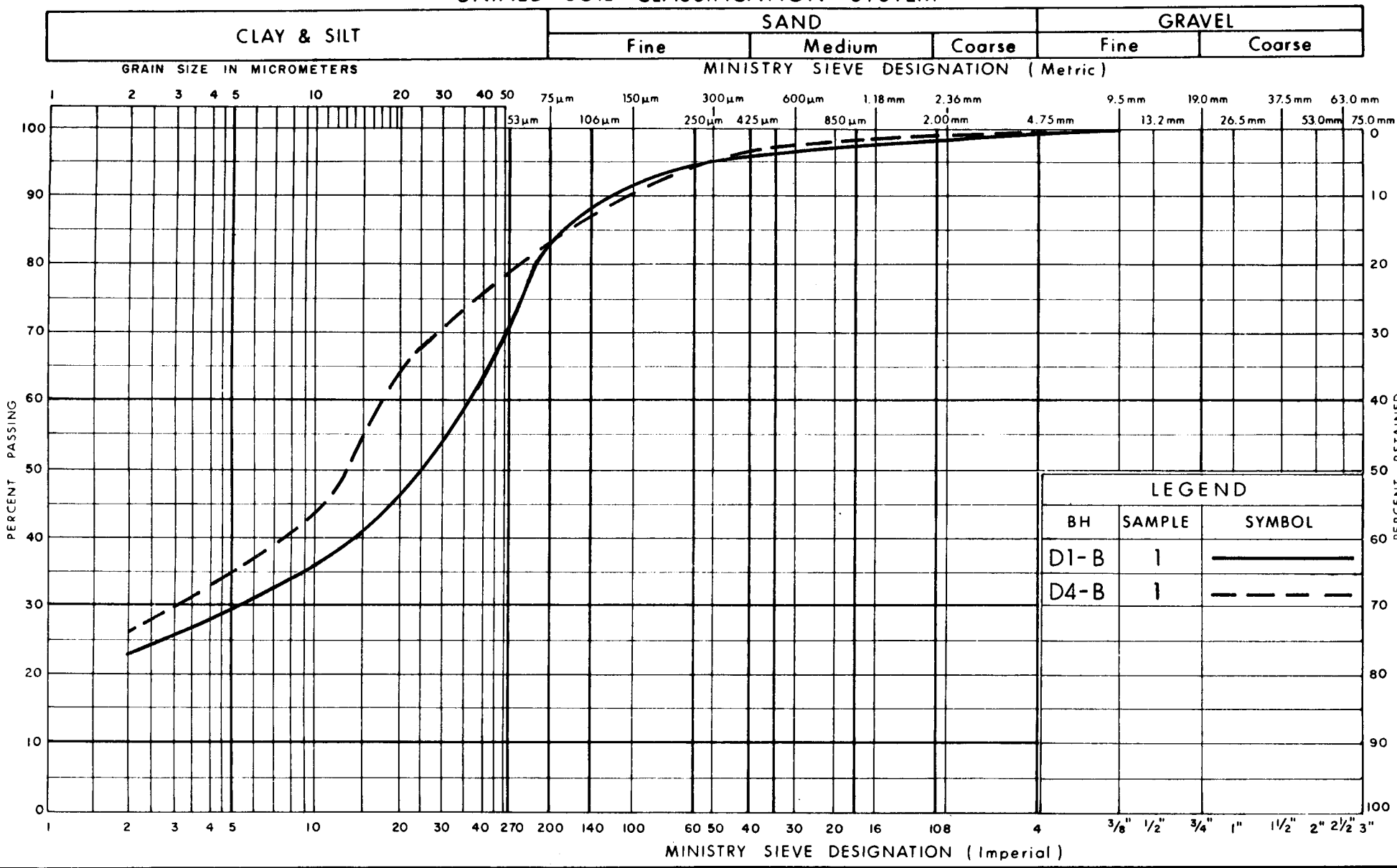
The project was carried out by T. Sangiuliano under the general supervision of P. Payer, Senior Foundation Engineer. The report was written by T. Sangiuliano, reviewed by P. Payer and approved by M.S. Devata, Chief Foundation Engineer.

T. Sangiuliano, P.Eng.
Foundation Engineer

M.S. Devata, P.Eng.
Chief Foundation Engineer

APPENDIX

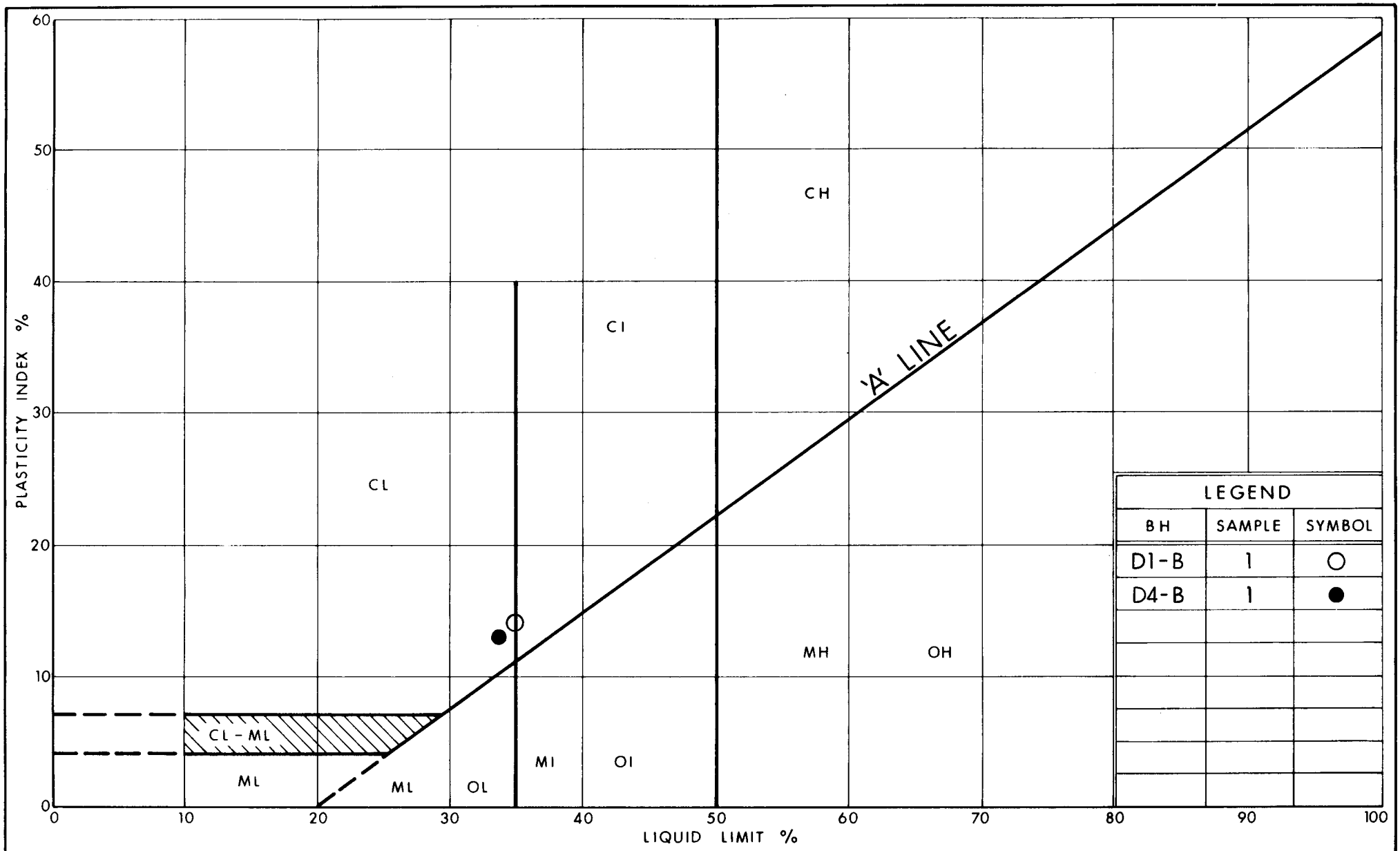
UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION
IRREGULAR MIXTURE OF
CLAYEY SILT, SAND & GRAVEL (FILL MATERIAL)

FIG No 1
W P 2512 - 90 - 01
2513 - 90 - 01



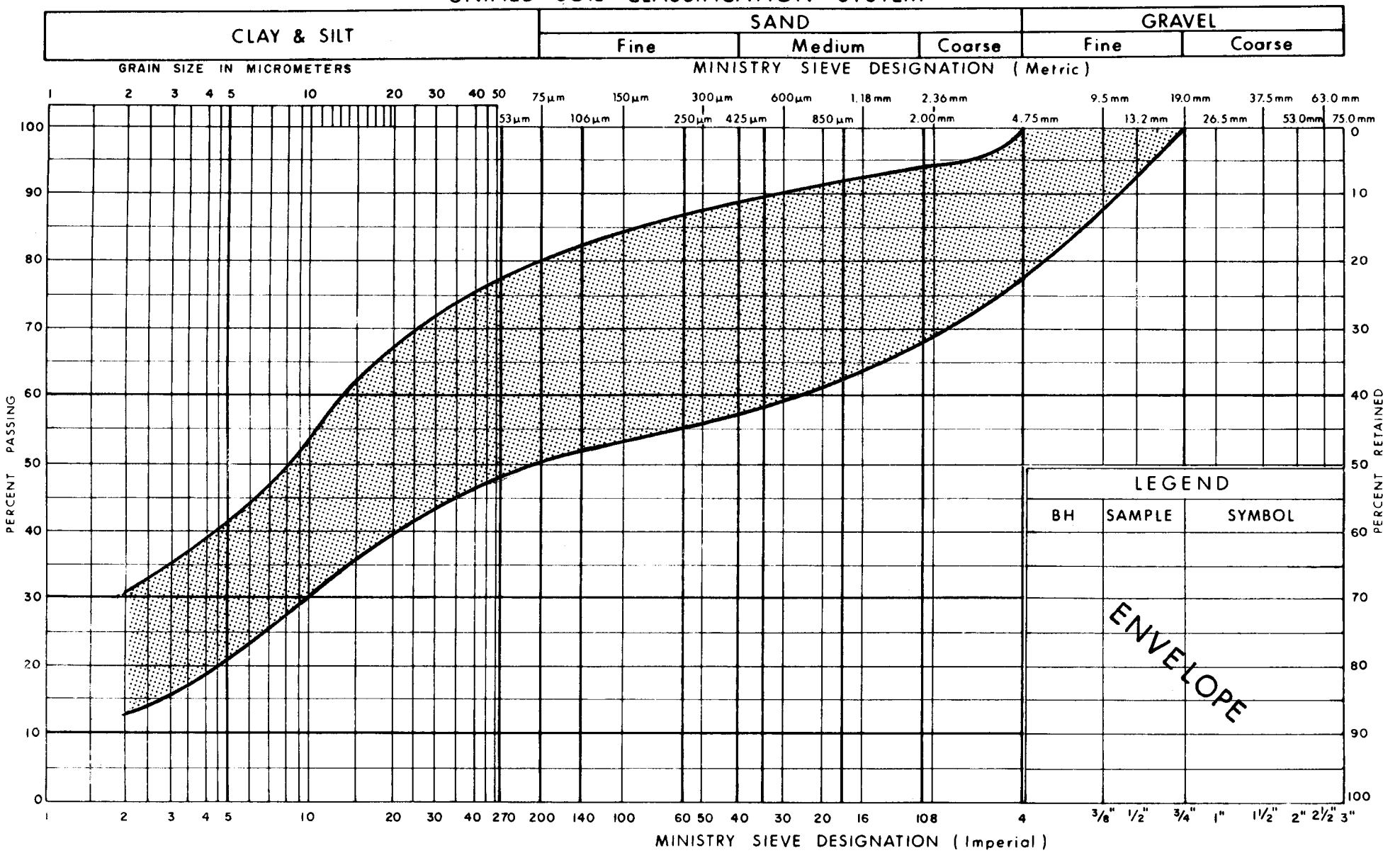
Ministry of Transportation
Ontario

PLASTICITY CHART
IRREGULAR MIXTURE OF
CLAYEY SILT, SAND & GRAVEL (FILL MATERIAL)

FIG No 2
W P 2512-90-01
2513-90-01

78 12 M

UNIFIED SOIL CLASSIFICATION SYSTEM



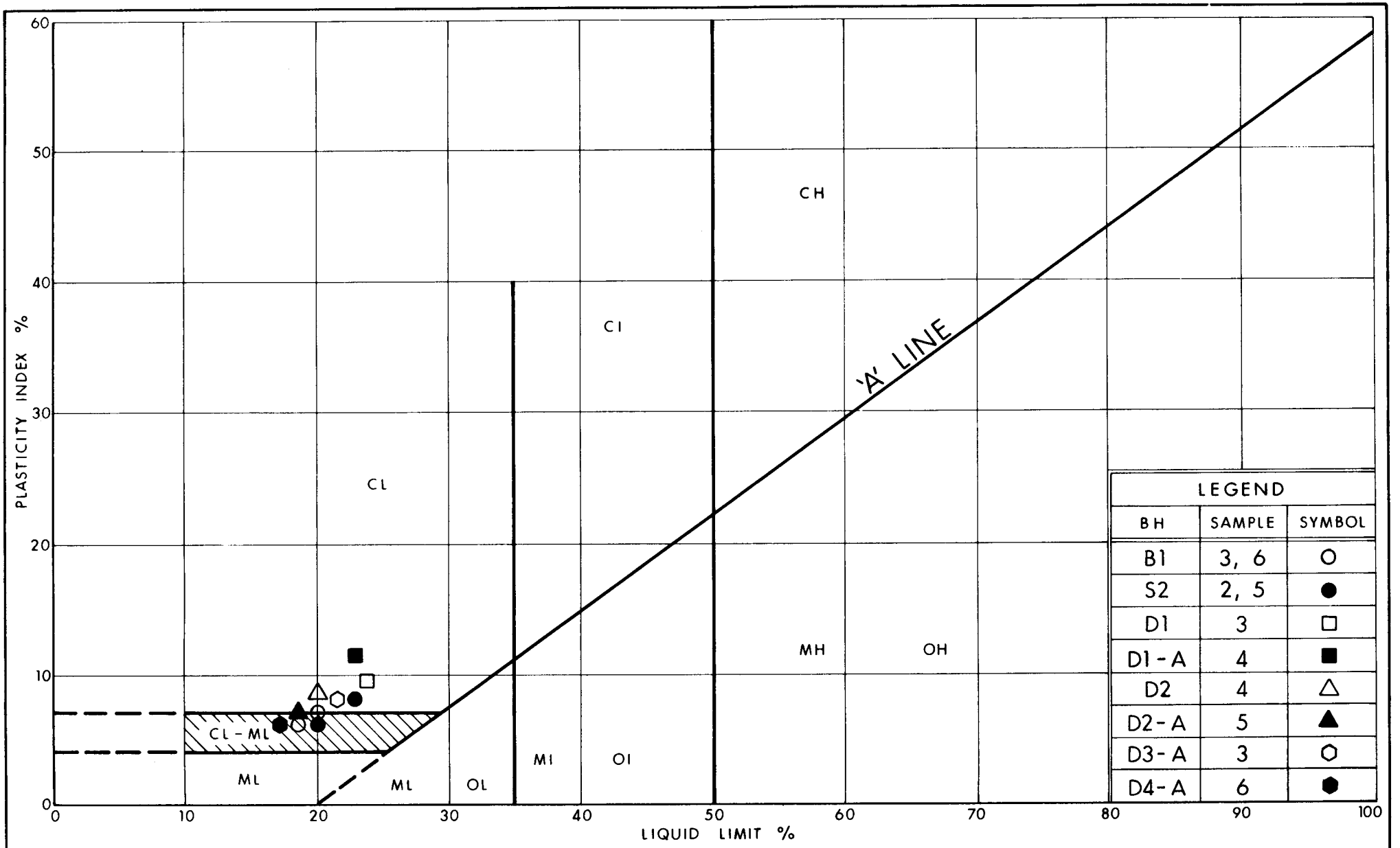
Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION
HET MIXTURE OF
CLAYEY SILT, SAND & GRAVEL (Glacial Till)

FIG No 3

W P 2512-90-01
2513-90-01

25



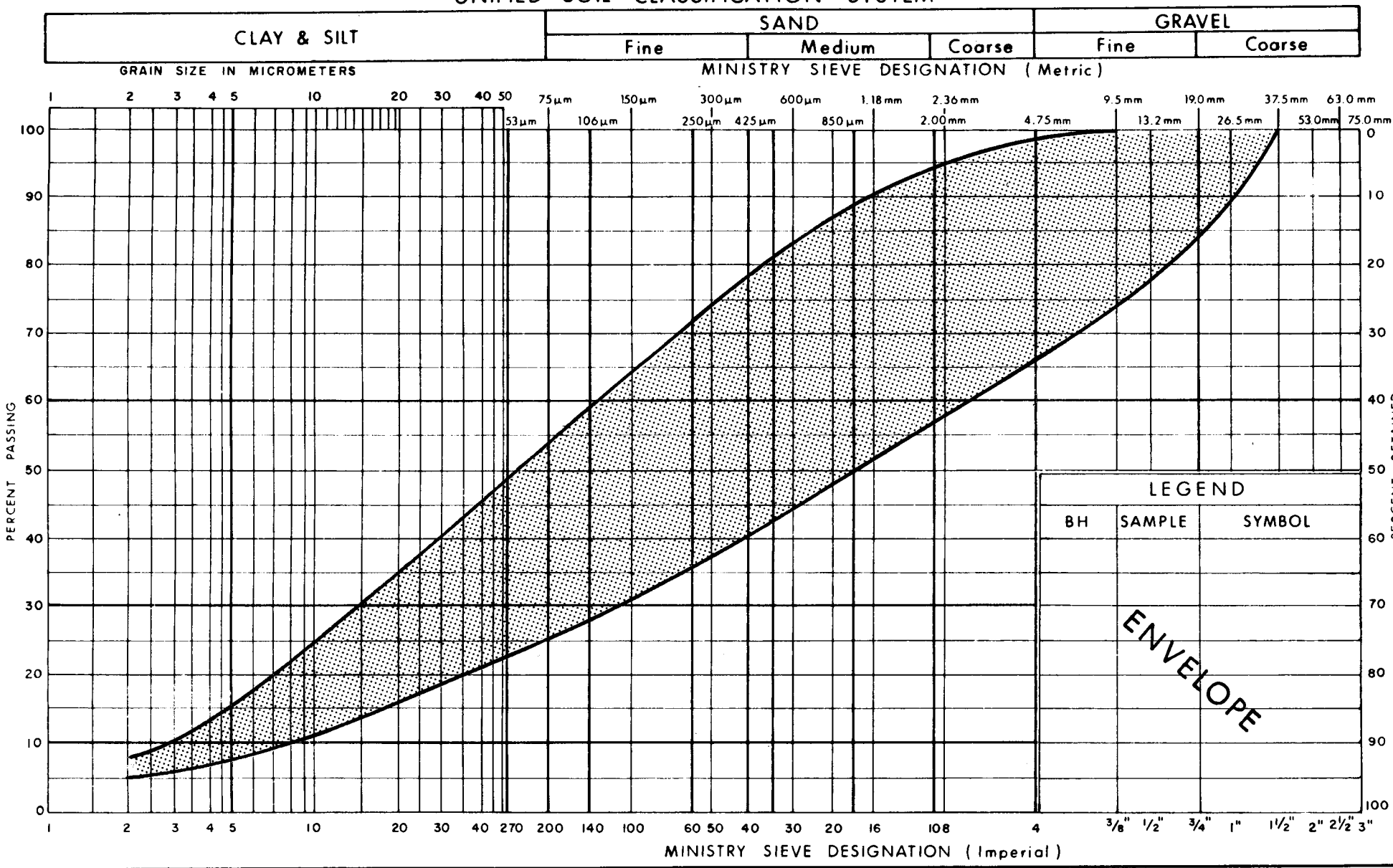
Ministry of Transportation
Ontario

PLASTICITY CHART
HET MIXTURE OF
CLAYEY SILT, SAND & GRAVEL (Glacial Till)

FIG No 4

W P 2512-90-01
2513-90-01

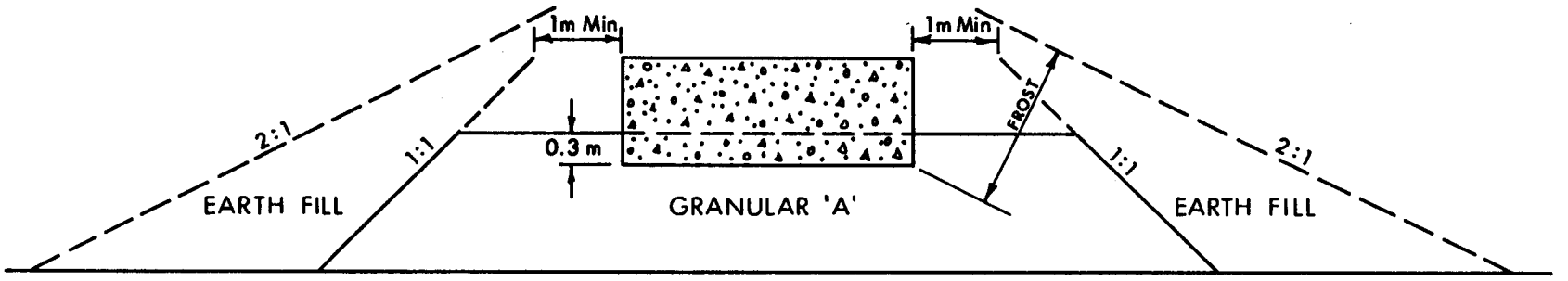
UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of Transportation
Ontario

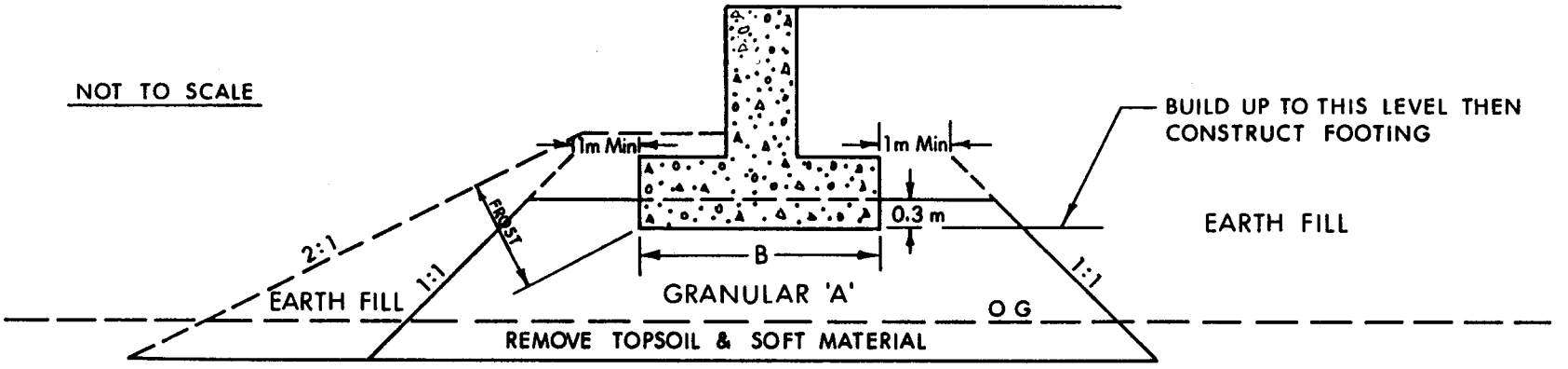
GRAIN SIZE DISTRIBUTION
HET MIXTURE OF
SILT, SAND & GRAVEL (Glacial Till)

FIG No 5
W P 2512-90-01
2513-90-01



X SECTION

NOT TO SCALE



LONGITUDINAL SECTION

NOTES:

1 - REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' & EARTH FILL.

2 - PLACE GRANULAR 'A' & EARTH FILL TO BOTTOM OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M T O STANDARDS.

3 - CONSTRUCT CONCRETE FOOTING.

4 - PLACE REMAINDER OF GRANULAR 'A' & EARTH FILL AS REQUIRED.

Ministry of Transportation Ontario	SCALES ON COMPACTED FILL SHOWING GRANULAR 'A' CORE	FIG No 6 W P 2512 - 90 - 01 2513 - 90 - 01

ROCK CORE DESCRIPTION
WP 2512-90-00

CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
S2	11 12	9.30-10.82 10.82-12.34	78 50	0 0	9.30-12.34	**SHALE,** greyish red, with interbedded greenish grey **SILTSTONE** (6%); very fine grained; weak to very weak; unweathered to slightly weathered (moderately weathered, 9.30-12.29 m); fractures extremely close to close spaced, flat, planar to undulating, smooth.
D1	11	9.30-10.82	100	0	9.30-10.82	**SHALE,** greyish red, with interbedded greenish grey **SILTSTONE** (20%); very fine grained; weak to very weak; unweathered to slightly weathered (moderately weathered, 9.30-10.62 m); fractures extremely close to close spaced, flat, planar to undulating, smooth.
D2	10	7.77-9.30	82	18	7.77-9.30	**SHALE,** greyish red, with interbedded greenish grey **SILTSTONE** (12%); very fine grained; weak to very weak; unweathered to slightly weathered (moderately weathered, 7.77-8.84 m); fractures close to extremely close spaced, flat, planar to undulating, smooth.

***CR** = CORE RECOVERY
***RQD** = ROCK QUALITY DESIGNATION

(NOTE: Depths are approximated where core recovery is less than 100%)

Logged by: DAW, Soils and Aggregates Section

ROCK CORE DESCRIPTION
WP 2513-90-00

CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
S4	11	9.14-10.67	82	53	9.14-10.67	**SHALE**, greyish red, with interbedded greenish grey **SILTSTONE** (12%); very fine grained; weak to very weak; unweathered to slightly weathered; fractures moderately close to very close spaced, flat, planar to undulating, smooth.
D3A	11	9.14-10.67	100	13	9.14-10.67	**SHALE**, greyish red, with interbedded greenish grey **SILTSTONE** (15%); very fine grained; weak to very weak; moderately weathered; fractures extremely close to close spaced, flat, planar to undulating, smooth.
D4	11	9.14-10.67	100	7	9.14-10.67	**SHALE**, greyish red, with interbedded greenish grey **SILTSTONE** (15%); very fine grained; weak to very weak; unweathered to slightly weathered (moderately weathered, 9.14-10.26 m); fractures extremely close to close spaced, flat, planar to undulating, smooth.

***CR** = CORE RECOVERY
***RQD** = ROCK QUALITY DESIGNATION

(NOTE: Depths are approximated where core recovery is less than 100%)

Logged by: DAW, Soils and Aggregates Section

EXPLANATION OF TERMS USED IN REPORT

N VALUE: THE STANDARD PENETRATION TEST (SPT) N VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 51mm O.D. SPLIT BARREL SAMPLER TO PENETRATE 0.3m INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WITH A MASS OF 63.5kg, FALLING FREELY A DISTANCE OF 0.76m. FOR PENETRATIONS OF LESS THAN 0.3m N VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. AVERAGE N VALUE IS DENOTED THUS $\bar{N}$.

DYNAMIC CONE PENETRATION TEST: CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (51mm O.D. 60° CONE ANGLE) DRIVEN BY 475 J IMPACT ENERGY ON 'A' SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 0.3m ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH (c_u) AS FOLLOWS:

c_u (kPa)	0 - 12	12 - 25	25 - 50	50 - 100	100 - 200	>200
	VERY SOFT	*SOFT*	*FIRM*	*STIFF*	*VERY STIFF*	*HARD*

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF DENSENESS AS INDICATED BY SPT N VALUES AS FOLLOWS:

N (BLOWS/0.3m)	0 - 5	5 - 10	10 - 30	30 - 50	>50
	VERY LOOSE	*LOOSE*	*COMPACT*	*DENSE*	*VERY DENSE*

ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH OF THE CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE INTACT CORE PIECES, 100mm+ IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	*POOR*	*FAIR*	*GOOD*	*EXCELLENT*

JOINTING AND BEDDING:

SPACING	50mm	50 - 300mm	0.3m - 1m	1m - 3m	>3m
JOINTING	*VERY CLOSE*	*CLOSE*	*MOD. CLOSE*	*WIDE*	*VERY WIDE*
BEDDING	*VERY THIN*	*THIN*	*MEDIUM*	*THICK*	*VERY THICK*

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

S S	SPLIT SPOON	T P	THINWALL PISTON
W S	WASH SAMPLE	O S	OSTERBERG SAMPLE
S T	SLOTTED TUBE SAMPLE	R C	ROCK CORE
B S	BLOCK SAMPLE	P H	T W ADVANCED HYDRAULICALLY
C S	CHUNK SAMPLE	P M	T W ADVANCED MANUALLY
T W	THINWALL OPEN	F S	FOIL SAMPLE

STRESS AND STRAIN

u_w	kPa	PORE WATER PRESSURE
r_u	1	PORE PRESSURE RATIO
σ	kPa	TOTAL NORMAL STRESS
σ'	kPa	EFFECTIVE NORMAL STRESS
τ	kPa	SHEAR STRESS
$\sigma_1, \sigma_2, \sigma_3$	kPa	PRINCIPAL STRESSES
ϵ	%	LINEAR STRAIN
$\epsilon_1, \epsilon_2, \epsilon_3$	%	PRINCIPAL STRAINS
E	kPa	MODULUS OF LINEAR DEFORMATION
G	kPa	MODULUS OF SHEAR DEFORMATION
μ	1	COEFFICIENT OF FRICTION

MECHANICAL PROPERTIES OF SOIL

m_v	kPa^{-1}	COEFFICIENT OF VOLUME CHANGE
C_c	1	COMPRESSION INDEX
C_s	1	SWELLING INDEX
C_α	1	RATE OF SECONDARY CONSOLIDATION
c_v	m^2/s	COEFFICIENT OF CONSOLIDATION
H	m	DRAINAGE PATH
T_v	1	TIME FACTOR
U	%	DEGREE OF CONSOLIDATION
σ'_{vo}	kPa	EFFECTIVE OVERBURDEN PRESSURE
σ'_p	kPa	PRECONSOLIDATION PRESSURE
τ_f	kPa	SHEAR STRENGTH
c'	kPa	EFFECTIVE COHESION INTERCEPT
ϕ'	-°	EFFECTIVE ANGLE OF INTERNAL FRICTION
c_u	kPa	APPARENT COHESION INTERCEPT
ϕ_u	-°	APPARENT ANGLE OF INTERNAL FRICTION
τ_R	kPa	RESIDUAL SHEAR STRENGTH
τ_r	kPa	REMOULDED SHEAR STRENGTH
S_t	1	SENSITIVITY = $\frac{c_u}{\tau_r}$

PHYSICAL PROPERTIES OF SOIL

ρ_s	kg/m^3	DENSITY OF SOLID PARTICLES
γ_s	kN/m^3	UNIT WEIGHT OF SOLID PARTICLES
ρ_w	kg/m^3	DENSITY OF WATER
γ_w	kN/m^3	UNIT WEIGHT OF WATER
ρ	kg/m^3	DENSITY OF SOIL
γ	kN/m^3	UNIT WEIGHT OF SOIL
ρ_d	kg/m^3	DENSITY OF DRY SOIL
γ_d	kN/m^3	UNIT WEIGHT OF DRY SOIL
ρ_{sat}	kg/m^3	DENSITY OF SATURATED SOIL
γ_{sat}	kN/m^3	UNIT WEIGHT OF SATURATED SOIL
ρ'	kg/m^3	DENSITY OF SUBMERGED SOIL
γ'	kN/m^3	UNIT WEIGHT OF SUBMERGED SOIL

e	1,%	VOID RATIO
n	1,%	POROSITY
w	1,%	WATER CONTENT
S_r	%	DEGREE OF SATURATION
w_L	%	LIQUID LIMIT
w_P	%	PLASTIC LIMIT
w_S	%	SHRINKAGE LIMIT
I_P	%	PLASTICITY INDEX = $w_L - w_P$
I_L	1	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
e_{max}	1,%	VOID RATIO IN LOOSEST STATE
e_{min}	1,%	VOID RATIO IN DENSEST STATE
I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
D	mm	GRAIN DIAMETER
D_n	mm	n PERCENT - DIAMETER
C_U	1	UNIFORMITY COEFFICIENT
h	m	HYDRAULIC HEAD OR POTENTIAL
q	m^3/s	RATE OF DISCHARGE
v	m/s	DISCHARGE VELOCITY
i	1	HYDRAULIC GRADIENT
k	m/s	HYDRAULIC CONDUCTIVITY
j	kN/m^3	SEEPAGE FORCE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No B1 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 772 E 311 406 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 17 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
83.7	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	47						
			2	SS	113		82				
			3	SS	120	/18cm			o ⊢	24.0	7 43 35 15
	Brown / Grey		4	SS	100	/5cm					
			5	SS	100	/10cm	80				
	Red		6	SS	100	/13cm			o ⊢	27.4	10 35 35 20
			7	SS	100	/3cm					
							78				
			8	SS	100	/15cm					
76.7	shale fragments		9	SS	100	/15cm					
7.0	End of Borehole										
	• 91 04 18										

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No B2 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 765 E 311 415 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 18 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
83.6	Ground Surface									
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	45					
			2	SS	120	/20cm	82			
	Brown		3	SS	100	/13cm				
	Grey		4	SS	100	/8cm				
			5	SS	100	/15cm	80			
	Red		6	SS	100	/13cm				
			7	SS	100	/13cm	78			
			8	SS	100	/13cm				
75.7	shale fragments		9	SS	100	/10cm	76			
7.9	End of Borehole (Probable Bedrock)									
	• 91 04 18									

$+^3$, $\times^5$: Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No B3 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 886 E 311 142 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 08 CHECKED BY PP

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
84.1	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	59						
			2	SS	75				o ⊢	23.5	8 24 50 18
	Brown / Grey		3	SS	120	/20cm	82				
			4	SS	100	/15cm			o ⊢		9 25 49 17
			5	SS	100	/15cm	80				
			6	SS	100	/15cm					
			7	SS	100	/15cm					
78.0											
6.1	Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till) Grey, Very Dense		8	SS	120	/23cm	78				
77.2											
6.9	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) trace shale fragments Red, Hard										
76.3			9	SS	100	/15cm					
7.8	End of Borehole										
	• 91 05 09										

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No B4 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 890 E 311 133 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 09 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa: o UNCONFINED + FIELD VANE; • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L; WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
83.8	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	52						
			2	SS	86		82				
	Brown / Grey		3	SS	106						
			4	SS	120	/20cm					
			5	SS	100	/15cm	80				
			6	SS	100	/13cm					
			7	SS	100	/15cm					
77.7							78				
6.1	Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till) Grey, Very Dense		8	SS	100	/15cm					
76.9											
6.9	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) trace shale fragments										
76.0	Red, Hard		9	SS	100	/8cm					
7.8	End of Borehole										
	• 91 05 10										

+³, x⁵: Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No D1 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 811 E 310 929 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY TS

DATUM Geodetic DATE 91 04 26 CHECKED BY PP

ELEV / DEPTH	SOIL PROFILE: DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, + FIELD VANE, • QUICK TRIAXIAL, × LAB VANE; 20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
86.3	Ground Surface (Road Shoulder)										
0.0 / 85.5	Sand and Gravel (Fill Material) Brown						86				
0.8 / 84.9	Irregular Mixture of Clayey Silt, Sand and Gravel (Fill Material) Stiff		1	SS	10					23.0	3 20 47 30
1.4	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Brown, Hard		2	SS	60	▼*					
			3	SS	90		84			23.5	4 23 55 18
82.5			4	SS	100	/13cm					
3.8	Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till) Grey, Very Dense		5	SS	100	/15cm					11 51 31 7
			6	SS	100	/15cm	82				
			7	SS	100	/15cm					
			8	SS	100	/15cm	80				
			9	SS	100	/15cm					
77.2							78				
9.1	Shale Bedrock with interbedded Siltstone Grey / Red Weak to Very Weak Moderately Weathered / Unweathered		10	SS	100	/15cm					
75.5							76				
10.8	End of Borehole										
	* 91 04 29										

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D1-A 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 807 E 310 938 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 29 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
86.3	Ground Surface (Roadway Shoulder)										
0.0	Sand and Gravel (Fill Material)						86				
85.5	Brown										
0.8	Irregular Mixture of Clayey Silt, Sand and Gravel (Fill Material)		1	SS	12						
			2	SS	21						
84.0	Brown with traces of Black Organics, Stiff to Very Stiff										
2.3	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Brown, Hard		3	SS	45	▼*	84				
			4	SS	80						6 31 46 17
82.1			5	SS	120	/15cm					
4.2	Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till) Grey, Very Dense		6	SS	100	/8cm	82				
			7	SS	100	/13cm					
			8	SS	100	/13cm	80		o		3 47 44 6
			9	SS	100	/10cm					
77.2							78				
76.8	Shale Bedrock – Grey, Weathered		10	SS	120	/18cm					
9.5	End of Borehole										
	* 91 04 30										

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No D1-B 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 815 E 310 914 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 29 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
85.1	Ground Surface										
0.0	Sand and Gravel (Fill Material)										
84.3	Brown										
0.8	Irregular Mixture of Clayey Silt, Sand and Gravel (Fill Material)		1	SS	7		84				1 15 61 23
83.6	Brown with traces Black Organics, Firm										
1.5	Very Stiff / Hard		2	SS	25						
			3	SS	67	▼*					
	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Brown		4	SS	100	/15cm	82				
80.5											
80.2	Het. Mixt. of Silt, Sand & Gravel **		5	SS	100	/15cm					
4.9	End of Borehole										

* 91 04 30

** (Glacial Till)

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D1-C 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 809 E 310 953 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 29 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
86.2	Ground Surface										
0.0	Sand and Gravel (Fill Material)						86				
85.4	Brown										
0.8	Irregular Mixture of Clayey Silt, Sand and Gravel (Fill Material)		1	SS	16						
84.2	Brown-Grey, Very Stiff		2	SS	12						
2.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Brown, Hard		3	SS	100	▼* /20cm	84				
			4	SS	100	/15cm					
81.6							82				
4.6 81.3	Het. Mixt. of Silt, Sand & Gravel **		5	SS	100	/15cm			o		10 36 49 5
4.9	End of Borehole										
	* 91 04 30										
	** (Glacial Till)										

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ⊕ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No D2 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 792 E 311 135 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY TS

DATUM Geodetic DATE 91 04 24 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
84.5	Ground Surface					•					
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	31		84				
			2	SS	100	/8cm					
			3	SS	100	/8cm	82				
	Brown / Grey		4	SS	128				o		5 26 52 17
			5	SS	100	/15cm					
			6	SS	100	/10cm	80				
			7	SS	100	/13cm					
			8	SS	120	/15cm					
76.9							78				
7.6	Shale Bedrock with interbedded Siltstone Red with interbedded Grey, Weak to Very Weak, Unweathered to Moderately Weathered		9	SS	100	/15cm					
			10	RC	REC =82%		76				RQD = 18 %
75.2											
9.3	End of Borehole • GWL not established										

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D2-A 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 789 E 311 145 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 25 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
84.3	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard						84				
			1	SS	30						
			2	SS	87						
	Brown / Grey		3	SS	120	/23cm	82				
			4	SS	100	/8cm					
			5	SS	100	/13cm			o ⊢		10 26 52 12
	Red		6	SS	100	/15cm	80				
			7	SS	100	/15cm					
			8	SS	100	/15cm					
76.7			9	SS	**		78				
7.6	End of Borehole * 91 04 26 ** Sampler Bouncing (Probable Bedrock)										

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No D2-B 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 789 E 311 120 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 25 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
84.3	Ground Surface									
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	33		84			
			2	SS	116					
			3	SS	120	/23cm	82			
	Brown / Grey		4	SS	110	▼*				
79.7			5	SS	120	/8cm	80			
4.6	End of Borehole • 91 04 26									

+³, ×⁵: Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No D2-C 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 790 E 311 160 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 25 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
84.3	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard						84				
	Brown / Grey		1	SS	34	▼*					
			2	SS	77				○		6 28 53 13
			3	SS	95		82				
			4	SS	120						
79.6			5	SS	100/15cm		80				
4.7	End of Borehole										
	* 91 04 26										

+3, ×5 ; Numbers refer to Sensitivity

20 / 15 ◇ 5 (%) STRAIN AT FAILURE / 10

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No D3 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 849 E 311 609 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 30 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
83.4	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard					DRY *					
			1	SS	45		82				
			2	SS	97						
			3	SS	120 /25cm						
	Brown / Grey		4	SS	100 /15cm		80				
			5	SS	100 /15cm						
			6	SS	120 /20cm						
			7	SS	120 /25cm		78				
	trace shale fragments		8	SS	120 /20cm						
							76				
			9	SS	120 /23cm						
74.3			10	SS	**						
9.1	End of Borehole										

* 91 05 01

** Sampler Bouncing (Probable Bedrock)

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D3-A 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 844 E 311 619 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY TS

DATUM Geodetic DATE 91 04 30 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE; 20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L; WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
83.4	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	34	*	82				
			2	SS	120	/18cm					
			3	SS	100	/15cm			o —	22.7	7 29 44 20
			4	SS	100	/15cm	80				
	Brown / Grey		5	SS	120	/20cm					
			6	SS	100	/13cm			o —	24.3	5 26 51 18
			7	SS	100	/10cm	78				
			8	SS	127						
	Red, trace shale fragments		9	SS	100	/18cm	76				
74.3			10	SS	**						
9.1	Shale Bedrock with interbedded Siltstone. Red with interbedded Grey, Weak to Very Weak, Moderately Weathered		11	RC	REC = 100%		74				RQD = 13 %
72.7											
10.7	End of Borehole										

* Groundwater level not established

** Sampler Bouncing (Probable Bedrock)

$+^3$, $\times^5$; Numbers refer to Sensitivity

$\frac{20}{15 \diamond 5}$ (%) STRAIN AT FAILURE
10

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D3-B 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 845 E 311 593 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 01 CHECKED BY PP

SOIL PROFILE ELEV/DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
83.4	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	49	DRY	82				
			2	SS	134						
			3	SS	120	/23cm					
			4	SS	100	/13cm	80				
	Brown										
78.6	Grey		5	SS	100	/8cm					
4.8	End of Borehole										
	• 91 05 02										

+³, ×⁵: Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D3-C 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 845 E 311 633 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 02 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
82.8	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)					DRY					
	Very Stiff		1	SS	15		82				
	Hard		2	SS	30						
			3	SS	119						
	Brown						80				
	Grey		4	SS	120	/20cm					
77.9			5	SS	100	/15cm	78				
4.9	End of Borehole										
	• 91 05 03										

+³, ×⁵ : Numbers refer to Sensitivity

15 ◇ 5 (%) STRAIN AT FAILURE (20 / 10)

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D4 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 869 E 311 402 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY TS

DATUM Geodetic DATE 91 05 03-06 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
83.0	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)		1	SS	14	*	82				
			2	SS	15						
	Stiff / Hard		3	SS	64		80				
	Brown / Grey		4	SS	58						
	Heterogeneous Mixture of Silt, Sand and Gravel (Glacial Till) Very Dense		5	SS	60						34 42 19 5
	Red		6	SS	64		78				
			7	SS	100 /15cm						
			8	SS	100 /15cm		76				
			9	SS	100 /13cm						
73.9			10	SS	**		74				
9.1	Shale Bedrock with interbedded Siltstone Red with interbedded Grey, Weak to Very Weak Moderately Weathered		11	RC	REC =100%						RQD = 7%
72.3	Unweathered										
10.7	End of Borehole										

* (G W L not established)

** Sampler Bouncing (Probable Bedrock)

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No D4-A 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 865 E 311 412 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 02 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
83.0	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till)										
	Very Stiff		1	SS	17		82				
	Hard		2	SS	44						
	Brown										
	Grey		3	SS	79				o ⊢		13 32 37 18
			4	SS	125		80				
			5	SS	116	▼*					
			6	SS	119		78		o ⊢		9 29 47 15
	Red, trace shale fragments		7	SS	100	/15cm					
			8	SS	100	/15cm					
							76				
75.2			9	SS	100	/8cm					
7.8	End of Borehole										
	• 91 05 03										

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D4-B 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 865 E 311 425 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 03 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
83.0	Ground Surface										
0.0	Irregular Mixture of Clayey Silt, Sand and Gravel (Fill Material) Brown with trace of Black Organics Stiff		1	SS	12		82				1 17 55 27
			2	SS	12						
80.7											
2.3	Brown / Grey Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		3	SS	32	▼*	80				
			4	SS	48						
78.0	Silt, Grey, Very Dense		5	SS	55						
5.0	End of Borehole										
	* 91 05 06										

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No D4-C 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 867 E 311 386 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 03 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
83.1	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	100	/15cm	82				
			2	SS	100	/13cm					
			3	SS	*						
			4	SS	100	/8cm	80				
	Brown / Grey										
78.2			5	SS	100	/15cm					
4.9	End of Borehole										

* Sampler Bouncing (Probable Boulder)

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No S1 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 783 E 311 392 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 23 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	TYPE	'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
84.9	Ground Surface										
0.0	Sand and Gravel (Fill Material) Brown										
84.1											
0.8	Irregular Mixture of Clayey Silt, Sand and Gravel (Fill Material)		1	SS	13		84				
			2	SS	14						
82.6	Brown, Stiff										
2.3	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		3	SS	52		82				
			4	SS	95						
	Interbedded Clayey Silt		5	SS	33						
			6	SS	120	*▼ /20cm	80				
	Sand and Gravel		7	SS	27**						
	Brown / Red		8	SS	100	/13cm					
77.3							78				
77.0	Shale Bedrock – Weathered, Red		9	SS	100	/13cm					
7.9	End of Borehole										

* 91 04 24

** Disturbed Sample

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No S1-A 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 776 E 311 376 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 23 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
83.3	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	82	▼*	82				
			2	SS	111						
	Brown / Grey		3	SS	100						
			4	SS	42		80				
79.5											
3.8	Clayey Silt with interbedded layers of Sand										
78.3	Brown, Hard		5	SS	45						
5.0	End of Borehole										
	* 91 04 24										

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation Ontario

Foundation Design

RECORD OF BOREHOLE No S2 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 777 E 311 416 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY TS

DATUM Geodetic DATE 91 04 18-22 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
83.3	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	63		82				
			2	SS	103				o	23.1	6 33 47 14
	Brown										
	Grey		3	SS	100	/10cm					
			4	SS	100	/13cm	80				
			5	SS	100	/13cm			o	25.9	23 50 9 18
			6	SS	100	/10cm					
	Red		7	SS	100	/15cm	78				
			8	SS	100	/13cm					
75.7							76				
7.6	Shale Bedrock with interbedded Siltstone		9	SS	100	/15cm					
			10	SS	100	/15cm	74				
	Red with interbedded Grey, Weak to Very Weak, Moderately Weathered		11	RC	REC = 78%						RQD = 0 %
			12	RC	REC = 50%		72				RQD = 0 %
71.0											
12.3	End of Borehole										
	• 91 04 24										

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No S2-A 1 OF 1 METRIC

W.P. 2512-90-01 LOCATION Co-ords: N 4 782 778 E 311 432 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 04 23 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
83.3	Ground Suarface										
0.0						DRY *					
	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Brown, Hard		1	SS	120	/20cm	82				
			2	SS	136						
			3	SS	100	/10cm					
			4	SS	100	/8cm	80				
78.5			5	SS	100	/8cm					
4.8	End of Borehole										
	* 91 04 24										

+³, ×⁵ : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No S3 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 879 E 311 157 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 06 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, • QUICK TRIAXIAL, + FIELD VANE, × LAB VANE; 20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
84.1	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard										
			1	SS	47						
			2	SS	90					23.1	17 23 45 15
	Brown / Grey						82				
			3	SS	121						
			4	SS	127						8 28 49 15
			5	SS	100	/15cm	80				
			6	SS	100	/15cm					
			7	SS	100	/15cm					
			8	SS	100	/15cm	78				
76.2	trace shale fragments, Red		9	SS	100	/15cm					
7.9	End of Borehole										
	* 91 05 08										

+3, ×5 : Numbers refer to Sensitivity

20 / 15 ◇ 5 (%) STRAIN AT FAILURE / 10

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No S3-A 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 879 E 311 117 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 09 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
84.0	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard		1	SS	48						
			2	SS	59						
	Brown / Grey		3	SS	100	/18cm	82				
			4	SS	62						
						▼*	80				
79.1			5	SS	100	/15cm					
4.9	End of Borehole • 91 05 10										

+³, ×⁵ : Numbers refer to Sensitivity

20 / 15 ◇ 5 / 10 (%) STRAIN AT FAILURE

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No S4 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 875 E 311 134 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger, Rock Coring COMPILED BY TS

DATUM Geodetic DATE 91 05 07 CHECKED BY PP

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (o UNCONFINED, + FIELD VANE, • QUICK TRIAXIAL, × LAB VANE) (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
84.3	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard					*	84				
	Brown		1	SS	40						
	Grey		2	SS	57						
			3	SS	100	/10cm	82				
			4	SS	100	/15cm					
			5	SS	100	/15cm					
			6	SS	100	/15cm	80				
			7	SS	100	/15cm					
			8	SS	100	/15cm					
	trace shale fragments, Red		9	SS	100	/15cm	78				
75.2			10	SS	**		76				
9.1	Shale Bedrock with interbedded Siltstone Red with interbedded Grey, Weak to Very Weak, Moderately Weathered		11	RC	REC =82%		74				RQD = 53%
73.6											
10.7	End of Borehole										

* (G W L not established)

** Sampler Bouncing (Probable Bedrock)

+3, ×5 : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

Ministry of Transportation
Ontario

Foundation Design

RECORD OF BOREHOLE No S4-A 1 OF 1 METRIC

W.P. 2513-90-01 LOCATION Co-ords: N 4 782 875 E 311 172 ORIGINATED BY TS

DIST 4 HWY Q.E.W. BOREHOLE TYPE HS Auger COMPILED BY TS

DATUM Geodetic DATE 91 05 08 CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa o UNCONFINED + FIELD VANE • QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
84.3	Ground Surface										
0.0	Heterogeneous Mixture of Clayey Silt, Sand and Gravel (Glacial Till) Hard						84				
			1	SS	52						
			2	SS	100	/13cm					
	Brown						82				
	Grey		3	SS	100	/13cm					
			4	SS	100	/15cm					
79.6			5	SS	100	/10cm ▼*	80				
4.7	End of Borehole										
	* 91 05 09										

+^{3}, ×^{5} : Numbers refer to Sensitivity

20
15 ◇ 5 (%) STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION, ONTARIO PH-0-207 88 10

METRIC

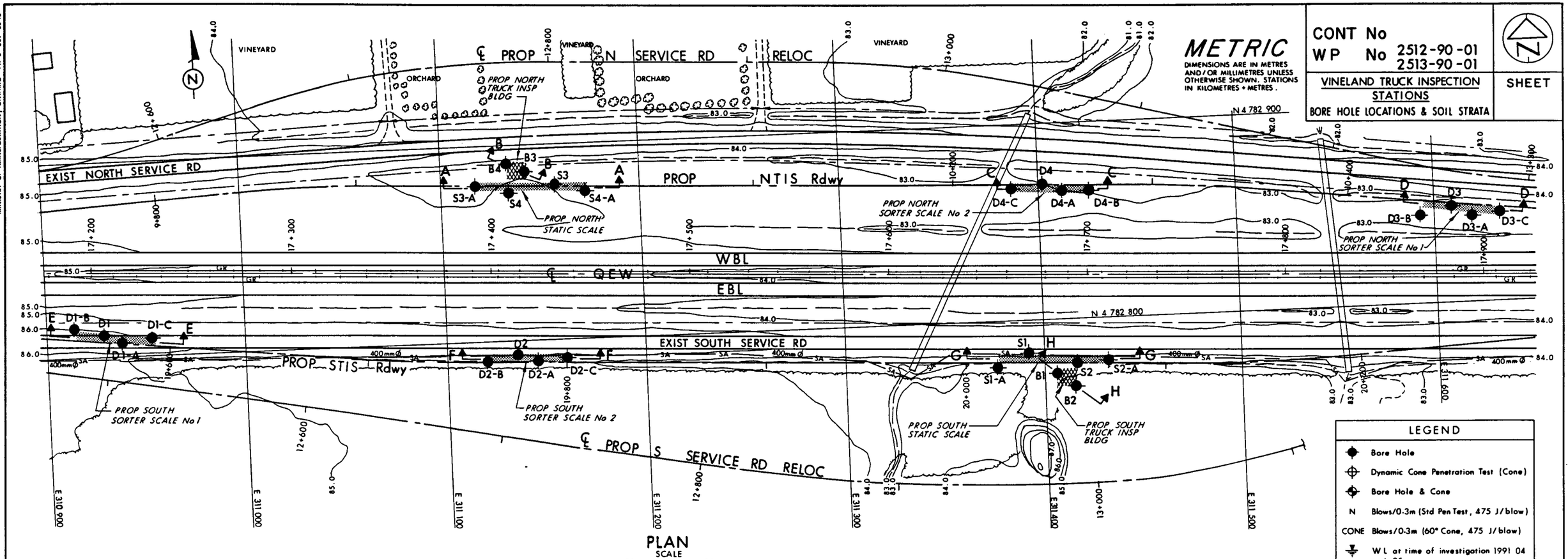
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

CONT No
WP No 2512-90-01
2513-90-01

SHEET

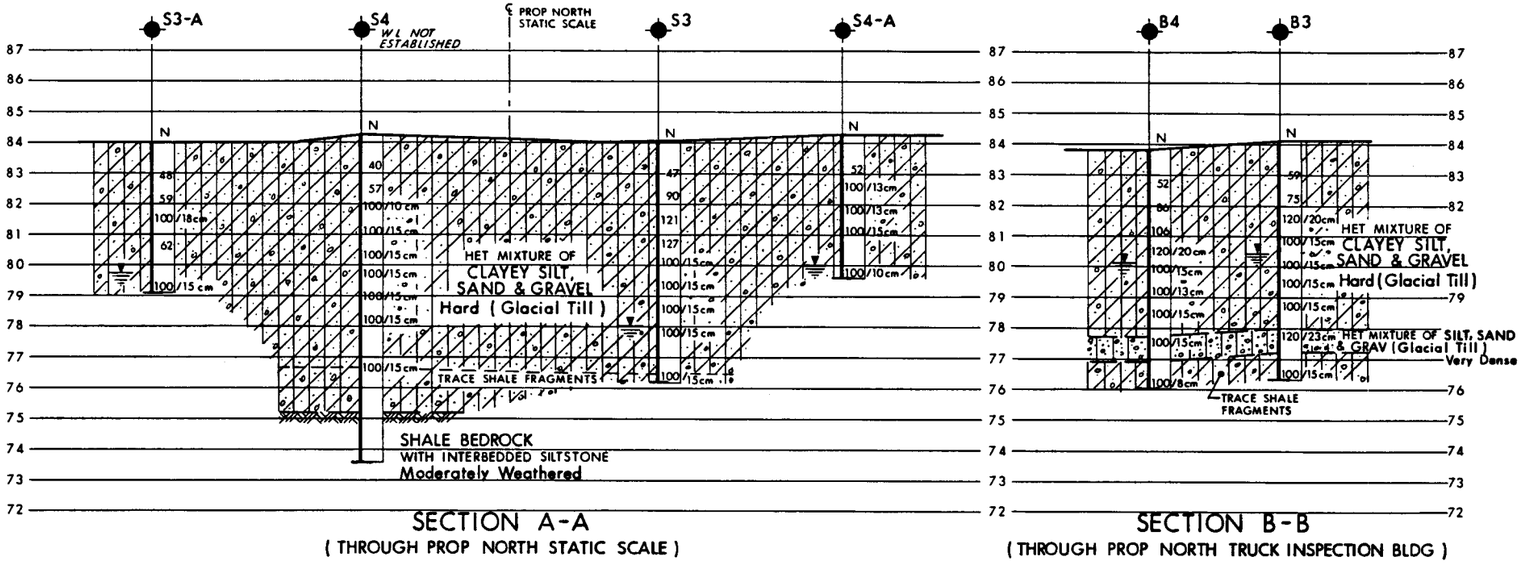
VINELAND TRUCK INSPECTION STATIONS

BORE HOLE LOCATIONS & SOIL STRATA



PLAN

SCALE 20m 0 20m



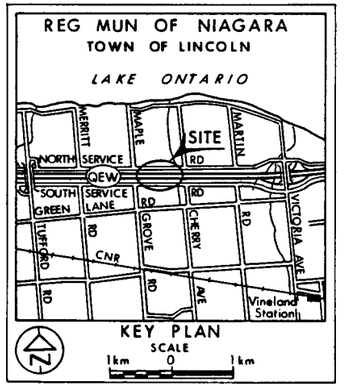
SECTION A-A

(THROUGH PROP NORTH STATIC SCALE)

SECTION B-B

(THROUGH PROP NORTH TRUCK INSPECTION BLDG)

SCALES
5m 0 5m HOR
2m 1 0 2m VERT



NOTE:

For Sections C-C To H-H Inclusive
Refer to Dwg No 25129001-B.

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation 1991 04 and 05.

No	ELEVATION	CO-ORDINATES NORTH	EAST
B1	83.7	4 782 772	311 406
B2	83.6	4 782 765	311 415
B3	84.1	4 782 886	311 142
B4	83.8	4 782 890	311 133
D1	86.3	4 782 811	310 929
D1-A	86.3	4 782 807	310 938
D1-B	85.1	4 782 815	310 914
D1-C	86.2	4 782 809	310 953
D2	84.5	4 782 792	311 135
D2-A	84.3	4 782 789	311 145
D2-B	84.3	4 782 789	311 120
D2-C	84.3	4 782 790	311 160
D3	83.4	4 782 849	311 609
D3-A	83.4	4 782 844	311 619
D3-B	83.4	4 782 845	311 593
D3-C	82.8	4 782 845	311 633
D4	83.0	4 782 869	311 402
D4-A	83.0	4 782 865	311 412
D4-B	83.0	4 782 865	311 425
D4-C	83.1	4 782 867	311 386
S1	84.9	4 782 783	311 392
S1-A	83.3	4 782 776	311 376
S2	83.3	4 782 777	311 416
S2-A	83.3	4 782 778	311 432
S3	84.1	4 782 879	311 157
S3-A	84.0	4 782 879	311 117
S4	84.3	4 782 875	311 134
S4-A	84.3	4 782 875	311 172

NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

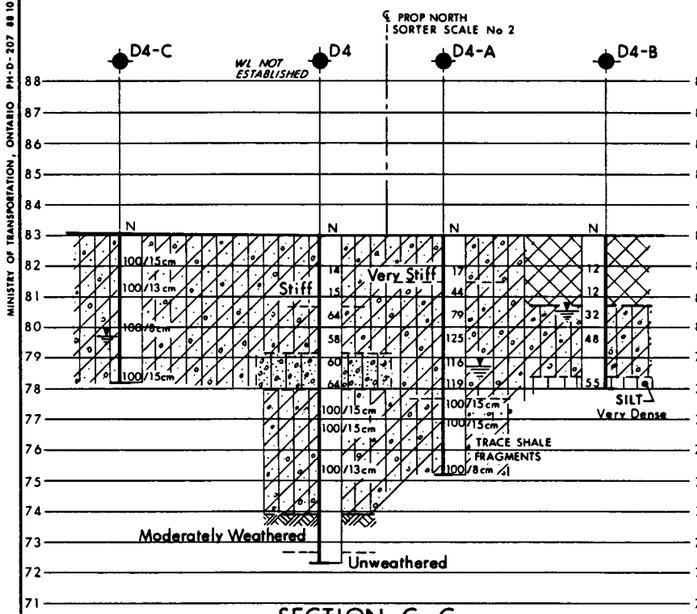
REV.	DATE	BY	DESCRIPTION

Geocres No 30M3-191

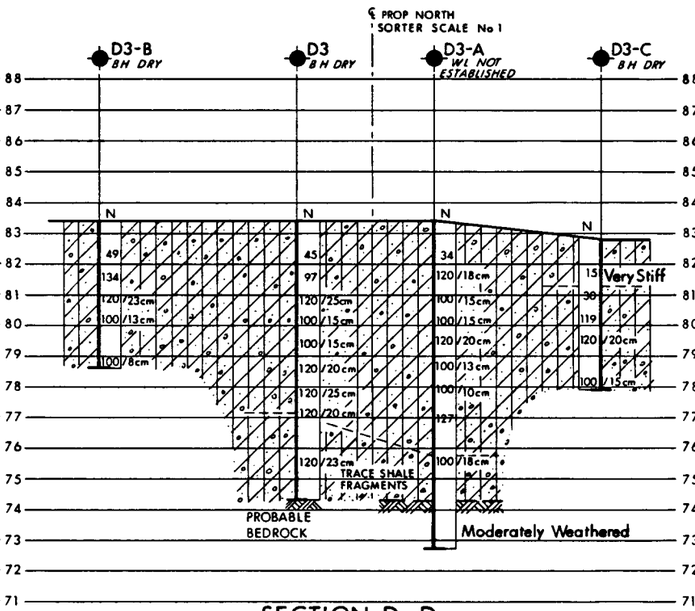
HWY No QEW			DIST 4
SUBM'D TS	CHECKED TS	DATE 1991 08 15	DWG 25129001-A
DRAWN RS	CHECKED	APPROVED	25139001-A

REF No B-137-QEW-12 & 13; 1988 11
Marshall Macklin Monaghan Limited, (VINELAND T.I.S. Sheets 3, 4, 5 & 6)

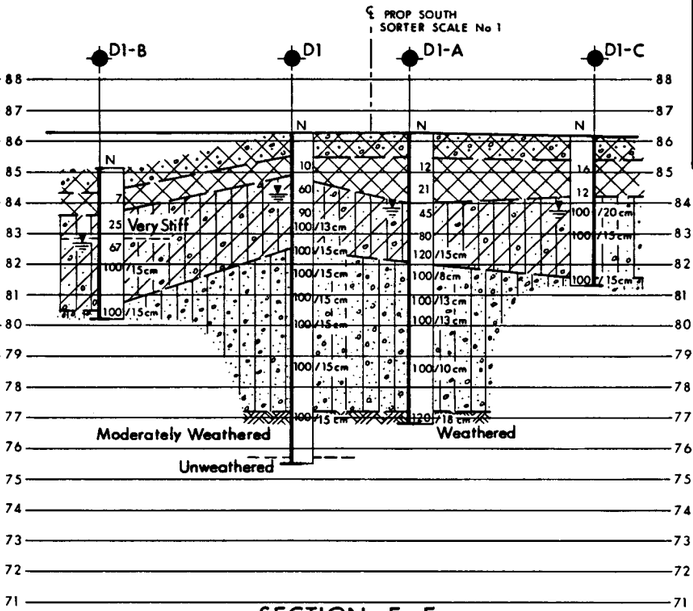
MINISTRY OF TRANSPORTATION, ONTARIO PH-D-207 88 10



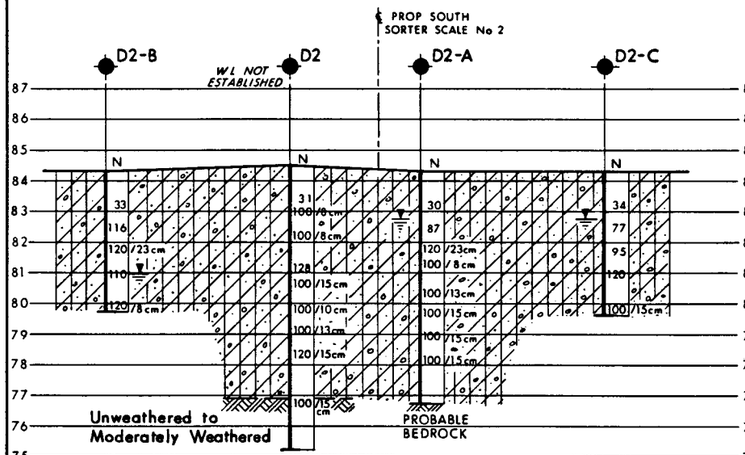
SECTION C-C
(THROUGH PROP NORTH SORTER SCALE No 2)



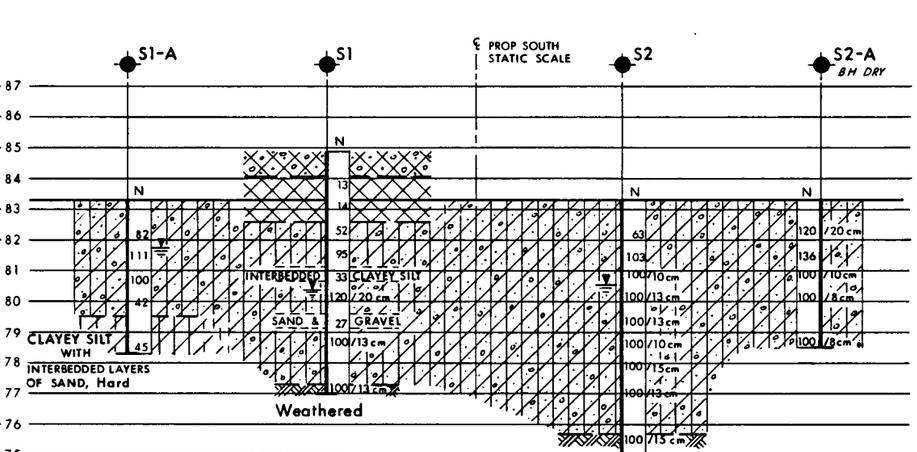
SECTION D-D
(THROUGH PROP NORTH SORTER SCALE No 1)



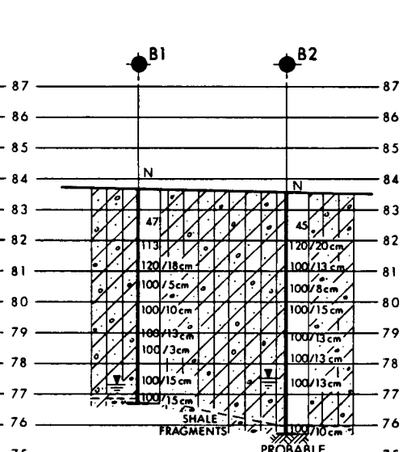
SECTION E-E
(THROUGH PROP SOUTH SORTER SCALE No 1)



SECTION F-F
(THROUGH PROP SOUTH SORTER SCALE No 2)



SECTION G-G
(THROUGH PROP SOUTH STATIC SCALE)



SECTION H-H
(THROUGH PROP SOUTH TRUCK INSP BLDG)

SCALES
5m 0 5m HOR
2m 1 0 2m VERT

SOIL STRATIGRAPHY LEGEND

- SAND & GRAVEL (FILL MATERIAL)
- IRREGULAR MIXTURE OF CLAYEY SILT, SAND & GRAVEL Firm to Very Stiff, (FILL MATERIAL) WITH TRACE OF ORGANICS
- HETEROGENEOUS MIXTURE OF CLAYEY SILT, SAND & GRAVEL Hard (Glacial Till)
- HETEROGENEOUS MIXTURE OF SILT, SAND & GRAVEL Very Dense (Glacial Till)
- SHALE BEDROCK WITH INTERBEDDED SILTSTONE

NOTE:
For Bore Hole Locations Refer to Dwg No 25129001-A.

CONT No
WP No 2512-90-01
2513-90-01

VINELAND TRUCK INSPECTION STATIONS
SOIL STRATA

SHEET

METRIC DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

Refer to Dwg No 25129001-A

KEY PLAN
SCALE

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation 1991 04 and 05.

No	ELEVATION
B1	83.7
B2	83.6
D1	86.3
D1-A	86.3
D1-B	85.1
D1-C	86.2
D2	84.5
D2-A	84.3
D2-B	84.3
D2-C	84.3
D3	83.4
D3-A	83.4
D3-B	83.4
D3-C	82.8
D4	83.0
D4-A	83.0
D4-B	83.0
D4-C	83.1
S1	84.9
S1-A	83.3
S2	83.3
S2-A	83.3

-≡NOTE≡-
The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence.

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section 102-2 of Form 100.

REV.	DATE	BY	DESCRIPTION

Geocres No 30M3-191

HWY No Q E W			DIST 4
SUBM'D T S	CHECKED TS	DATE 1991 08 22	DWG 25129001-B 25139001-B
DRAWN R S	CHECKED	APPROVED	