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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

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FOUNDATION DESIGN SECTION

**foundation
investigation and
design report**

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 122-87-00 DIST 9
HWY 416 STR SITE --

Proposed High Mast Lighting
Highway 416/Knoxdale Road to Fallowfield Road

CONT 93-66

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FOUNDATION INVESTIGATION REPORT
For
Proposed High Mast Lighting
Highway 416/Knoxdale Road to Fallowfield Road
W.P. 122-87-00
Eastern Region
District 9, Kingston

INTRODUCTION

A foundation investigation was carried out at the above-captioned site for proposed high mast lighting along the new Highway 416, at the proposed interchanges for Knoxdale Road and Fallowfield Road.

During this investigation, boreholes were drilled at or adjacent to twenty-six (26) of the 35 proposed locations for the new high mast lights. Subsurface information for seven (7) other proposed locations was obtained from two previous investigations (W.P. 128-87-04 and W.P. 121-87-07). Since access to one borehole was not available at the time of drilling, and one other high mast light pole was added subsequent to our field investigations, these two remaining locations will require some additional field investigation at a later date.

This report contains the factual information obtained from the boreholes, drilled during this investigation, as well as selected boreholes from the two previous investigations, which pertain to the structural foundations for the proposed high mast lights, at the locations shown on Drawing No.'s 1228700-A and 1228700-B.

SITE DESCRIPTION

The field investigations were carried out along the alignment for the new Highway 416 at two proposed interchanges, within the City of Nepean, Regional Municipality of Ottawa-Carleton, Ontario. The topography of the area is generally flat to gently undulating.

The first site, is located at the proposed interchange for Highway 416 along Fallowfield Road between Cedarview Road and Moodie Drive. This site, which will henceforth be referred to as the 'Fallowfield Site', extends from the north face of Dibblee Quarry, to approximately 650 m south of Fallowfield Road.

The second site is located at the proposed interchange for Highway 416 and Knoxdale Road. This site, which will henceforth be referred to as the 'Knoxdale Site', lies directly west of the existing alignment of Cedarview Road and extends from approximately 800 m north of Knoxdale Road, to approximately 900 m to the south of it.

Physiographically, both sites lie in the area known as the Ottawa Valley Clay Plains, which are characterized by glacial till (which occurs as till plains), ice contact stratified drift and ridges of the underlying bedrock. The overburden is relatively thin and was deposited during and immediately following the Wisconsin Glaciation.

At the Fallowfield site, the overburden is underlain by Paleozoic bedrock comprised of interbedded silty dolostone, lithographic to fine crystalline limestone, shale, and fine-grained calcareous quartz sandstone of the Gull River Formation. The overburden at the Knoxdale site is also underlain by Gull River Formation rocks as well as interbedded sandy dolostone, dolostone and quartz sandstone of the March Formation.

PROCEDURES

The fieldwork, for this project, was carried out by this office during the period covering April 4 to 12, 1991 and consisted of twenty-six sampled boreholes advanced to depths of up to 7.7 m, using continuous flight, hollow stem augers driven by a bombardier-mounted drilling rig equipped with standard soil sampling equipment.

When probable bedrock or a large boulder was encountered, most of the boreholes were extended using conventional diamond drilling (BXL) techniques in order to penetrate the boulders and to prove bedrock. Some additional information was obtained from dynamic cone penetration testing, which was carried out adjacent to most of the boreholes. However, in several cases, boulders prevented the cones from being driven to bedrock.

Groundwater levels were measured in the open boreholes immediately upon completion of sampling. Piezometers were then installed in eleven (11) of the

boreholes, in order to measure the long term groundwater conditions and a return visit was made to the site to measure the water levels in them.

The locations of the boreholes were staked in the field, and their elevations determined by the Eastern Region Surveys and Plans Office. However, during the field investigation, it became apparent that several of the high mast light locations had been altered. The boreholes at the locations which had not, as yet, been drilled, were slightly moved to reflect these changes and the Surveys and Plans Office were then asked to re-survey them.

The soil samples obtained in the field were examined in the laboratory by visual and tactile methods. Moisture Content, Atterberg Limits and Grain Size Distribution tests were carried out on selected samples. Pocket penetrometer tests were also carried out on selected samples, where they were applicable.

SUBSURFACE CONDITIONS

Boreholes P1 to P7, P9, P12 to P14 and P16 were drilled at the proposed locations for high mast light pole no.'s at the Fallowfield Site. BH's P-9 to P23 and P26 to P34 were drilled at the proposed locations for several high mast light poles at the Knoxdale Site. It should be noted ,however, that the numbering of the light poles at the Knoxdale Site has been reversed subsequent to our field investigations.

Subsurface information for several of the remaining high mast light poles was obtained from the boreholes drilled during this investigation as well as selected boreholes from the two previous investigations (W.P. 128-87-04 and W.P. 121-87-07). The relevant borehole logs and laboratory testing from these investigations, is included in Appendix B at the back of this report. However, it should be noted that, since access to the proposed location for high mast pole P34 (original number) was unavailable at the time of the field investigation, this pole (and P35, which has only recently been added to the list) will be dealt with at a later date.

Since the soil conditions vary somewhat at each of the two sites, brief descriptions of the subsurface conditions at each site followed by more detailed

descriptions of individual strata and the groundwater conditions encountered in the boreholes will be given in separate sections.

Fallowfield Site

BH's P1 to P7, P9, P12 to P14 and P16 were drilled at the locations of the high mast light poles with the same designation. Most of the boreholes were drilled to the south of Fallowfield Road. However, BH's P13 to P17 were drilled to the north of the road on property presently occupied by the Dibblee quarry.

South of Fallowfield Road, a thin layer of topsoil and slightly organic sandy to clayey silt, from 0.3 m to 0.9 m thick, is underlain by a very dense, heterogeneous mixture of silty sand, gravel and a trace of clay (glacial till). Occasional to numerous slabs of rafted rock and boulders occur within this till deposit, at several locations. Limestone or silty dolostone bedrock was encountered, in most boreholes, at depths of 2.9 m to 10.5 m.

To the north of Fallowfield Road, 0.1 m to 1.7 m of topsoil and/or silty sand to sand and gravel fill overlies a heterogeneous mixture of silt, sand and gravel (glacial till). However, at P15 (which is in the quarry itself), the fill lies directly on bedrock. Limestone bedrock occurs at depths of 0.1 m to 4.9 m.

Detailed descriptions of the subsurface conditions are given in the following sections.

Topsoil

A surficial layer of topsoil, from 0.3 m to 0.7 m thick, was encountered in all boreholes on the south side of Fallowfield Road.

Clayey Silt to Sand and Gravel (Fill)

At many locations, the topsoil, south of Fallowfield Road, is underlain by a thin layer of clayey silt to silty sand, which contains traces of topsoil enclosures. Similar material was encountered at BH P16, to the north of

Fallowfield Road. This material has been referred to as fill, since it appears that these soils have been disturbed by past farming activity which has resulted in topsoil enclosures becoming entrained into it.

Crushed and broken limestone bedrock comprised of silt to gravel-sized particles was encountered at the ground surface adjacent to and within Dibblee Quarry at BH's P13 and P16, respectively (see Figure 1). It appears that this material has been placed as fill over the underlying bedrock.

In any case, it should be noted that, in our experience at many sites, the thickness of topsoil, fill and/or soils disturbed by farming activity can vary significantly between boreholes.

Silty Sand to Coarse Sand and Gravel

BH P-6 encountered a deposit of greyish brown to dark grey, silty sand to coarse sand and gravel. This deposit extended to a depth of approximately 4.1 m (or an elevation of about 98.4 m).

A Moisture Content of 12 percent was measured in one of the samples obtained.

Although 'N' values, measured during Standard Penetration Testing (SPT), ranged from 1 to 13 blows/0.3 m, the lowest value recorded was likely to be unrepresentative, due to the unbalanced hydrostatic head and the resulting disturbance of the sand beneath the augers. This soil is considered to be compact.

Heterogeneous Mixture of Silty Sand, some Gravel, Trace of Clay (Glacial Till)

All boreholes contacted a heterogeneous mixture of silty sand, some gravel and a trace of clay containing occasional to numerous boulders at depths of 0.5 m to 4.1 m.

Grain Size Distribution Tests on the samples obtained from this deposit and shown on Figure 2 indicates generally well-graded mixtures of sand, silt, gravel

and clay. These soils are likely to be of glacial origin and therefore, may be considered to be a glacial till.

An Atterberg Limit Test, carried out on a slightly more cohesive sample of soil from BH P4, gave liquid limit and plasticity indices of 16 and 3 percent at a moisture content of 18 percent which indicated a material which behaves as a plastic silt. Although, Moisture Contents ranged from 5 to 18 percent, they averaged about 10 percent.

Measured 'N' values were generally more than 50 blows/0.3 m, indicating very dense conditions. However, lower values were encountered in the upper part of the deposit at P4 (7 blows/0.3 m) and P6 (23 blows/0.3 m).

During drilling, through this deposit, boulders and rafted pieces of the underlying bedrock were encountered at most locations. However, at several locations, notably P1, P4, P5, P12 and P14, boulders became so numerous that the boreholes were extended by coring.

Bedrock

Bedrock was encountered in most of the boreholes at depths of 0.4 to 10.5 m or elevations 96.3 m to 118.1 m.

BH's P2, P3, P6, P12 and the boreholes on the north side of Fallowfield Road near Dibblee Quarry (P13, P14 and P16) contacted a light to dark (or greenish) grey, laminated (and occasionally nodular), medium strong, limestone. The limestone was found to contain numerous thin undulating shaly partings and occasional thin layers of shale (particularly in BH's P1 and P2). BH's P1, P4 and P6, also contacted a dark greenish grey to dark grey, weak to very weak, silty dolostone.

Detailed descriptions of the rock core obtained, during this investigation, are given in Appendix A.

GROUNDWATER

Piezometers installed in several of the boreholes on the south side of Fallowfield Road, have recorded water levels, at least 24 hours after their installation, at depths of 0.2 m to 3.6 m beneath the existing ground surface (or elevations of 101.4 m to 114.8 m).

BH's P13 and P14 were found to be dry. Although, minor water was encountered in the piezometer installed in BH P-16, this water is likely to be the remaining drill water used to core bedrock and that this hole, was, in fact, dry as well.

Knoxdale Site

Generally, at the Knoxdale site, a thin layer of topsoil and/or slightly organic clayey to sandy silt from 0.15 m to 0.8 m thick, is underlain by layers of clayey to sandy silt and/or a firm to hard, heterogeneous mixture of clayey silt, sand, with a trace of gravel (glacial till). Where the till is present, it generally overlies bedrock, which was encountered at depths of 0.5 m to 5.6 m.

Topsoil

A surficial layer of topsoil, from 150 mm to 250 mm thick, was contacted at the ground surface at several of the boreholes.

Sandy Silt

Beneath the topsoil and at the ground surface at many other locations, a layer of fill, containing topsoil enclosures was encountered to depths of 0.4 m to 0.8 m at the boreholes. This material has been referred to as fill, since it appears that these soils have been disturbed by past farming activity which has resulted in topsoil enclosures becoming entrained into it.

Silty Clay to Clayey Silt

Beneath the fill, BH's P20 and P30 to P33 contacted a thin, silty clay to clayey silt layer, at depths of 0.6 m to 1.8 m (or elevations of 93.1 m to 93.9 m). This layer extended to depths of 1.2 m to 2.9 m (or elevations of 92.2 m to 93.3 m).

Atterberg Limit Tests, carried out on two samples of soil from this layer and shown on Figure 3, measured liquid limits of 21 and 49 percent and plasticity indices of 6 and 27 percent, respectively. These test results indicate soils which behave as clayey silt to silt or silty clay soils. Moisture Contents were found to range from 29 to 40 percent in samples obtained from these layers.

A Grain Size Distribution Test carried out on a slightly cohesive sample obtained from this layer was found to have 6 percent sand, 79 percent silt and 15 percent clay (see Figure 4).

'N' values ranged from 7 to 15 blows/0.3 m indicating soils of firm to stiff consistency.

Silt to Sandy Silt

BH's P20, P22 and P29 to P33 contacted a cohesionless deposit of sandy silt to silt at depths of 0.2 m to 2.9 m (or elevations of 91.8 m to 94.5 m) which extended to depths of 1.4 m to 5.6 m (or elevations of 88.9 m to 93.5 m).

The results of a Grain Size Distribution Test, carried out on a sample of soil obtained from this deposit, is shown on Figure 5.

Moisture Content Tests, carried out on samples from this deposit, ranged from 14 to 30 percent.

'N' values, measured during this investigation, ranged from 1 to 42 blows/0.3 m indicating very loose to dense soils. However, it appears that, based on the cone testing carried out adjacent to some of the boreholes, the very low (ie.

less than 2 blows/0.3 m) 'N' values are likely due to unbalanced hydrostatic head (and the resulting disturbance) in the boreholes immediately prior to testing.

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

A heterogeneous mixture of clayey silt, sand and a trace of gravel was encountered in nearly all of the boreholes (P23, P24, P30 and P33, excluded) at depths of 0.4 m to 4.4 m (or elevations of 90.1 m to 95.0 m). This deposit extended to elevations ranging from about 88.9 m to 94.0 m in the boreholes.

These soils are likely to be of glacial origin and therefore, may be considered to be a glacial till.

The results of Atterberg Limits Tests, which were carried out on several samples of the till, are summarized below and on Figure 6:

	<u>Range %</u>	<u>Average %</u>
Natural Moisture Content (w)	8-14	10.8
Liquid Limit (w_L)	13-23	16.3
Plastic Limit (w_p)	10-15	11.8
Plasticity Index (I_p)	3-8	4.5

These results indicate soils which behave as clayey to plastic silts.

Grain Size Distribution Tests carried out on five samples obtained from this deposit, and shown on Figure 7, reveal a fairly well-graded mixture from 33 to 55 percent silt, 11 to 14 percent clay-sized particles, and from 26 to 42 percent sand and 3 to 14 percent gravel.

'N' values measured during Standard Penetration Testing ranged from 8 to 77 blows/0.3 m indicating soils of stiff to hard consistency.

Bedrock

Bedrock was encountered in most of the boreholes at depths of 0.5 m to 5.6 m (88.9 m to 94.8 m).

The bedrock, at all locations, consisted of a light grey to medium dark grey, medium strong, dolostone which was found to be cherty or vuggy in places. BH P33 also encountered a 1.4 m thick layer of very light grey to medium dark grey, medium strong dolomitic sandstone. Details of the rock core obtained from the boreholes can be found in Appendix A.

GROUNDWATER CONDITIONS

The groundwater levels, when measured in the open boreholes, immediately upon completion of sampling (or prior to coring), were generally found at the ground surface or up to depths of 2.2 m. BH P27, however, was found to be dry.

Groundwater levels, measured in the piezometers installed at the site ranged from the ground surface to depths of about 0.6 m (or elevations of 93.6 m to 95.6 m).

In any case, it should be noted that the groundwater table is always subject to seasonal fluctuations and is expected to rise during the spring freshet and during and immediately following any periods of prolonged heavy rainfall.

DISCUSSION AND RECOMMENDATIONS

It is proposed to construct the 34 high mast lighting poles, shown on Drawing No.'s 1228700-A and 1228700-B, and listed in Tables I and II. It should be noted that the numbering of the light poles at the Knoxdale site has been reversed subsequent to our field investigations and the new numbers are shown in brackets on the drawing and in Table II.

Design

The loads from the high mast lights may be transferred to the subsoil or underlying bedrock by means of a single bored, cast-in-place concrete caisson.

Caissons should be founded at the maximum elevation needed to provide the required lateral resistance. The design of the caissons should be in accordance with the method outlined in the following papers for both cohesive and cohesionless soils:

Brohms, B. B. Lateral Resistance of Piles in Cohesive Soil Journal of the Soil Mechanics and Foundation Division, ASCE Vol. 90, No. SM2, Paper 3285, March 1964.

Brohms, B. B. Lateral Resistance of Piles in Cohesionless Soil, Journal of the Soil Mechanics and Foundation Division, ASCE Vol. 90, No. SM3, Paper 3090, May 1964.

Based on the boreholes drilled during this and the previous investigations, the calculated parameters to be used for the design are outlined in Tables III and IV and includes:

For Cohesionless Soils: The Angle of Internal Friction, ϕ (degrees)

For Cohesive Soils: The Unconfined Compressive Strength q_u (kPa)

Bulk Unit Weight: γ , (kN/m³)

It should be noted, that soils within 1.8 m of the finished ground surface should not be included in the calculation for lateral resistance.

It should also be noted that boreholes were drilled at or within close proximity to 26 of the 35 proposed locations for the high mast light poles. The stratigraphy at all of the other proposed locations [with the exceptions of P34 and P35 (original numbering)] have been based on stratigraphical projections from surrounding boreholes drilled during this and previous investigations. Therefore, wherever, the stratigraphy has been based on projections, the elevations shown in Tables III and IV are only approximate and may be expected to vary somewhat.

Based on the existing and proposed grades (ie. 102.5 m versus 113.0 m), it appears that there will be a significant grade raise at P6. In addition, we understand that despite similar reported existing and final grades (ie. 108.6 m versus 108.4 m), we understand that high mast light pole, P15, which is presently located within the quarry, is in an area where extensive filling will be required.

In any case, where light poles are to be located in areas where the grade is to be substantially raised, it is recommended that the fill in those areas consist of granular material or clean earth fill free of boulders or other inclusions which are greater than 150 mm. Such material should be well compacted as per MTO specifications to prevent excessive downdrag on the caissons and for ease of augering during construction.

Construction Considerations

Caissons must be cased during their installation to seal off any saturated sand zones that may possibly be encountered prior to reaching their lowest elevations. If, however, the ingress of water becomes intolerable, then drilling mud etc. or somewhat more extensive groundwater control measures may be required.

Caissons should have a minimum diameter of 760 mm to allow for inspection of their bases, prior to pouring the foundation concrete. This is in order to confirm the suitability of the founding soil (or rock) and to ensure that disturbance due to unbalanced hydrostatic head has not occurred at the base and/or the lower portions of the shaft of the caisson.

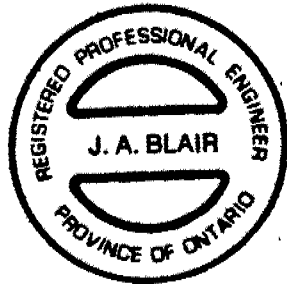
It should be noted that caissons will extend through glacial till which, at the Fallowfield Site in particular, is known to contain occasional to often numerous boulders. Augering is expected to be extremely difficult under such conditions and chopping bits, core barrels etc. will be necessary.

MISCELLANEOUS

The design parameters to be used for high mast light poles P34 and P35 will follow in a supplemental report when subsurface information at these locations is made available to us.

The field investigation was supervised by Messrs. J. Blair and F. Tannis, using equipment owned and operated by F. E. Johnston Drilling Co. Ltd.

This report was written by J. Blair, Project Foundation Engineer, reviewed by B. Iyer, Senior Foundation Engineer and approved by M. Devata, Chief Foundation Engineer.



John A. Blair

J. Blair, P.Eng.
Project Foundation Engineer

for *B. Iyer*

M. Devata, P.Eng.
Chief Foundation Engineer

APPENDIX

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 (R Q D), 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	e	1, %	VOID RATIO	e_{min}	1, %	VOID RATIO IN DENSEST STATE
γ_s	kn/m ³	UNIT WEIGHT OF SOLID PARTICLES	n	1, %	POROSITY	I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
ρ_w	kg/m ³	DENSITY OF WATER	w	1, %	WATER CONTENT	D	mm	GRAIN DIAMETER
γ_w	kn/m ³	UNIT WEIGHT OF WATER	S_r	%	DEGREE OF SATURATION	D_n	mm	n PERCENT - DIAMETER
P	kg/m ³	DENSITY OF SOIL	w_L	%	LIQUID LIMIT	C_u	1	UNIFORMITY COEFFICIENT
γ	kn/m ³	UNIT WEIGHT OF SOIL	w_p	%	PLASTIC LIMIT	h	m	HYDRAULIC HEAD OR POTENTIAL
ρ_d	kg/m ³	DENSITY OF DRY SOIL	w_s	%	SHRINKAGE LIMIT	q	m ³ /s	RATE OF DISCHARGE
γ_d	kn/m ³	UNIT WEIGHT OF DRY SOIL	I_p	%	PLASTICITY INDEX = $\frac{w_L - w_p}{w - w_p}$	v	m/s	DISCHARGE VELOCITY
ρ_{sat}	kg/m ³	DENSITY OF SATURATED SOIL	I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$	i	1	HYDRAULIC GRADIENT
γ_{sat}	kn/m ³	UNIT WEIGHT OF SATURATED SOIL	I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$	k	m/s	HYDRAULIC CONDUCTIVITY
ρ'	kg/m ³	DENSITY OF SUBMERGED SOIL	e_{max}	1, %	VOID RATIO IN LOOSEST STATE	j	kn/m ³	SEEPAGE FORCE
γ'	kn/m ³	UNIT WEIGHT OF SUBMERGED SOIL						

Table I

High Mast Light Pole Locations
Interchange at Highway 416 and Fallowfield Road

<u>Pole #</u>	<u>Northing</u>	<u>Easting</u>	<u>Existing G.S.</u> <u>(m)</u>
P1	5 014 062	360 282	112.2
P2	5 014 260	360 265	111.6
P3	5 014 371	360 190	110.8
P4	5 014 412	360 083	110.0
P5	5 014 506	360 200	109.3
P6	5 014 594	360 292	102.5
P7	5 014 559	360 219	106.6
P8	5 014 545	360 087	108.6
P9	5 014 501	359 944	112.4
P10	5 014 654	360 064	107.0
P11	5 014 594	359 948	112.0
P12	5 014 470	359 805	115.4
P13	5 014 615	359 751	118.5
P14	5 014 710	359 900	112.8
P15	5 014 740	359 858	108.5
P16	5 014 886	359 880	110.7
P17	5 014 957	359 732	117.4

Table II

High Mast Light Pole Locations
Interchange at Highway 416 and Knoxdale Road

<u>Pole #</u>	<u>Northing</u>	<u>Easting</u>	<u>Existing G.S.</u> <u>(m)</u>
P18 (P34)	5 019 860	359 276	94.8
P19 (P33)	5 019 742	359 309	94.9
P20 (P32)	5 019 629	359 358	95.1
P21 (P31)	5 019 493	359 344	94.9
P22 (P30)	5 019 515	359 515	94.7
P23 (P29)	5 019 444	359 467	95.2
P24 (P28)	5 019 366	359 350	95.6
P25 (P27)	5 019 260	359 366	95.6
P26 (P26)	5 019 262	359 466	95.6
P27 (P25)	5 019 092	359 339	95.5
P28 (P24)	5 019 148	359 440	94.9
P29 (P23)	5 019 215	359 594	94.6
P30 (P22)	5 019 080	359 584	94.5
P31 (P21)	5 018 953	359 636	94.5
P32 (P20)	5 018 868	359 700	94.5
P33 (P19)	5 018 675	359 815	94.5
P34 (P18)	5 018 554	359 987	94.2
P35	5 019 977	359 250	

*Note: The most recent high mast light pole numbering is shown in brackets.

Table III
Fallowfield Road Site

Pole No.	Ground Surface Elevations		Soil Boundary Elevation		Soil Type	Design Parameters			Assumed Water Level (m)	Remarks	Borehole No.
	Original Grade (m)	Finished Grade (m)	Upper (m)	Lower (m)	Cohesive Non-Cohesive	ϕ Degrees	q_u kPa	γ kN/m ³			
P1	112.2	111.6	109.8 109.0	109.0 101.7	Non-Cohesive Non-Cohesive	38 35		22.5 22.5	109.2	Numerous Boulders	P1
			101.7 101.5	101.5 <101.5	V. Weak Shale Weak silty Dolostone		1500 6000	20.0 24.5			
P2	111.6	109.5	107.7 105.8 108.5	105.8 105.0 <105.8	Non-Cohesive V. Weak Shale Medium Strong Limestone	38		22.5 20.0 25.0	109.3		P2
							1500 15000				
P3	110.8	110.7	108.9 108.0	107.9 <108.0	Non-Cohesive Medium Strong Limestone	38		22.5 25.0	110.6		P3
							15000				
P4	110.0	108.4	107.3	<107.3	Weak, Silty Dolostone		6000	24.0	109.8		P4
P5	109.3	109.3	107.5 102.8	102.8 <102.8	Non-Cohesive Non-Cohesive	38 35		22.5 22.5	108.8	Numerous Boulders	P5
P6	102.5	102.8	101.0 100.4 98.4 96.6	100.4 98.4 96.6 96.3	Cohesive Non-Cohesive Non-Cohesive Non-Cohesive		15	17.0 20.5 22.5 22.5	101.4	Numerous Boulders	P6
						33 38 35					
			96.3	94.1	Medium Strong Limestone		15000	25.0			
			94.1	<94.1	Weak to V. Weak Silty Dolostone		6000	24.5			
P7	106.6	106.2	104.4 102.7 99.0	102.7 99.0 <99.0	Non-Cohesive Non-Cohesive Non-Cohesive	38 34 38		22.5 22.0 22.5	106.4		P7
P8	108.6	108.6	106.8 106.5**	106.3** 102.5**	Non-Cohesive Non-Cohesive	38 35		22.5 22.5	107.0	Numerous Boulders	6
			102.5**	<102.5**	Weak Silty Dolostone		* 6000	24.5			

Table III .../cont'd
Fallowfield Road Site

Pole No.	Ground Surface Elevations		Soil Boundary Elevation		Soil Type	Design Parameters			Assumed Water Level (m)	Remarks	Borehole No.
	Original Grade (m)	Finished Grade (m)	Upper (m)	Lower (m)		ϕ Degrees	qu kPa	γ kN/m ³			
P9	112.3	113.2	111.4 109.0	109.0 <109.0**	Cohesive Non-Cohesive Weak Silty Dolostone	38	6000	22.5 24.5	109.7		P9
P10	107.0	109.0	107.2	104.2**	Non-Cohesive	38		22.5	105.8	Numerous Boulders	7/20-8
			104.2**	99.4**	Non-Cohesive	35		22.5			
			99.4**	<99.4**	Weak Silty Dolostone		6000	24.5			
P11	112.0	111.9	110.1	107.5**	Non-Cohesive	38		22.5	110.0*	Numerous Boulders	1,8, 20-1 20-2
			107.5**	106.0**	Non-Cohesive	35		22.5			
			106.0**	<106.0**	Medium Strong Limestone		15000	25.0			
P12	115.3	115.1	113.3	112.6	Non-Cohesive	38		22.5	114.8	Numerous Boulders	P12
			112.6	111.7	Non-Cohesive	35		22.5			
			111.7	<111.7	Medium Strong Limestone		15000	25.0			
P13	118.5	118.3	118.1	<118.1	Medium Strong Limestone		15000	25.0		V. Loose	P13
P14	112.8	111.3	109.5 109.2	109.2 <109.2	Non-Cohesive Medium Strong Limestone	38	15000	22.5 25.0	107.5		P14
P15	108.5	108.4	107.3	<107.3	Medium Strong Limestone		15000	25.0	107.5	Located on Quarry Floor	
P16	110.7	110.0	108.2 106.6	106.6 <106.6	Non-Cohesive Medium Strong Limestone	38	15000	22.5 25.0	106.5		P16
P17	117.4	116.8	115.0** <112.0**	112.0	Non-Cohesive Medium Strong Limestone	38	15000	22.5 25.0	Dry 107.5	Located at Quarry Rim	

**Note: Elevations are only approximate since they were based on projections of stratigraphy.

Table IV
Knoxdale Road Site

Pole No.	Ground Surface Elevations		Soil Boundary Elevation		Soil Type	Design Parameters			Assumed Water Level (m)	Remarks	Borehole No.
	Original Grade (m)	Finished Grade (m)	Upper (m)	Lower (m)		ϕ Degrees	q_u kPa	γ kN/m ³			
P18 (P34)	94.8	94.6	92.8 92.7 91.9 90.3	92.7 91.9 90.3 <90.3	Cohesive Non-Cohesive Cohesive Medium Strong Dolostone	33 33	 175 20000	21.8 20.3 21.9 25.0	94.4		P18
P19 (P33)	94.9	94.9	93.1 92.9 92.1 90.8	92.9 92.1 90.8 <90.8	Cohesive Non-Cohesive Cohesive Medium Strong Dolostone	33	300 125 20000	21.5 21.9 19.1 25.0	94.0		P19
P20 (P32)	95.1	95.0	93.2 92.2 91.6	92.2 91.6 <91.6	Non-Cohesive Cohesive Medium Strong Dolostone	30	 175 20000	18.9 20.3 25.0	94.5		P20
P21 (P31)	94.9	93.8	93.5	<93.5	Medium Strong Dolostone		20000	25.0	94.9		P21
P22 (P30)	94.7	94.3	92.8	<92.8	Medium Strong Dolostone		20000	25.0	94.9		P22
P23 (P29)	95.2	95.3	94.7	<94.7	Medium Strong Dolostone		20000	25.0	95.2		P23
P24 (P28)	95.6	95.5	94.8	<94.8	Medium Strong Dolostone		20000	25.0	95.6		P24
P25 (P27)	95.6	95.5	94.0	<94.0	Medium Strong Dolostone		20000	25.0	95.6		P25
P26 (P26)	95.6	95.4	93.6** 92.8**	92.8**	Cohesive Medium Strong Dolostone		275 20000	21.0 25.0	95.6		P25/ 5,7
P27 (P25)	95.5	95.8	94.0 93.4	93.4 <93.4	Cohesive Medium Strong Dolostone		300 20000	21.5 25.0	95.5		P27

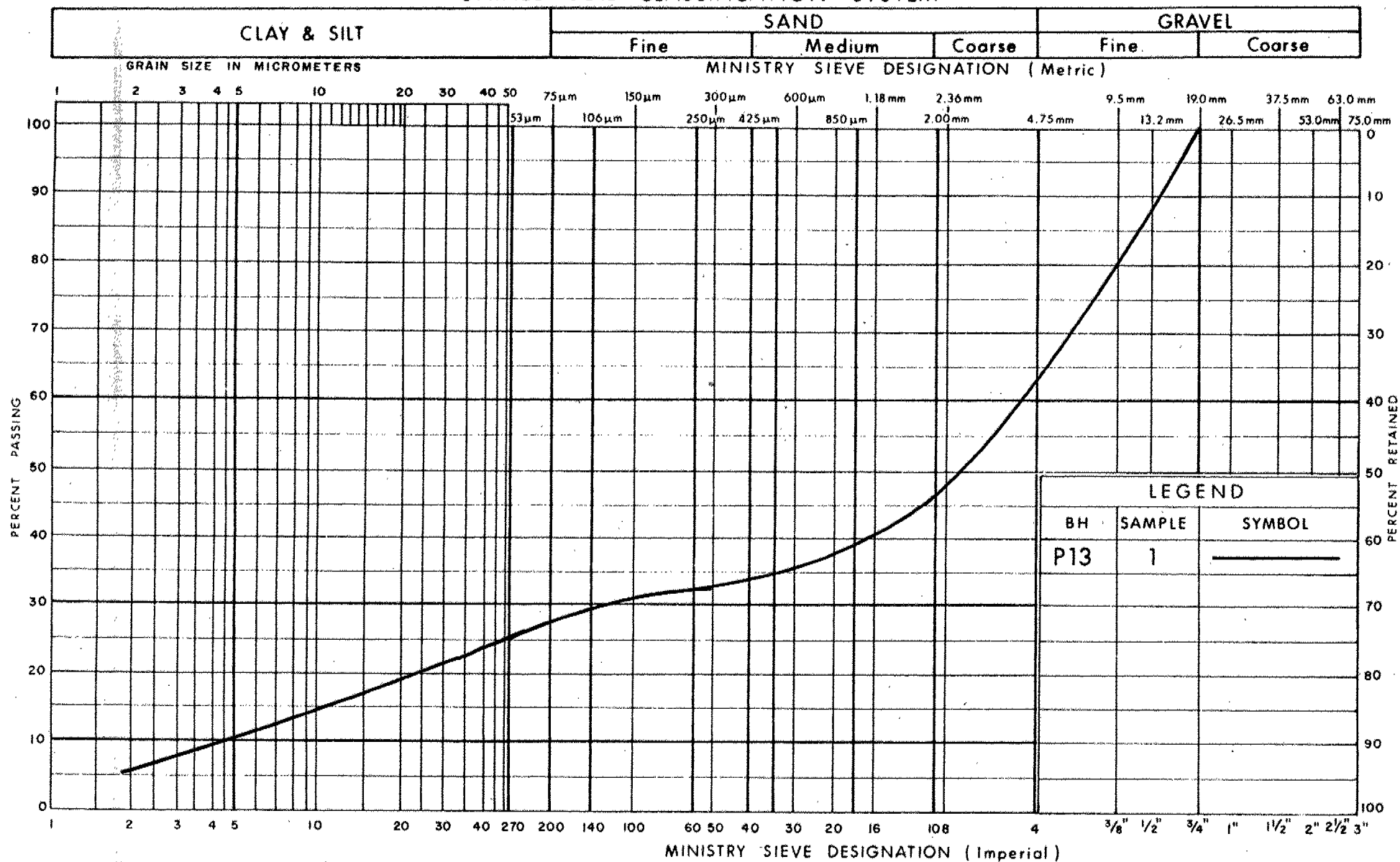
Table IV .../cont'd
Knoxdale Road Site

Pole No.	Ground Surface Elevations		Soil Boundary Elevation		Soil Type	Design Parameters			Assumed Water Level (m)	Remarks	Borehole No.
	Original Grade (m)	Finished Grade (m)	Upper (m)	Lower (m)	Cohesive (C) Non-Cohesive (NC)	ϕ Degrees	q_u kPa	γ kN/m ³			
P28 (P24)	94.9	95.3	93.5 92.8** 92.0**	92.8** 92.0** <92.0**	Cohesive Non-Cohesive Medium Strong Dolostone	27	200 20000	20.5 18.0 25.0	94.9		P29, P27
P29 (P23)	94.6	95.2	93.4 92.6 89.7	92.6 89.7 <89.7	Cohesive Non-Cohesive Medium Strong Dolostone	27	125 20000	19.1 18.0 25.0	94.3		P29
P30 (P22)	94.5	93.9	92.1 90.8 90.5**	90.8 90.5 <90.5**	Non-Cohesive Cohesive Medium Strong Dolostone	27	200 20000	18.2 20.5 25.0	93.0		P30
P31 (P21)	94.5	94.5	92.7 90.8 90.0 88.9	90.8 90.0 88.9 <88.9	Non-Cohesive Non-Cohesive Non-Cohesive Medium Strong Dolostone	28 30 35	20000	18.5 21.5 22.2 25.0	94.3		P31
P32 (P20)	94.5	94.5	92.7 90.5 90.1 89.6	90.5 90.1 89.6 <89.6	Non-Cohesive Non-Cohesive Cohesive Medium Strong Dolostone	28 32	250 20000	18.5 19.0 20.8 25.0	94.2		P32
P33 (P19)	94.5	94.5	92.7 90.8 88.9	90.8 88.9 <88.9	Non-Cohesive Non-Cohesive Medium Strong Dolostone	32 35	20000	19.0 20.5 25.0	93.6		P33

Note: *The most recent high mast light pole numbering is shown in brackets.

**Elevations are only approximate since they were based on projections of stratigraphy.

UNIFIED SOIL CLASSIFICATION SYSTEM



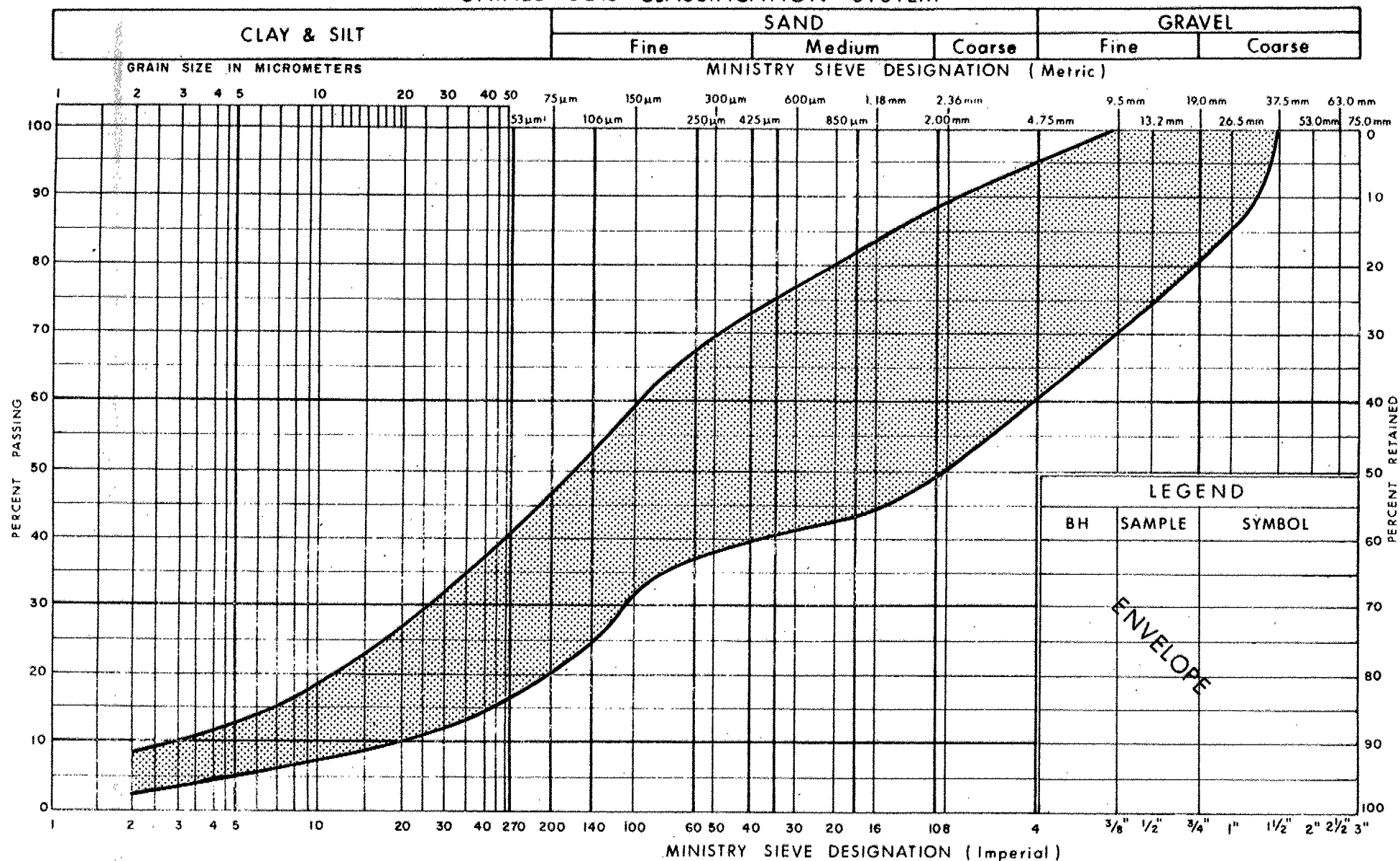
Ministry of
Transportation

GRAIN SIZE DISTRIBUTION
GRAVELLY SAND & SILT (FILL)
 (COMPRISED OF CRUSHED PIECES OF LIMESTONE)

FIG No 1

W P 122-87-00

UNIFIED SOIL CLASSIFICATION SYSTEM

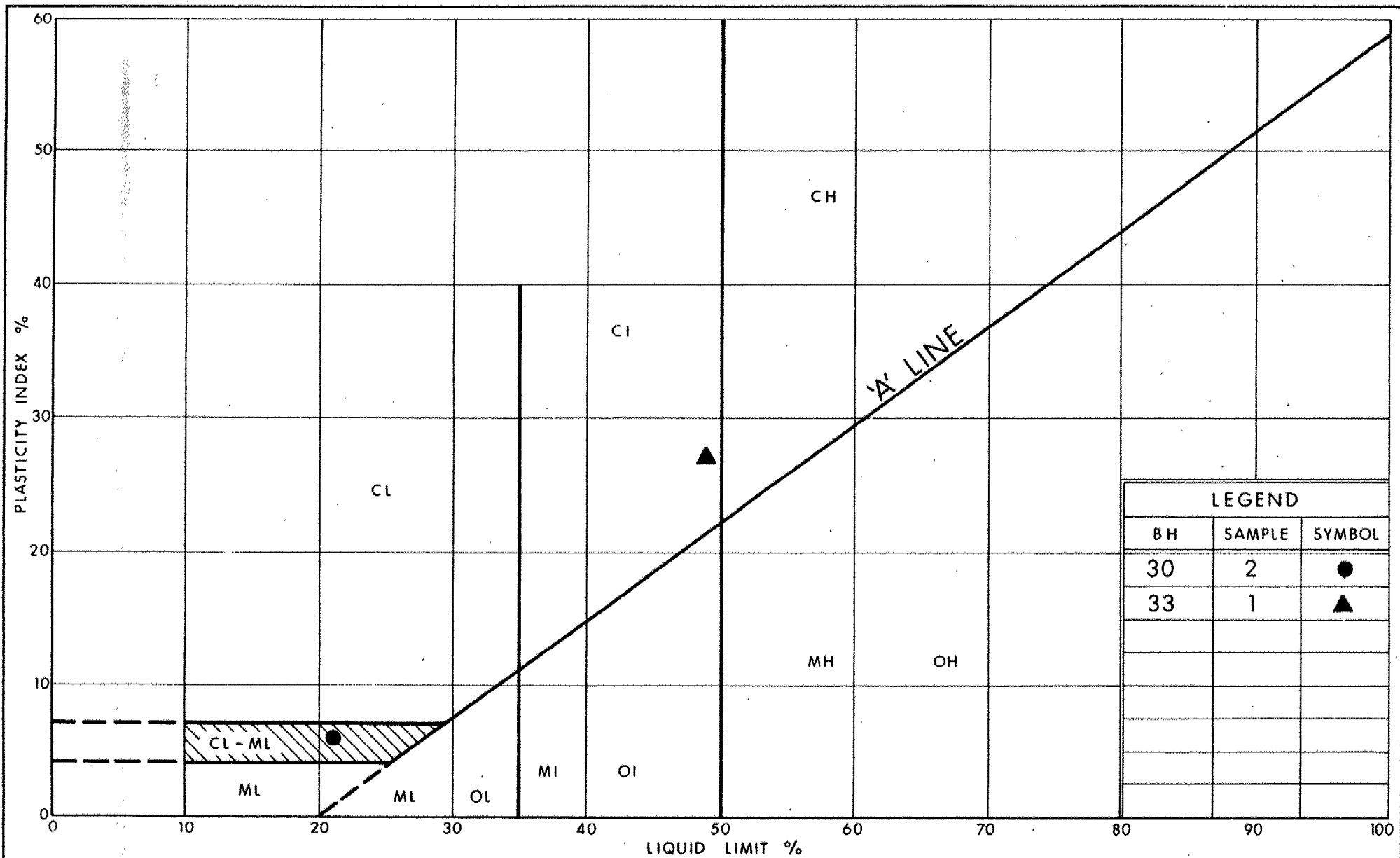


Ministry of
Transportation

GRAIN SIZE DISTRIBUTION
HETEROGENEOUS MIXTURE OF SILTY SAND
 SOME GRAVEL, TRACE OF CLAY (GLACIAL TILL)

FIG No 2

W P 122-87-00



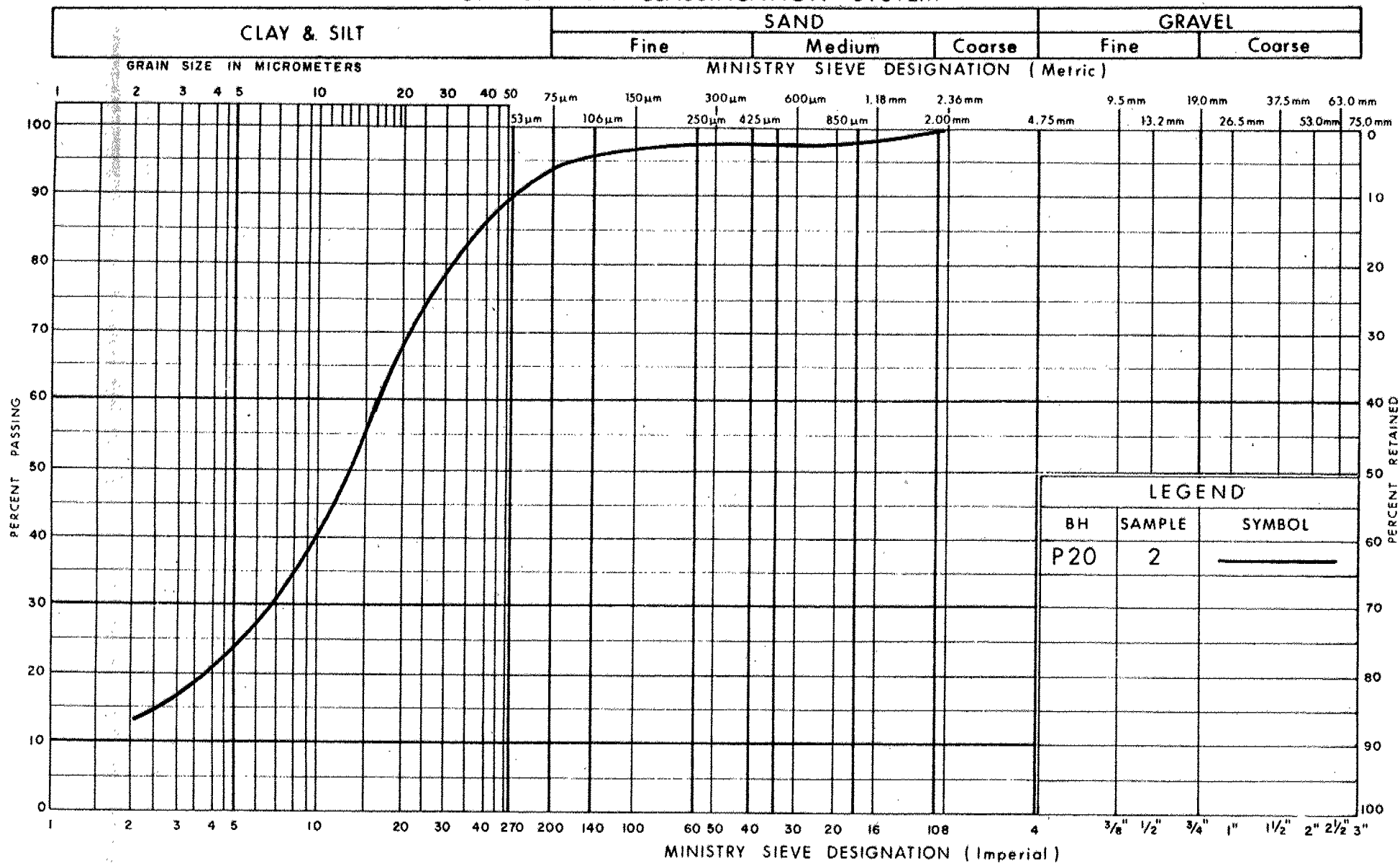
Ministry of
Transportation
Ontario

PLASTICITY CHART SILTY CLAY TO CLAYEY SILT

FIG No 3

W P 122-87-00

UNIFIED SOIL CLASSIFICATION SYSTEM



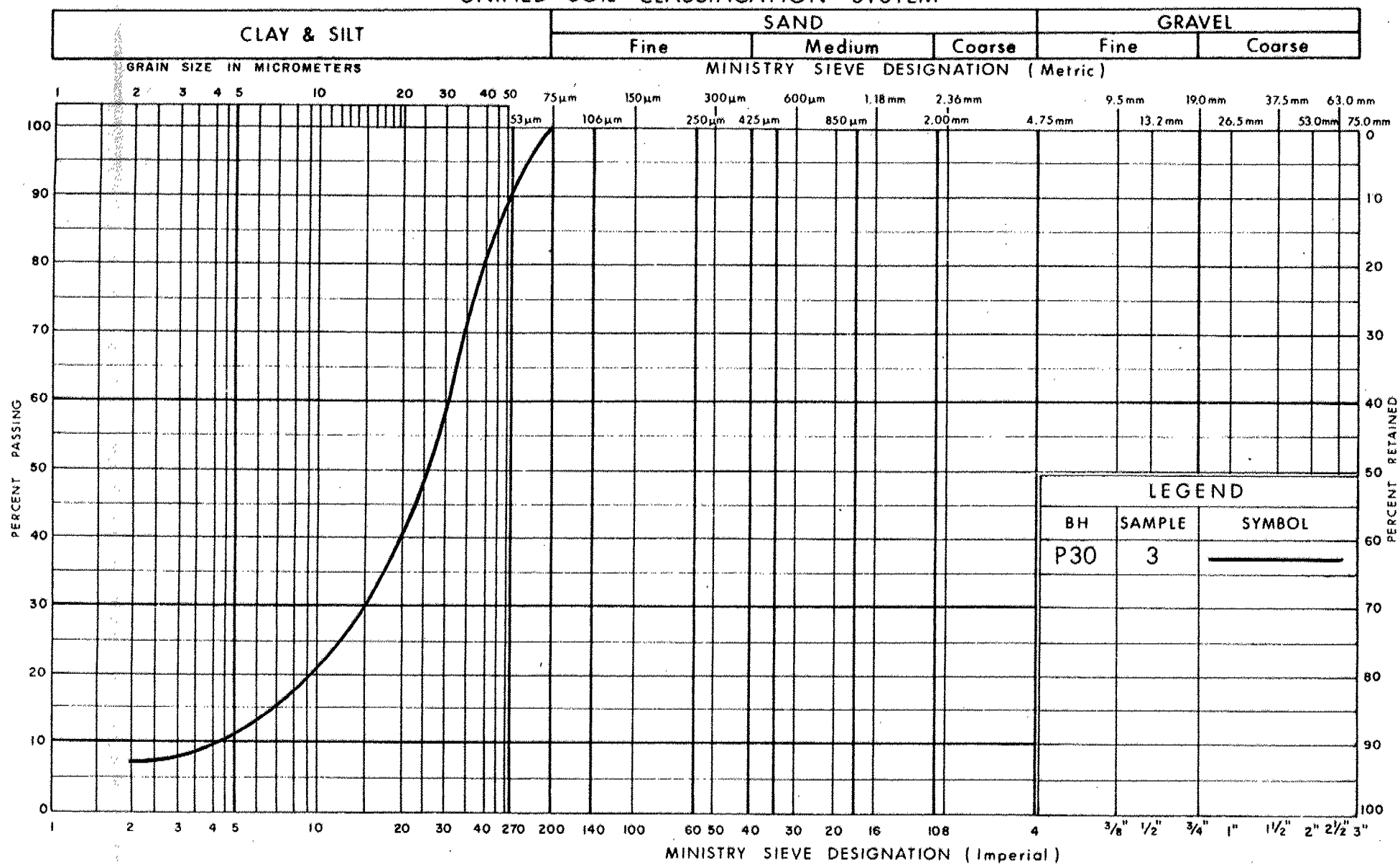
Ministry of
Transportation

GRAIN SIZE DISTRIBUTION
SILTY CLAY TO CLAYEY SILT

FIG No 4

W P 122-87-00

UNIFIED SOIL CLASSIFICATION SYSTEM

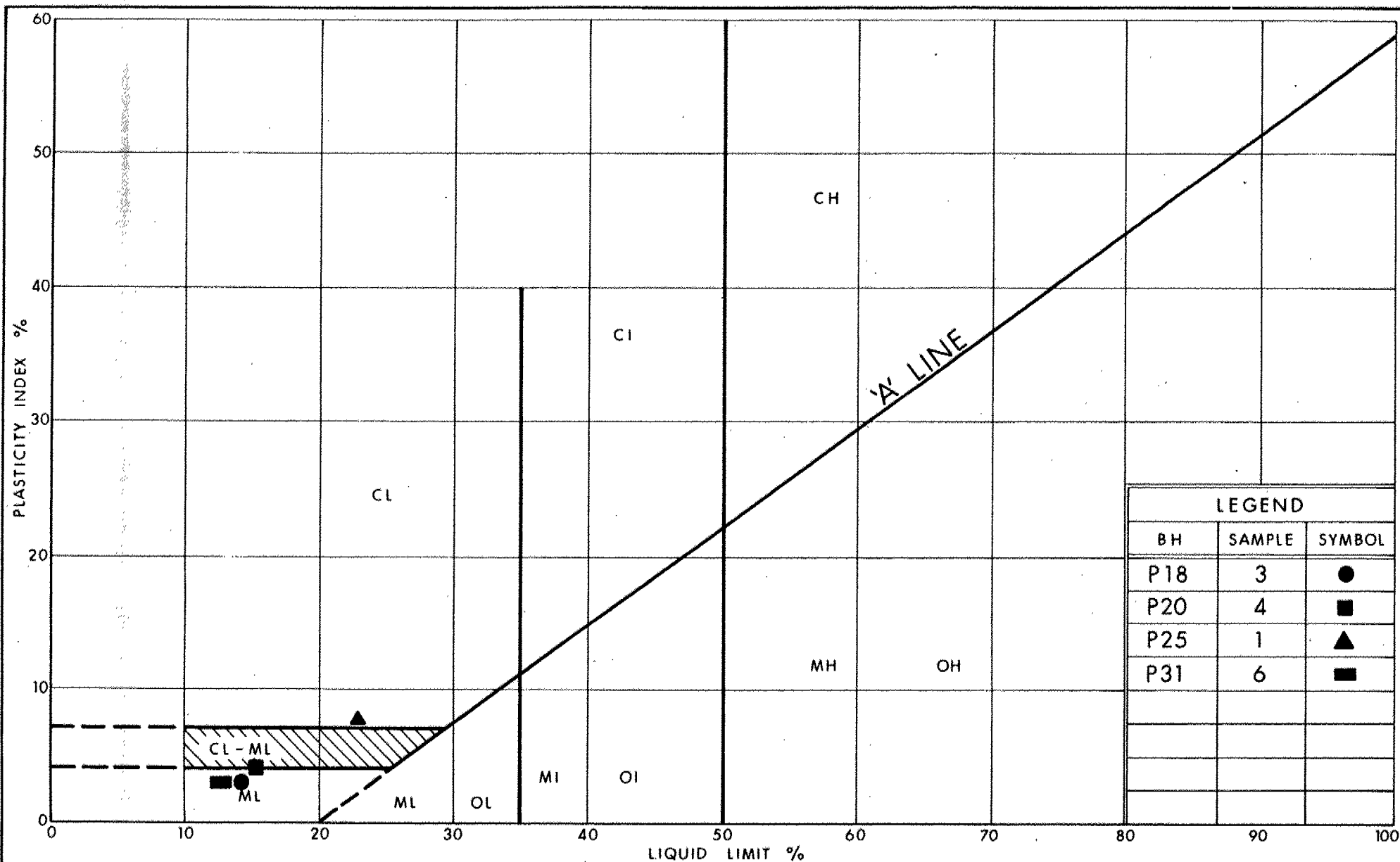


Ministry of
Transportation

GRAIN SIZE DISTRIBUTION
SILT TO SANDY SILT

FIG No 5

W P 122-87-00



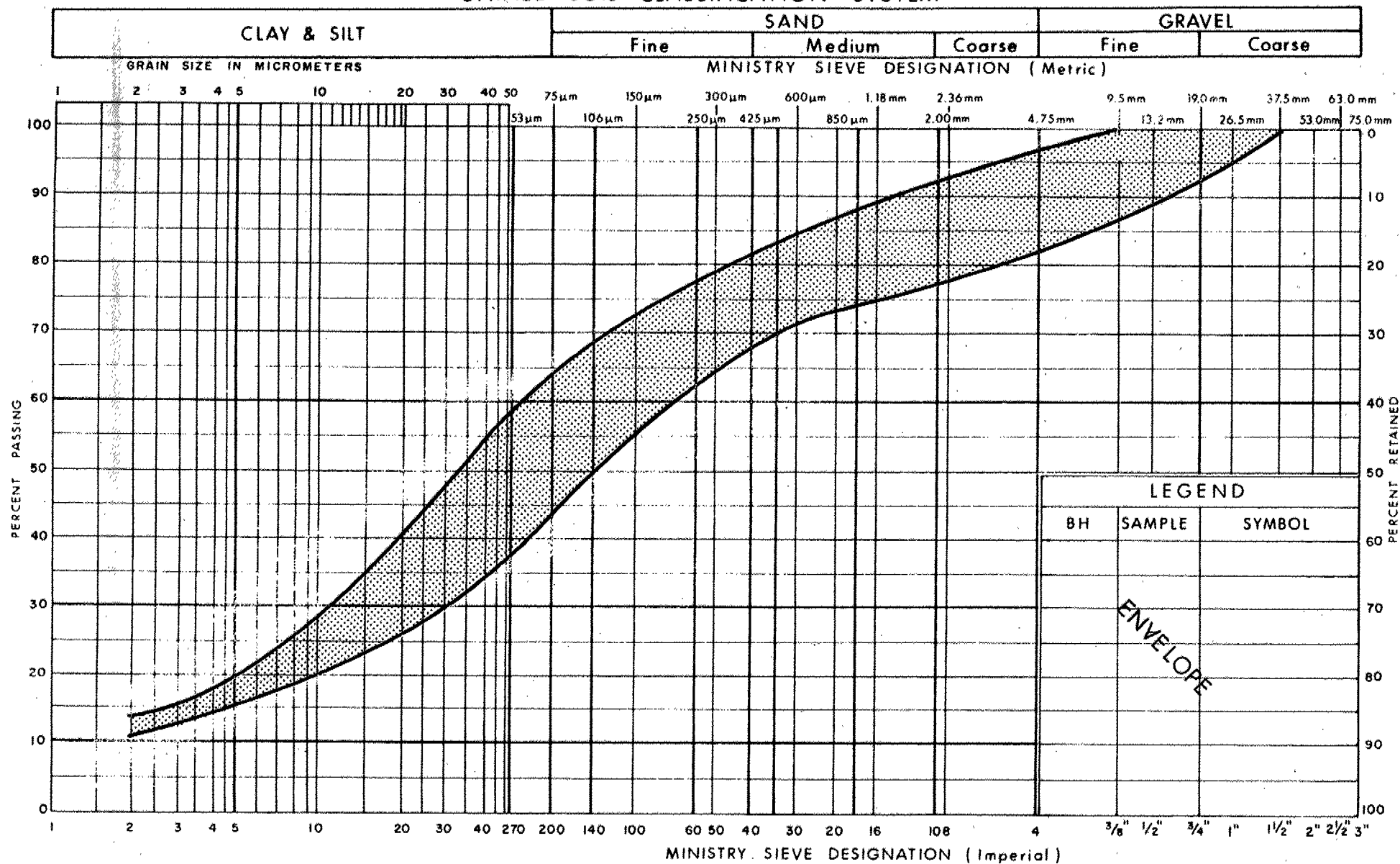
Ministry of
Transportation

PLASTICITY CHART
HETEROGENEOUS MIXTURE OF CLAYEY SILT & SAND
TRACE OF GRAVEL (GLACIAL TILL)

FIG No 6

W P 122-87-00

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation

GRAIN SIZE DISTRIBUTION
HETEROGENEOUS MIXTURE OF CLAYEY SILT & SAND
TRACE OF GRAVEL (GLACIAL TILL)

FIG No 7

W P 122-87-00

RECORD OF BOREHOLE No P1

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 062; E 360 282 ORIGINATED BY JB
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 09 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT 7 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		
112.2	Ground Surface													
0.0	Sandy Silt (Topsoil)		1	SS	7		112							
111.7			2	SS	50/15cm		111							
0.5	Heterogeneous Mixture of Silty Sand, Some Gravel, Trace of Clay		3	SS	54/15cm		110							
	Brown		4	SS	50/8cm		109							
	Greyish Brown to Grey		5	SS	55/15cm		108							
	Occasional Boulders		6	BXL RC	REC 83%		107							
	Numerous Boulders		7	BXL RC	REC 94%		106							
	Very Dense		8	BXL RC	REC 67%		105							
	(Glacial Till)		9	BXL RC	REC 80%		104							
			10	BXL RC	REC 56%		103							
			11	BXL RC	REC 99%		102							
			12	BXL RC	REC 83%									
			13	BXL RC	REC 52%									
			14	BXL RC	REC 69%									
			15	BXL RC	REC 55%									
			16	BXL RC	REC 42%									
			17	BXL RC	REC 80%									
101.7	Greyish Brown to Grey		18	BXL RC	REC 92%									
10.5	Bedrock Greyish Black Shale													
101.0	Greenish Grey Dolostone													
11.2	End of Borehole													
91 04 11														
* GROUND WATER CONDITIONS														
PIEZO. NO.		GROUND WATER ELEVATION (Metres)												
1		108.6												

RECORD OF BOREHOLE No P3

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 372; E 360 190 ORIGINATED BY JB
DIST 9 HWY 415 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 10 CHECKED BY BI

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 7 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					
110.8	Ground Surface																
0.0	Sandy Silt (Topsoil)		1	SS	2												
110.2	Dark Brown																
0.6	Brown to Greyish Brown		2	SS	35/10cm		110										
	Heterogeneous Mixture of Silty Sand, Some Gravel, Trace of Clay																
	Occasional Boulders		3	SS	50/13cm		109										
	Very Dense (Glacial Till)																
108.0	Brown to Greyish Brown		4	SS	50/8cm		108										
2.8	Dark to Light Grey																
	Bedrock		5	BXL RC	REC 100%		107										RQD 52%
	Limestone		6	BXL RC	REC 100%		106										RQD 100%
105.1																	
5.7	End of Borehole																
91 04 11																	
* GROUND WATER CONDITIONS																	
PIEZO. NO.			GROUND WATER ELEVATION (Metres)														
1			110.6														

RECORD OF BOREHOLE No P4

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 412; E 360 082 ORIGINATED BY JB
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
 DATUM Geodetic DATE 91 04 05 CHECKED BY BI

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 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
110.0	Ground Surface																
0.0	Sandy Silt to Silty Sand Loose (Fill)	Topsoil, Dark Brown Traces of Root Fibres, Brown	1	SS	2												
109.1			2	SS	7												
0.8			3	SS	25	/5cm											10 46 36 8
	Heterogeneous Mixture of Silty Sand, Some Gravel, Trace of Clay Compact (Glacial Till)		4	BXL RC	REC 88%												RQD 46%
107.3		Brown to Greyish Brown															
2.7		Dark Greenish Grey to Dark Grey	5	BXL RC	REC 92%												RQD 25%
	Bedrock																
			6	BXL RC	REC 96%												RQD 96%
105.0																	
5.0	End of Borehole																
	• Note: Water level measured in open borehole immediately prior to coring.																

RECORD OF BOREHOLE No P5

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 506; E 360 200 ORIGINATED BY JB
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 08 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40						60	80	100	WATER CONTENT (%)
109.3	Ground Surface																	
0.0	Sandy Silt to Silty Sand	Dark Brown, Topsoil	1	SS	2													
108.5	(Fill)	Traces of Organics	2	SS	55													
0.8	Light Greyish Brown																	
	Heterogeneous Mixture of Silty Sand, Some Gravel, Trace of Clay		3	SS	50/13cm									13 49 32 6				
	Occasional Sand Layers and Boulders		4	SS	50/8cm													
	Very Dense (Glacial Till)		5	SS	30/8cm													
	Gravelly Sand Layer		6	SS	50/13cm									21 73 6				
			7	SS	60/15cm													
	Occasional Boulders		8	SS	64/8cm													
	Numerous Boulders		9	BXL RC	REC 67%									RQD 22%				
101.6																		
7.7	End of Borehole																	
<p>91 04 11</p> <p>* GROUND WATER CONDITIONS</p> <table border="1"> <tr> <th>PIEZO. NO.</th> <th>GROUND WATER ELEVATION (Metres)</th> </tr> <tr> <td>1</td> <td>108.9</td> </tr> </table>															PIEZO. NO.	GROUND WATER ELEVATION (Metres)	1	108.9
PIEZO. NO.	GROUND WATER ELEVATION (Metres)																	
1	108.9																	

RECORD OF BOREHOLE No P6

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 595; E 360 293 ORIGINATED BY JB/FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 05/06 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	20 40 60 80 100					
102.5	Ground Surface													
0.0	Clayey Silt (Topsoil)		1	SS	3		102							
102.0	Dark Brown Brown to Greyish Brown													
0.5	Clayey Silt, Some Sand Contains Traces of Root Fibres Firm to Stiff		2	SS	1		101							
			3	SS	12									
100.4	Till-Like						100							
2.1	Silty Sand to Coarse Sand and Gravel		4	SS	13									
	Light Greyish Brown Light to Dark Grey		5	SS	1**									
	Compact		6	SS	23									
98.4							99							
4.1	Heterogeneous Mixture of Silty Sand, Some Gravel, Trace of Clay Very Dense (Glacial Till)		7	SS	50	/11cm	98							** Sand Likely Disturbed Due to Hydro- static Head.
96.3	Numerous Boulders		8	BXL RC	REC 69%		97							RQD 0%
6.2	Bedrock		9	BXL RC	REC 100%		96							RQD 100%
	Limestone Light to Medium Dark Grey Dark Greenish Grey to Dark Grey		10	BXL RC	REC 100%		95							RQD 95%
93.2	Silty Dolostone						94							
9.3	End of Borehole													
	• Note: Water level in open borehole at a depth of 1.1 m immediately prior to coring													

RECORD OF BOREHOLE No P7

1 OF 1 METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 573; E 360 220 ORIGINATED BY JB
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger COMPILED BY JB
 DATUM Geodetic DATE 91 04 10 CHECKED BY BI

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	20 40 60 80 100	20 40 60 80 100	20 40 60 80 100					
106.6	Ground Surface																
0.0	Sandy Silt (Topsoil)		1	SS	1												
106	Dark Greyish Brown		2	SS	77	/22cm											
0.6	Brown to Greyish Brown		3	SS	50	/8cm											
	Heterogeneous Mixture of Silty Sand, Some Gravel Trace of Clay																
	Contains Occasional Cobbles and Boulders		4	SS	50	/13cm											
	Dense to Very Dense (Glacial Till)																
			5	SS	33												
			6	SS	59												
99.0	End of Borehole																
7.6	Note: water level in open borehole at a depth of 0.3 m (caved at 0.6 m) immediately upon completion of sampling.																

RECORD OF BOREHOLE No P9

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 501; E 359 945 ORIGINATED BY JB
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger COMPILED BY JB
DATUM Geodetic DATE 91 04 10 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _P	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40						60	80	100	10
112.3	Ground Surface																	
0.0	Topsoil						112											
111.7	Dark Brown																	
0.6	Greyish Brown																	
	Heterogeneous Mixture of Silty Sand, Some Gravel Trace of Clay																	
	Compact to Dense		1	SS	75													
	Very Dense				/25cm													
	(Glacial Till)																	
	Gravelly																	
109.0			2	SS	50	/10cm												
3.3	End of Borehole																	
	Note: The water level in the open borehole was at a depth of 0.3 m immediately upon com- pletion of sampling.																	

RECORD OF BOREHOLE No P12

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 474; E 359 851 ORIGINATED BY JB
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
 DATUM Geodetic DATE 91 04 04/05 CHECKED BY BJ

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 7 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	WATER CONTENT (%) 10 20 30		
115.3	Ground Surface															
0.0	300 mm Sandy Silt (Topsoil) Dark Brown Grayish Brown	1	AS													
	Heterogeneous Mixture of Silty Sand, Some Gravel, Trace of Clay	2	SS	25 13cm												
	Contains Occasional Cobbles and Boulders	3	SS	50/13cm												
	Very Dense (Glacial Till)	4	SS	32/8cm												
	Numerous Boulders	5	BXL RC	REC 41%								RQD 27%				
111.7	Grayish Brown Light to Dark Grey															
3.6	Bedrock	6	BXL RC	REC 97%								RQD 53%				
	Limestone															
110.3																
5.0	End of Borehole															
<p>91 04 11 * GROUND WATER CONDITIONS</p> <table border="1"> <thead> <tr> <th>PIEZO. NO.</th> <th>GROUND WATER ELEVATION (Metres)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>114.8</td> </tr> </tbody> </table>													PIEZO. NO.	GROUND WATER ELEVATION (Metres)	1	114.8
PIEZO. NO.	GROUND WATER ELEVATION (Metres)															
1	114.8															

RECORD OF BOREHOLE No P13

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 615; E 359 751 ORIGINATED BY JB
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
 DATUM Geodetic DATE 91 04 04 CHECKED BY BI

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					
118.5	Ground Surface																
0.0 118.1	Gravelly Sand and Silt (Fill) Dark Brown Light to Dark Grey		1	AS		DRY *	118	25/5cm									40 32 22 6
0.4	Bedrock		2	BXL RC	REC 87%		117										RQD 65%
	Limestone		3	BXL RC	REC 100%		116										RQD 83%
115.6																	
2.9	End of Borehole																
	* Note: Borehole dry immediately prior to coring.																

RECORD OF BOREHOLE No P14

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 710; E 359 900 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 12 CHECKED BY BI

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 7 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					
112.8	Ground Surface																
0.0	300 mm Sand and Gravel (Fill) --- Greyish Brown Light to Dark Grey		1	AS		DRY *											
	Limestone		2	BXL RC	REC 72%		112										RQD 12%
	Bedrock						111										
	Light to Dark Grey --- Greenish Grey Silty Dolostone --- Greenish Grey Light to Dark Grey		3	BXL RC	REC 20%		110										RQD 0%
	Limestone		4	BXL RC	REC 90%		109										RQD 50%
107.9							108										
4.9	End of Borehole																
	* Note: Borehole was found to be dry immediately prior to coring.																

RECORD OF BOREHOLE No P16

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 014 886; E 359 880 ORIGINATED BY JB
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 04 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100	W _p	W	W _L					
110.7	Ground Surface																			
0.0	Silty Sand (Fill) Contains Traces of Root Fibres and Topsoil Enclosures		1	SS	31															
			2	SS	7															
109.0	Brown to Dark Brown		3	SS	50/5mm															
1.7	Brown to Grey Heterogeneous Mixture of Silty Sand, Some Gravel, Trace of Clay Contains Numerous Boulders Dense to Very Dense (Glacial Till)		4	RC	REC 74%															
			5	RC	REC 44%															
			6	BXL RC	REC 94%															
			7	BXL RC	REC 92%															
106.6	Brown to Grey		8	BXL RC	REC 84%															
4.1	Bedrock																			
105.9	Light to Dark Grey Limestone																			
4.8	End of Borehole																			
<p>91 04 12 * GROUND WATER CONDITIONS</p> <table border="1"> <tr> <td>PIEZO. NO.</td> <td>GROUND WATER ELEVATION (Metres)</td> </tr> <tr> <td>1</td> <td>106.3</td> </tr> </table>																	PIEZO. NO.	GROUND WATER ELEVATION (Metres)	1	106.3
PIEZO. NO.	GROUND WATER ELEVATION (Metres)																			
1	106.3																			

RECORD OF BOREHOLE No P18

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 860; E 359 276 ORIGINATED BY JB
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 11 CHECKED BY BI

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 7 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					
94.8	Ground Surface																
0.0	Sandy Silt (Fill)																
94.4	Contains Traces of Organics Dark Brown																
0.4	Greyish Brown																
	Heterogeneous Mixture of Clayey Silt, Sand, Trace of Gravel		1	SS	29												7 26 55 12
	Greyish Brown		2	SS	14												
	Grey		3	SS	15												
	Clayey		4	SS	9												
	Loose to Compact (Glacial Till)		5	SS	27												
90.3	Grey																
4.5	Pale Yellowish Brown to Dark Grey		6	BXL RC	REC 99%												RQD 89%
88.7	Bedrock Dolostone																
6.1	End of Borehole • Note: Water level in open borehole at a depth of 0.4 m (caved at 2.3 m) immediately upon completion of coring. It is unlikely that the water level has had sufficient time to stabilize.																

RECORD OF BOREHOLE No P19

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 736; E 359 320 ORIGINATED BY FT/JB
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 11/12 CHECKED BY BI

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 7 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					
94.9	Ground Surface																
0.0	Clayey Silt (Fill)																
94.4	Contains Traces of Organics																
0.5	Heterogeneous Mixture of Clayey Silt, Sand, Trace of Gravel		1	SS	8												
	Greyish Brown to Brownish Grey		2	SS	34												
	Sandy		3	SS	25												
	Stiff to Hard (Glacial Till)		4	SS	10												
90.8	Grey		5	SS	7	/15cm											
4.1	Brownish Grey to Dark Grey		6	BXL RC	REC 98%												RQD 92%
	Bedrock																
	Dolostone		7	BXL RC	REC 97%												RQD 90%
87.7	End of Borehole																
7.2	Note: Water level in open borehole at a depth of 1.0 m (caved at 2.8 m) approximately 4 hours after completion of coring. The water level may not have had sufficient time to stabilize.																

RECORD OF BOREHOLE No P20

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 629; E 359 358 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 11 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT			UNIT WEIGHT 7 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	W _p	W	W _L					
95.1	Ground Surface																			
0.0	Clayey Silt (Fill) --- 150 mm Topsoil																			
94.6	Contains Traces of Organics Dark Brown																			
0.5	Greyish Brown																			
	Clayey Silt, Some Sand		1	SS	9															
	Firm to Stiff																			
93.3			2	SS	5											0 6 79 15				
1.8	Greyish Brown																			
	Sandy Silt		3	SS	10															
	Trace of Clay Loose																			
92.2																				
2.9	Heterogeneous Mixture of																			
	Clayey Silt, Some Sand																			
91.6	Trace of Gravel (Glacial Till), Very Stiff		4	SS	15															
3.5	Brownish Grey to Dark Grey																			
	Bedrock		5	BXL RC	REC 94%											RQD 77%				
	Dolostone		6	BXL RC	REC 89%											RQD 85%				
88.5																				
6.6	End of Borehole																			
<p>91 04 12</p> <p>* GROUND WATER CONDITIONS</p> <table border="1"> <thead> <tr> <th>PIEZO. NO.</th> <th>GROUND WATER ELEVATION (Metres)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>94.5</td> </tr> </tbody> </table>																	PIEZO. NO.	GROUND WATER ELEVATION (Metres)	1	94.5
PIEZO. NO.	GROUND WATER ELEVATION (Metres)																			
1	94.5																			

RECORD OF BOREHOLE No P21

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 493; E 359 344 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91.04.10/11 CHECKED BY BI

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					
94.9	Ground Surface																
0.0	180 mm Topsoil																
94.3	Clayey Silt, Some Sand Traces of Organics (Fill)	Brown to Dark Brown															
0.6	Heterogeneous Mixture of Clayey Silt, Some Sand, Trace of Gravel, Hard (Glacial Till)	Greyish Brown	1	SS	53												
93.5		Greyish Brown															
1.4		Brownish Grey to Dark Grey															
	Bedrock		2	BXL RC	REC. 98%												RQD 58%
92.0																	
2.9	End of Borehole																
	* Note: Water level at ground surface immediately prior to coring.																

RECORD OF BOREHOLE No P22

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 516; E 359 514 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 10 CHECKED BY BI

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 7 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					
94.7	Ground Surface													
0.0	150 mm topsoil													
93.3	Sandy Silt to Sand and Silt		1	SS	21									
1.4	Heterogeneous Mixture of Clayey Silt, Some Sand, Trace of Gravel (Glacial Till), Hard		2	SS	35 / 25cm									
92.8														
1.9	Pale Yellowish Brown to Dark Brown		3	BXL RC	REC 88%									
	Bedrock		4	BXL RC	REC 95%									
	Dolostone													
90.0			5	BXL RC	REC 91%									
4.7	End of Borehole													
	*Note: The water level in the open borehole was at the ground surface immediately prior to coring.													

RECORD OF BOREHOLE No P23

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 445; E 359 467 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 10 CHECKED BY BI

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 7 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					
95.2	Ground Surface																
0.0	150 mm Topsoil Clayey Silt, Some Sand (Fill), Traces of Organics Brown to Dark Brown		1	AS													
0.5	Brownish Grey to Dark Grey		2	RC	REC 94%												RQD 57%
	Bedrock																
	Dolostone		3	RC	REC 98%												RQD 88%
91.8																	
3.4	End of Borehole * Note: Water level in open borehole at ground surface immediately upon completion of sampling. AS = Sample obtained from the tip of the auger.																

RECORD OF BOREHOLE No P24

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 370; E 359 357 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 10 CHECKED BY BI

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			20	40	60	80	100					
95.8																
0.0	Sandy Silt — 50 mm topsoil Trace of Clay and Organics (Fill)		1	SS	3											
94.8	Brown to Dark Brown															
0.8	Brownish Grey to Dark Grey															
	Bedrock		2	BXL RC	REC 100%											RQD 57%
	Dolostone															
			3	BXL RC	REC 90%											RQD 85%
91.7																
3.9	End of Borehole															
	* Note: Water level in the open borehole at the ground surface immediately prior to sampling.															

RECORD OF BOREHOLE No P27

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 186; E 359 348 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 09 19 CHECKED BY BI

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 7 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					
95.5	Ground Surface																
0.0	Topsoil, Dark Brown																
94.9	Clayey Silt, Some Sand Traces of Organics, (Fill)																
0.6	Heterogeneous Mixture of Clayey Silt, Sand, Some Gravel Very Stiff to Hard (Glacial Till)		1	SS	23												
93.4	Brown		2	SS	77												14 41 33 12
2.1	Pale Yellowish Brown to Dark Grey																
	Bedrock		3	BXL RC	REC 100%												RQD 82%
	Dolostone		4	BXL RC	REC 98%												RQD 83%
90.1																	
5.4	End of Borehole																
	• Note: Water level in open borehole at the ground surface immediately prior to coring.																

RECORD OF BOREHOLE No P29

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 019 194; E 359 605 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 08 CHECKED BY BI

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 7 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
94.6	Ground Surface																	
0.0	Clayey Silt, Some Sand	Topsoil Dark Brown Brown																
94.0	Traces of Organics (Fill)																	
0.6	Heterogeneous Mixture of Clayey Silt, Sand, Tr. of Gravel Stiff to Hard	Brown	1	SS	38													
	(Glacial Till)	Brownish Grey	2	SS	10													
			3	SS	8													
91.7		Brownish Grey																
2.9	Silty Sand to Sandy Silt	Grey	4	SS	1													
	Loose to Compact		5	SS	0													
89.7		Grey	6	SS	9 / 20 cm													
4.8	Pale Yellowish Brown to Dark Grey		7	BXL RC	REC 91%													
	Bedrock																	
	Dolostone		8	BXL RC	REC 98%													
87.3																		
7.3	End of Borehole																	
<p>91 04 12 * GROUND WATER CONDITIONS</p> <table border="1"> <tr> <th>PIEZO. NO.</th> <th>GROUND WATER ELEVATION (Metres)</th> </tr> <tr> <td>1</td> <td>94.3</td> </tr> </table>														PIEZO. NO.	GROUND WATER ELEVATION (Metres)	1	94.3	
PIEZO. NO.	GROUND WATER ELEVATION (Metres)																	
1	94.3																	

1 OF 1

W.P. 122-87-00 LOCATION Co-ords. N 5 019 083; E 359 584 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger COMPILED BY JB
DATUM Geodetic DATE 91 04 09 CHECKED BY BI

+3, x5: Numbers refer to Sensitivity

RECORD OF BOREHOLE No P31

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 018 976; E 359 628 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 04/05 CHECKED BY BI

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 7 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
94.5	Ground Surface																
0.0	Clayey Silt, Some Sand	Topsoil															
93.9	Traces of Organics (Fill)	Brown to Dark Brown															
0.6	Clayey Silt, Some Sand	Greyish Brown															
93.3	Very Stiff	Greyish Brown	1	SS	15												
1.2	Sandy Silt, Trace of Clay and Gravel (Slightly Cohesive)	Grey	2	SS	8												
	Loose		3	SS	4												
			4	SS	6												
90.8	Heterogeneous Mixture of Clayey Silt, Sand, Trace of Gravel		5	SS	10												
3.7	Compact to Dense (Glacial Till)		6	SS	40												
88.9	Pale Yellowish Brown to Dark Grey	Grey															
5.6	Bedrock		7	BXL RC	REC 92%									RQD 87%			
	Dolostone		8	BXL RC	REC 60%									RQD 58%			
85.8	End of Borehole																
<p>91 04 12</p> <p>• GROUND WATER CONDITIONS</p> <table border="1"> <tr> <td>PIEZO. NO.</td> <td>GROUND WATER ELEVATION (Metres)</td> </tr> <tr> <td>1</td> <td>94.3</td> </tr> </table>														PIEZO. NO.	GROUND WATER ELEVATION (Metres)	1	94.3
PIEZO. NO.	GROUND WATER ELEVATION (Metres)																
1	94.3																

RECORD OF BOREHOLE No P32

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 018 869; E 359 702 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 05 CHECKED BY BI

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 7 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					
94.5	Ground Surface													
0.0	250 mm Topsoil													
93.9	Silty Clay, Trace of Sand Tr. of Organics (Fill)	Dark Brown to Brown Grey												
0.6	Silty Clay, Trace of Sand		1	SS	10									
93.1	Stiff													
1.4	Sandy Silt, Trace of Clay to Silty Sand		2	SS	4									
			3	SS	7									
			4	SS	4									
		Loose	5	SS	18									
90.1	Compact													
4.4	Heterogeneous Mixture of Clayey Silt, Sand, Some Gravel (Glacial Till)	Hard Grey	6	SS	25	/20cm								12 41 34 13
89.6	Pale Yellowish Brown to Dark Grey													
4.9	Bedrock		7	BXL RC	REC 100%									RQD 73%
	Dolomite													
			8	BXL RC	REC 98%									RQD 90%
86.5														
8.0	End of Borehole													
	• Note: Water level in open borehole immediately prior to coring.													

RECORD OF BOREHOLE No P33

1 OF 1

METRIC

W.P. 122-87-00 LOCATION Co-ords. N 5 018 675; E 359 816 ORIGINATED BY FT
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring COMPILED BY JB
DATUM Geodetic DATE 91 04 04 CHECKED BY BI

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT			UNIT WEIGHT 7 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	W _p W W _L	WATER CONTENT (%)							
94.5	Ground Surface																	
0.0	230 mm Topsoil																	
93.9	Clayey Silt, Some Sand. Trace of Organics (Fill)																	
0.5	Greyish Brown																	
93.1	Silty Clay, Some Sand Stiff		1	SS	11													
1.4	Greyish Brown																	
	Brownish Grey		2	SS	24													
	Brownish Grey																	
	Grey		3	SS	17													
	Sandy Silt to Silty Sand																	
	Slightly Cohesive		4	SS	13													
			5	SS	42													
	Compact to Dense		6	SS	39													
88.9	Grey																	
5.6	Brownish Grey																	
	Dolostone		7	BXL RC	REC 95%									RQD 95%				
	Brownish Grey																	
	Light to Medium Grey																	
	Bedrock																	
	Dolomitic Sandstone		8	BXL RC	REC 93%									RQD 93%				
	Dolostone																	
85.9																		
8.6	End of Borehole																	
<p>91 04 12 * GROUND WATER CONDITIONS</p> <table border="1"> <thead> <tr> <th>PIEZO. NO.</th> <th>GROUND WATER ELEVATION (Metres)</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>93.6</td> </tr> </tbody> </table>															PIEZO. NO.	GROUND WATER ELEVATION (Metres)	1	93.6
PIEZO. NO.	GROUND WATER ELEVATION (Metres)																	
1	93.6																	

APPENDIX "A"

ROCK CORE DESCRIPTION

ROCK CORE DESCRIPTION

WP 122-87-00

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CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
P1	6	3.57-3.94	83	28	3.57-10.52	OVERBURDEN (boulder till).
	7	3.94-4.86	94	51	10.52-10.72	SHALE (non-calcareous, ostracod-bearing), greyish black; very fine grained; very weak; unweathered to slightly weathered; fractures close to very close spaced, flat, undulating, smooth.
	8	4.89-5.31	67	0		
	9	5.31-5.64	89	0		
	10	5.64-5.94	58	0	10.72-11.16	SILTY DOLOSTONE (calcitic), dark greenish grey; very fine grained; weak; unweathered to slightly weathered; fractures close spaced, flat to near vertical, undulating to planar, smooth to rough.
	11	5.94-6.43	99	21		
	12	6.43-6.83	83	0		
	13	6.83-7.17	52	0		
	14	7.19-7.85	69	0		
	15	7.85-8.46	54	0		
	16	8.46-8.79	42	0		
	17	8.79-10.29	80	64		
	18	10.29-11.16	92	68		
P2	8	5.92-7.55	100	75	5.92-6.22	SHALE (non-calcareous), greyish black; very fine grained; very weak; unweathered to slightly weathered; fractures close to very close spaced, flat, undulating, smooth.
	9	7.55-8.79	100	87	6.22-8.79	
						LIMESTONE (undulating shaly partings; nodular, algal laminated, stromatolitic, and burrowed in places), medium dark grey to light grey; very fine grained; medium strong; unweathered to slightly weathered; fractures wide to extremely close spaced, flat, undulating, smooth to rough.

*CR = CORE RECOVERY

*RQD = ROCK QUALITY DESIGNATION

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

ROCK CORE DESCRIPTION

WP 122-87-00

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CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
P3	5	2.77-4.14	100	51	2.77-5.71	LIMESTONE (undulating shaly partings), medium dark grey to light grey; very fine grained; medium strong; unweathered to slightly weathered; fractures moderately close to extremely close spaced, flat to near vertical, undulating, smooth to rough.
	6	4.14-5.71	100	100		
P4	4	1.58-2.73	88	46	1.58-3.69	OVERBURDEN (boulder till).
	5	2.73-3.69	92	25	3.69-4.95	SILTY DOLOSTONE , dark greenish grey; very fine grained; weak; unweathered to slightly weathered; fractures moderately close to close spaced, flat to near vertical, undulating, smooth to rough.
	6	3.69-4.95	96	96		
P5	9	6.47-7.67	67	22	6.47-7.67	OVERBURDEN (boulder till).
P6	8	5.87-6.22	69	0	5.87-6.22	OVERBURDEN (boulder till).
	9	6.22-7.75	100	100	6.22-8.43	LIMESTONE (undulating shaly partings; nodular in places), medium dark grey to light grey; very fine grained; medium strong; unweathered to slightly weathered; fractures moderately close to very close spaced, flat to dipping, undulating, smooth to rough.
	10	7.75-9.30	100	95		
					8.43-9.30	SILTY DOLOSTONE , dark greenish grey to dark grey, with interbed 28 cm thick of greyish black SHALE ; very fine grained; weak to very weak; unweathered to slightly weathered; fractures moderately close to very close spaced, flat to near vertical, undulating, smooth to rough

*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 122-87-00**

Page 3 of 7

CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
P12	5	2.90-3.61	41	27	2.90-3.63	OVERBURDEN (boulder till).
	6	3.61-5.00	100	55	3.63-5.00	LIMESTONE (shaly partings), medium dark grey to light grey; very fine grained; medium strong; unweathered to slightly weathered; fractures moderately close to extremely close spaced, flat to near vertical, undulating to planar, smooth to rough.
P13	2	0.40-1.91	87	67	0.40-2.87	LIMESTONE (undulating shaly partings), medium dark grey to light grey; very fine grained; medium strong; unweathered to slightly weathered; fractures moderately close to very close spaced, flat to dipping, undulating to planar, smooth to rough.
	3	1.91-2.87	100	83		

*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 122-87-00

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CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
P14						
	2	0.30-1.83	72	12	0.30-2.00	LIMESTONE (undulating shaly partings; oolitic in part), medium dark grey to light grey; very fine to medium grained; medium strong; unweathered to slightly weathered (moderately weathered, 1.30-2.00 m); fractures close to extremely close spaced, flat to near vertical, undulating to planar, smooth to rough.
	3	1.83-3.35	20	0		
	4	3.35-4.88	90	50	2.00-2.60	SILTY DOLOSTONE (sandy in part; calcitic), light greenish grey to dark greenish grey; fine to medium grained; weak; moderately weathered; fractures close to very close spaced, flat to near vertical, undulating to planar, smooth to rough.
					2.60-4.88	LIMESTONE (undulating shaly partings), medium dark grey to light grey; very fine grained; medium strong; unweathered to slightly weathered (moderately weathered, 2.60-3.61 m); fractures moderately close to very close spaced, flat to near vertical, undulating to planar, smooth to rough.
P16	4	1.69-1.93	74	0	1.69-4.06	OVERBURDEN (boulder till).
	5	1.93-2.16	44	0	4.06-4.79	LIMESTONE (undulating shaly partings), medium dark grey to light grey; very fine grained; medium strong; unweathered to slightly weathered; fractures moderately close to very close spaced, flat, undulating to planar, smooth to rough.
	6	2.16-2.59	94	0		
	7	2.59-3.20	92	69		
	8	3.20-4.79	84	41		

*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 122-87-00

Page 5 of 7

CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
P18	6	4.50-6.10	99	89	4.50-6.10	DOLOSTONE (vuggy in part), pale yellowish brown to light grey to medium dark grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures wide to very close spaced, flat, planar, smooth.
P19	6	4.12-5.69	98	92	4.12-7.24	DOLOSTONE (cherty in places), light grey to medium dark grey to brownish grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures wide to close spaced, flat, planar to undulating, smooth to rough.
	7	5.69-7.24	100	93		
P20	5	3.51-5.06	96	79	3.51-6.60	DOLOSTONE (cherty in places), light grey to medium dark grey to brownish grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures moderately close to very close spaced, flat, planar to undulating, smooth to rough.
	6	5.06-6.60	90	87		
P21	2	1.37-2.95	98	58	1.37-2.95	DOLOSTONE, light grey to medium dark grey to brownish grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures moderately close to very close spaced, flat to near vertical, planar to undulating, smooth to rough.
P22	3	1.93-2.36	88	59	1.93-4.73	DOLOSTONE (vuggy in part and cherty in places), pale yellowish brown to light grey to medium dark grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures wide to close spaced, flat to near vertical, planar to undulating, smooth to rough.
	4	2.36-3.89	95	87		
	5	3.89-4.73	91	86		

*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 122-87-00

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CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
P23	2	0.61-1.83	94	57	0.61-3.35	DOLOSTONE (cherty in places), light grey to medium dark grey to brownish grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures moderately close to very close spaced, flat to near vertical, planar to undulating, smooth to rough.
	3	1.83-3.35	98	88		
P24	2	0.76-2.31	100	57	0.76-3.89	DOLOSTONE (cherty in places), light grey to medium dark grey to brownish grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures wide to close spaced, flat to near vertical, planar to undulating, smooth to rough.
	3	2.31-3.89	90	85		
P25	2	1.60-3.13	100	79	1.60-3.13	DOLOSTONE , medium grey to medium dark grey to brownish grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures wide to very close spaced, flat, planar to undulating, smooth to rough.
P27	3	2.29-3.86	100	82	2.29-5.39	DOLOSTONE (vuggy in part and cherty in places), pale yellowish brown to light grey to medium dark grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures moderately close to very close spaced, flat, planar to undulating, smooth to rough.
	4	3.86-5.39	98	83		
P29	7	4.92-5.82	91	59	4.92-7.34	DOLOSTONE (vuggy in part and cherty in places), pale yellowish brown to light grey to medium dark grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures moderately close to very close spaced, flat to near vertical, undulating to planar, smooth to rough.
	8	5.82-7.34	99	93		

*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 122-87-00

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CORE RECOVERY					CORE DESCRIPTION	
BH#	RC#	DEPTH (m)	% CR*	% RQD*	DEPTH (m)	DESCRIPTION
P31	7	5.64-7.16	92	87	5.64-8.69	DOLOSTONE (vuggy in part and cherty in places), pale yellowish brown to light grey to medium dark grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures wide to close spaced, flat, undulating to planar, smooth to rough.
	8	7.16-8.69	60	58		
P32	7	4.93-6.50	100	73	4.93-8.03	DOLOSTONE (vuggy in part and cherty in places), pale yellowish brown to light grey to medium dark grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures wide to very close spaced, flat to near vertical, undulating to planar, smooth to rough.
	8	6.50-8.03	98	90		
P33	7	5.56-7.09	95	95	5.56-6.55	DOLOSTONE , brownish grey; medium grained; medium strong; unweathered to slightly weathered; fractures wide spaced, flat, undulating, smooth.
	8	7.09-8.61	93	93	6.55-7.90	DOLOMITIC SANDSTONE , very light grey to medium dark grey; fine to medium grained; medium strong; unweathered to slightly weathered; fractures wide spaced, flat, undulating, smooth to rough.
					7.90-8.61	DOLOSTONE , medium grey; fine grained; medium strong; unweathered to slightly weathered; fractures moderately close spaced, flat, planar, smooth.

*CR = CORE RECOVERY

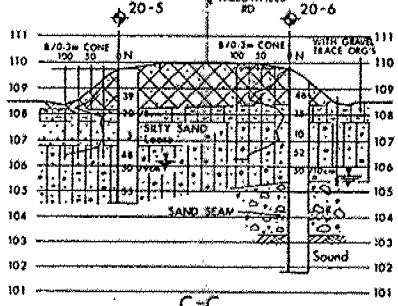
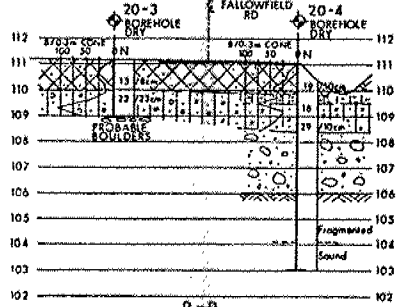
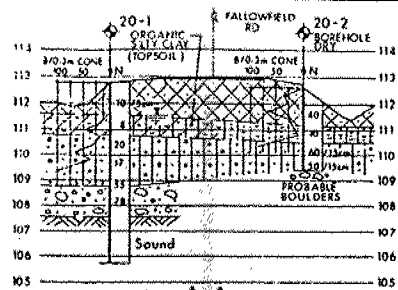
*RQD = ROCK QUALITY DESIGNATION

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

Logged by: DAW, Soils and Aggregates Section

APPENDIX "B"

**SELECTED BOREHOLES FROM
PREVIOUS INVESTIGATIONS**

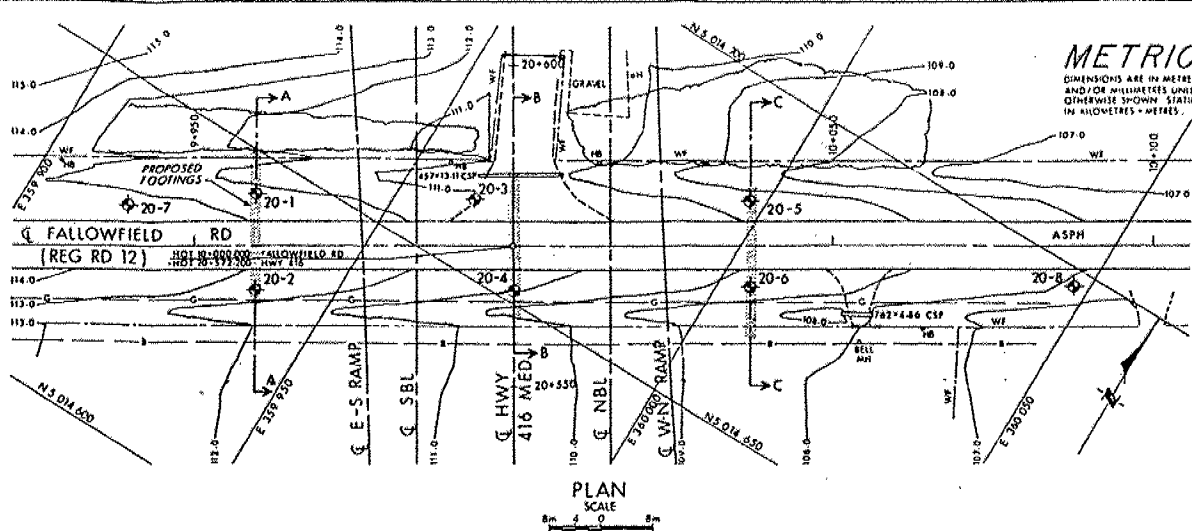


SECTIONS

SCALE
4m 2 0 2m Hor
2m 1 0 2m Vert

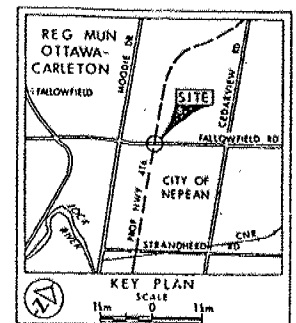
SOIL STRATIGRAPHY LEGEND

- SAND & GRAVEL (FILL)
- SILTY SAND (TOPSOIL)
- HETEROGENEOUS MIXTURE OF SILT, SAND & GRAVEL (GLACIAL TILL)
- BOULDERS WITH SAND & GRAVEL (GLACIAL TILL)
- LIMESTONE BEDROCK WITH INTERBEDDED SHALE LAYERS



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

CONT No
WP No 128-87-04
FALLOWFIELD RD UNDERPASS
(STRUCTURE 20)
BORE HOLE LOCATIONS & SOIL STRATA



LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- 12 Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- WL at time of investigation 89.05
- WL in Piezometer
- Piezometer

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
20-1	112.8	5 014 644.0	3 59 931.4
20-2	112.6	5 014 631.2	3 59 939.1
20-3	111.2	5 014 661.0	3 59 960.8
20-4	111.0	5 014 651.8	3 59 973.4
20-5	109.7	5 014 682.8	3 59 997.7
20-6	109.8	5 014 671.4	3 60 004.6
20-7	113.6	5 014 632.4	3 59 915.0
20-8	107.9	5 014 697.2	3 60 047.5

NOTE

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

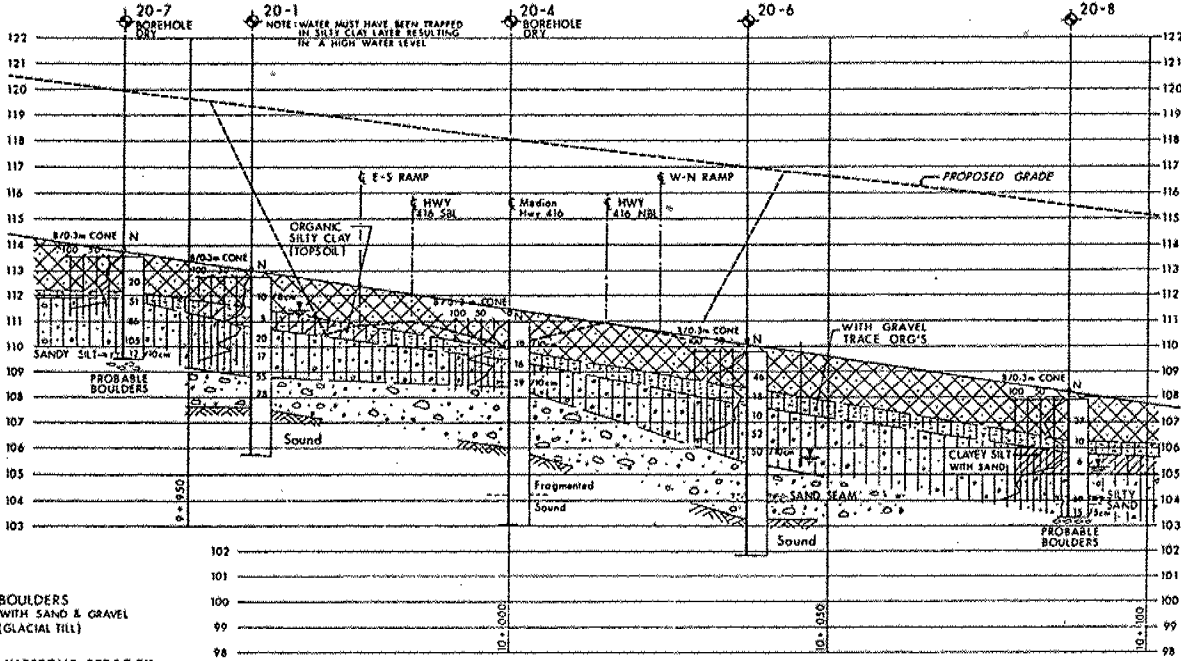
NOTE: The complete foundation investigation and design report for this project and other related documents may be obtained at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically included in accordance with the conditions of Section 102-2 of Form R0.

Geotechnical No 3105-160		DESCRIPTION	
REV. No. 216	DATE 89.07.18	DATE 89.07.18	DATE 89.07.18
DESIGNED BY: [Signature]	CHECKED BY: [Signature]	DATE 89.07.18	DATE 89.07.18
DRAWN BY: [Signature]	CHECKED BY: [Signature]	DATE 89.07.18	DATE 89.07.18

REF No E-52-416-S, 89.06

PROFILE FALLOWFIELD RD

SCALE
8m 4 0 8m Hor
2m 1 0 2m Vert



RECORD OF BOREHOLE No 20-1

METRIC

W P 128-87-04 LOCATION Co-ords: N 5 014 644.0; E 359 931.4 ORIGINATED BY TK
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring & Cone Test COMPILED BY BWS
 DATUM Geodetic DATE 89 05 15 CHECKED BY TK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	W _p	W	W _L			
								SHEAR STRENGTH kPa		WATER CONTENT (%)				
							○ UNCONFINED + FIELD VANE ■ QUICK TRIAXIAL x LAB VANE							
112.8	Ground Surface													GR SA SI CL
0.0	Sand & Gravel Brown		1	SS	10	8 cm								
111.6	(Fill)													
1.2	Organic Silty Clay (Topsoil)		2	SS	8									
110.8														
2.0	Het. Mixture of Silt, Sand and Gravel Brown Compact to Very Dense		3	SS	20									
			4	SS	17									48 26 20 6
108.8	(Glacial Till)													
4.0	Boulders with Sand And Gravel		5	SS	55									
			6	SS	78									34 34 26 6
107.6	(Glacial Till)		7	RC	83%	Rec								RQD = 0%
5.2														
	Limestone Bedrock with Interbedded Shale Layers Sound		8	BXL RC	95% Rec									RQD = 88%
105.7														
7.1	End of Borehole													
	*Note: Water Must Have Been Trapped in Silty Clay Layer Resulting in a High Water Level													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 20-2

METRIC

W P 128-87-04 LOCATION Co-ords: N 5 014 631.2; E 359 939.1
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger & Cone Test
 DATUM Geodetic DATE 89 05 16
 ORIGINATED BY TK
 COMPILED BY SKS
 CHECKED BY TK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE						
112.6	Ground Surface														GR SA SI CL
0.0	Sand & Gravel Brown					*	112								
	(Fill)		1	SS	40										
111.2															
1.4	Silty Sand (Topsoil)		2	SS	10		111								14 54 26 6
110.5	Het. Mixture of Silt, Sand & Gravel Brown, Very Dense		3	SS	60	15 cm	110								
2.1	(Glacial Till)		4	SS	50	15 cm									
109.4	End of Borehole														25 39 30 6
3.2	Refusal (Probable Boulders) *Borehole Dry														

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 20-3

METRIC

W.P. 128-87-04 LOCATION Co-ords: N 5 014 661.0; E 359 960.8 ORIGINATED BY BWS
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger & Cone Test COMPILED BY TK
 DATUM Geodetic DATE 89 05 15 CHECKED BY TK

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	SIRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
111.2	Ground Surface														
0.0	Sand & Gravel Brown					*	111								
1.0	(Fill)		1	SS	13 /	8 cm Bouncing			110						
1.2	Het. Mixture of Silt, Sand & Gravel Very Dense		2	SS	22 /	23 cm Bouncing									12 49 34 5
108.9	(Glacial Till)						109	62 / 42 cm							
2.3	End of Borehole							Refusal							
	Refusal (Probable Boulders)														
	*Borehole Dry														

RECORD OF BOREHOLE No 20-4

METRIC

W P 128-87-04 LOCATION Co-ords: N 5 014 651.8; E 359 973.4 ORIGINATED BY TK
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring & Cone Test COMPILED BY BWS
 DATUM Geodetic DATE 89 05 11-12 CHECKED BY TK

OFFICE REPORT ON SOIL EXPLORATION

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 x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
111.0	Ground Surface										
0.0	Sand & Gravel Brown (Fill)		1	SS	19	10 cm					33 46 16 5
109.9	Silty Sand (Topsoil)		2	SS	16						
1.1											
109.5	Het. Mixture of Silt, Sand & Gravel Compact to V. Dense		3	SS	29	10 cm					14 49 33 4
1.5											
108.4	(Glacial Till)		4	BXL	57%	Bouncing					RQD = 27%
2.6			5	BXL	37%						RQD = 0%
	Boulders with Sand & Gravel (Glacial Till)		6	RC	90%	Rec					RQD = 0%
			7	RC	42%	Rec					RQD = 0%
			8	RC	63%	Rec					RQD = 35%
			9	BXL	50%	Rec					RQD = 27%
106.0			10	RC	100%	Rec					RQD = 0%
5.0			11	BXL	75%						RQD = 34%
	Limestone Bedrock with Interbedded Shale Layers		12	BXL	100%	Rec					RQD = 18%
			13	RC	80%	Rec					RQD = 0%
			14	BXL	100%						RQD = 0%
			15	RC	100%	Rec					RQD = 0%
			16	BXL	98%	Rec					RQD = 56%
			17	RC							
103.0	End of Borehole										
8.0	<p>Notes:</p> <ol style="list-style-type: none"> Borehole Dry at 2.6 m below Ground Surface Drilling Water Lost at 6.2 m below Ground Surface (Probable Fracture Zone in Bedrock) 										



Ministry
of
Transportation
Ontario

RECORD OF BOREHOLE No 20-5

METRIC

W P 128-87-04 LOCATION Co-ords: N 5 014 682.8; E 359 997.7 ORIGINATED BY TK
DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger & Cone Test COMPILED BY BWS
DATUM Geodetic DATE 89 05 15 CHECKED BY TK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
109.7	Ground Surface															GR SA SI CL
0.0	Sand & Gravel Brown															
	(Fill)		1	SS	39											
108.2																
1.5	Silty Sand (Topsoil)		2	SS	20	8 cm										
107.7																
2.0	Silty Sand Loose		3	SS	5											1 46 45 8
106.8																
2.9	Het. Mixture of Silt, Sand and Gravel Dense to Very Dense		4	SS	48											14 52 29 5
			5	SS	50	9 cm										
106																
	(Glacial Till)															
105			6	SS	55											47 34 14 5
104.5																
5.2	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 20-6

METRIC

W P 128-87-04 LOCATION Co-ords: N 5 014 671.4; E 360 004.6 ORIGINATED BY TK
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger, BXL Rock Coring & Cone Test COMPILED BY BWS
 DATUM Geodetic DATE 89 05 12 CHECKED BY TK

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 x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
109.8	Ground Surface										
0.0	Sand & Gravel Brown										
	(Fill)		1	SS	46						
108.4											
1.4	Silty Sand with Gravel, Trace Organics (Topsoil)		2	SS	15						27 44 24 5
107.7											
2.1	Het. Mixture of Silt, Sand and Gravel Compact to Very Dense		3	SS	10						
			4	SS	52						
	(Glacial Till)		5	SS	50						21 45 30 4
105.4											
4.4	Boulders with Sand & Gravel		6	BXL	63% Rec						RQD = 25%
	(Glacial Till)		7	RC	100% Rec						RQD = 56%
	Sand Seam		8	RC	100% Rec						RQD = 78%
			9	BXL	78% Rec						
			10	RC	100% Rec						RQD = 0%
103.3											
6.5	Limestone Bedrock with Interbedded Shale Layers Sound		11	BXL	100% Rec						RQD = 89%
101.8											
8.0	End of Borehole										

RECORD OF BOREHOLE No 20-7

METRIC

W P 128-87-04 LOCATION Co-ords: N 5 014 632.4; E 359 915.0
 DIST 9 HWY 416 BOREHOLE TYPE H.S. Auger & Cone Test
 DATUM Geodetic DATE 89 05 16
 ORIGINATED BY TK
 COMPILED BY BWS
 CHECKED BY TK

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kp_d ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L	WATER CONTENT (%) 10 20 30	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES							
113.6	Ground Surface											
0.0	Sand & Gravel Brown											
	(Fill)		1	SS	20							
112.2	Silty Sand (Topsoil)											
1.1			2	SS	51							
1.7	Het. Mixture of Silt, Sand and Gravel Very Dense		3	SS	86							
	(Glacial Till)		4	SS	105							
109.5	Sandy Silt		5	SS	12 / 10 cm							
1.1	End of Borehole											
	Refusal (Probable Boulders)											
	*Borehole Dry											

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 20-8

METRIC

W P 128-87-04

LOCATION Co-ords: N 5 014 697.2; E 360 047.5

ORIGINATED BY TK

DIST 9 HWY 416

BOREHOLE TYPE H.S. Auger & Cone Test

COMPILED BY BWS

DATUM Geodetic

DATE 89 05 12

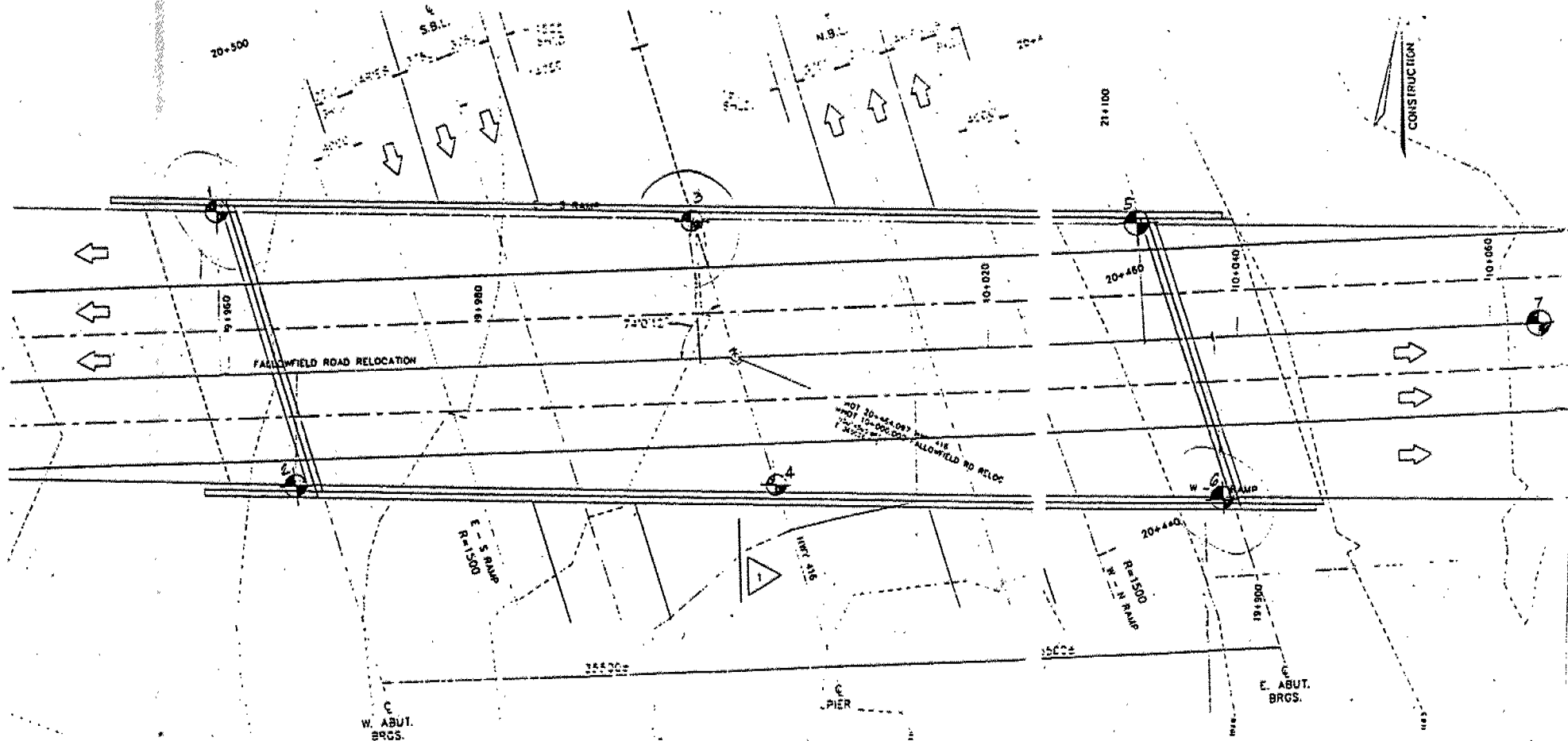
CHECKED BY TK

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 Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					
107.9 0.0	Ground Surface													GR SA SI CL
	Sand & Gravel Brown (Fill)		1	SS	27		107							
106.3 1.6 105.8	Silty Sand (Topsoil)		2	SS	10		106							
2.1	Clayey Silt with Sand		3	SS	6		105							2 33 47 18
105.0 2.9	Het. Mixture of Silt, Sand and Gravel Very Dense		4	SS	Refusal		104							18 46 26 10
	Silty Sand		5	SS	69									0 74 24 2
103.3 4.6	(Glacial Till) End of Borehole		6	SS	15 / 5 cm									
	Refusal (Probable Boulders)													

OFFICE REPORT ON SOIL EXPLORATION

+3, x5: Numbers refer to
Sensitivity

20
15
10
5 (%) STRAIN AT FAILURE



FALLOWFIELD ROAD
REALIGNED

RECORD OF BOREHOLE No 1

1 OF 1

METRIC

W.P. 128-87-04 LOCATION Co-ords: N 5 014 567.4, E 359 984.0 ORIGINATED BY M.M.
DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger COMPILED BY M.M.
DATUM Geodetic DATE 90/08/30 CHECKED BY B.I.

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 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
110.8	Ground Surface																
0.0						DRY											
	Heterogeneous mixture of Silt, Sand and Gravel trace Clay (Glacial Till) Very Dense		1	SS	*		110						0.1				17 48 27 8
			2	SS	*		109										
			3	SS	88		108						0.1				35 34 23 8
			4	SS	114		107										34 32 24 10
			5	SS	99		106										
	Gravel		6	SS	79		105										63 23 9 5
	Boulders		7	RC	REC 32%		104										RQD 32%
104.8																	
6.0																	
	Dolostone Bedrock Unweathered to Slightly Unweathered		8	RC	REC 100%		104										RQD 80.3%
103.2																	
7.6	End of Borehole • Sampler bouncing, probable boulders																

RECORD OF BOREHOLE No 4

1 OF 1

METRIC

W.P. 128-87-04 LOCATION Coords: N 5 014 556.4, E 360 031.7 ORIGINATED BY M.M.
DIST 9 HWY 415 BOREHOLE TYPE Hollow Stem Auger COMPILED BY M.M.
DATUM Geodetic DATE 90/08/30 CHECKED BY B.L.

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	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
109.5	Ground Surface															
0.0	Heterogeneous mixture of Silt, Sand and Gravel trace Clay (Glacial Till) Very Dense	1	SS	78	/28cm	109										
		2	SS	*		108										49 37 7 7
		3	SS	*		107										
	No Sample Retrieved	4	SS	*		106										
	Brown Grey/Brown	5	SS	*		105										
	Gravel	6	SS	80	/5cm	104										61 33 3 3
	Boulders	7	RC	REC	96%	103										RQD 48%
		8	RC	REC	100%	102										RQD 52%
		9	RC	REC	100%	101										RQD 67%
102.0																
7.6	End of Borehole • Sampler bouncing, probable boulders															


RECORD OF BOREHOLE No 6

1 OF 1

METRIC

W.P. 128-87-04 LOCATION Coords: N 5 014 563.6, E 360 066.6 ORIGINATED BY M.M.
 DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger COMPILED BY M.M.
 DATUM Geodetic DATE 90/08/30 CHECKED BY B.J.

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					

108.5	Ground Surface															
0.0	Heterogeneous mixture of Silt, Sand and Gravel trace Clay Brown Brown/Gray (Glacial Till) Very Dense															
			1	SS	75											
			2	SS	37											
			3	SS	*											9 54 30 7
			4	SS	*											
			5	SS	*											
			6	SS	*											
			7	RC	REC 100%											RQD 53%
			8	RC	REC 53%											RQD 0%
			9	RC	REC 31%											RQD 0%
101.7																
6.8	End of Borehole • Sampler bouncing, probable boulders															

RECORD OF BOREHOLE No 7

1 OF 1

METRIC

W.P. 128-87-04 LOCATION Co-ords: N 5 014 583.2, E 380 088.1 ORIGINATED BY M.M.
DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger COMPILED BY M.M.
DATUM Geodetic DATE 90/08/30 CHECKED BY B.I.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT w _p	NATURAL MOISTURE CONTENT w	LIQUID LIMIT w _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
107.6	Ground Surface																
0.0																	
	Dense Heterogeneous mixture of Silt, Sand and Gravel trace Clay (Glacial Till) Very Dense		7	SS	32		107									24.6	30 43 21 6
			2	SS	24		106										
	V. Dense Boulders		3	SS	*		105										
			4	SS	50	/15cm	104										23 48 15 14
102.4							103										
5.2	End of Borehole • Sampler bouncing, probable boulders																

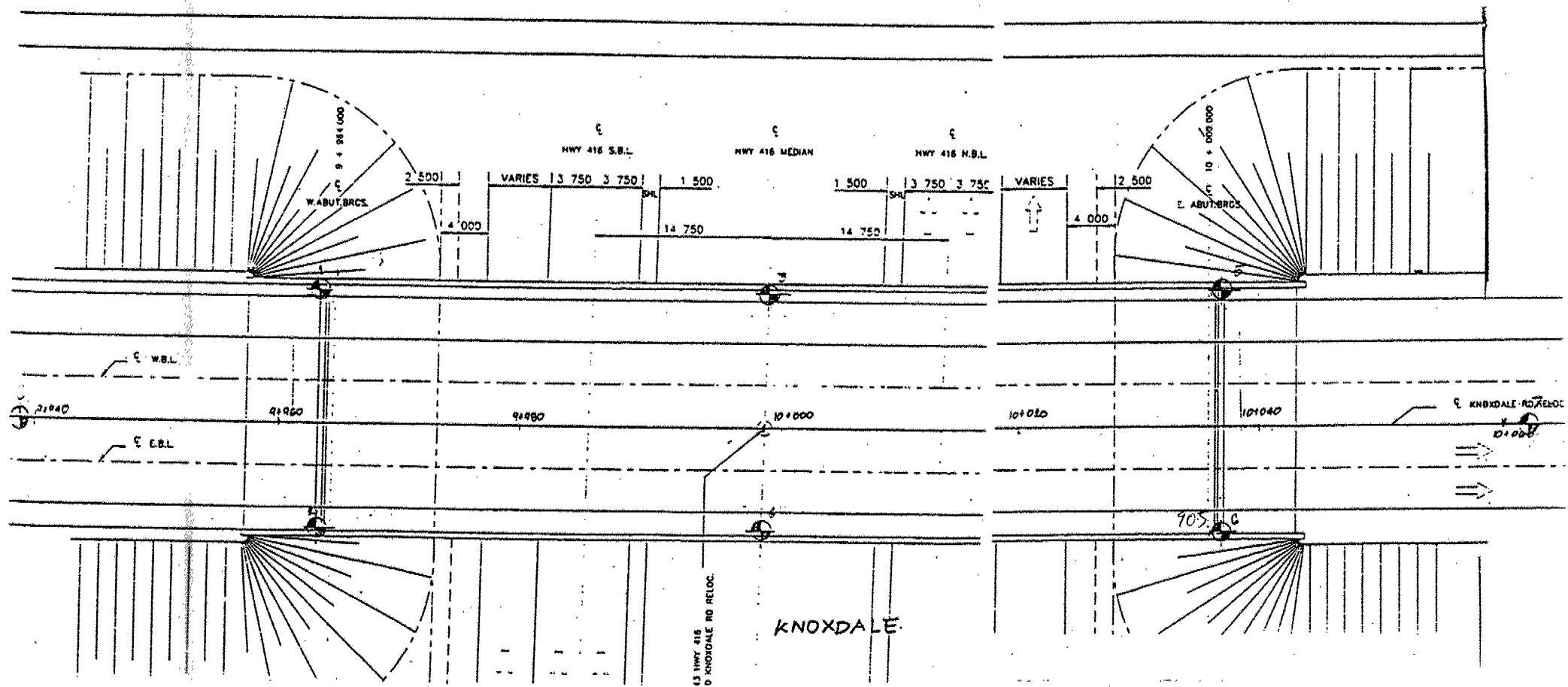
RECORD OF BOREHOLE No 8

1 OF 1

METRIC

W.P. 128-87-04 LOCATION Co-ords: N 5 014 548.0, E 359 956.8 ORIGINATED BY M.M.
DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger COMPILED BY M.M.
DATUM Geodetic DATE 90/08/30 CHECKED BY D.T.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT 7 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	W _p	W			W _L
111.2	Ground Surface																
0.0	Heterogeneous mixture of Silt, Sand and Gravel (Glacial Till) Compact to Very Dense		1	SS	29												
			2	SS	82												
			3	SS	41												
			4	SS	67												
			5	SS	47												
106.2	Boulders																
5.0	End of Borehole																



RECORD OF BOREHOLE No 1

1 OF 1

METRIC

W.P. 121-87-07 LOCATION Co-ords: N 5 019 230.7 E 359 493.5 ORIGINATED BY M.M.
DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger, Cone Penetration Test COMPILED BY M.M.
DATUM Geodetic DATE 90/08/30 CHECKED BY B.I.

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 7 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					
94.3	Ground Surface													
0.0	Heterogeneous mixture of Silt, Sand, Clay and Gravel (Glacial Till) Stiff to Very Dense		1	SS	18		94						20.9	11 36 50 3
			2	SS	28		93							
			3	SS	65		92						22.4	9 42 39 10
91.1							91							
3.2	Dolostone Medium Strong Unweathered		4	RC	REC 96%		90							
	Quartz Sandstone Medium Strong Unweathered						89							ROD 96%
88.5														
5.8	End of Borehole													

RECORD OF BOREHOLE No 2										1 OF 1		METRIC						
W.P. 121-87-07		LOCATION Co-ords: N 5 019 213.4, E 359 593.5		ORIGINATED BY M.M.		DIST 9 HWY 416		BOREHOLE TYPE Hollow Stem Auger		COMPILED BY M.M.		DATUM Geodetic		DATE 90/08/30		CHECKED BY B.L.		
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 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100										WATER CONTENT (%) 25 50 75
95.0	Ground Surface																	
0.0	Heterogeneous mixture of Silt, Sand, Clay and Gravel (Glacial Till) Very Stiff to Hard Brown		1	SS	16													
			2	SS	12													
92.4	End of Borehole Auger refusal at probable bedrock		3	SS	57	/20cm												
2.6																		

RECORD OF BOREHOLE No 4

1 OF 1

METRIC

W.P. 121-87-07 LOCATION Co-ords: N 5 019 231.8, E 359 535.7 ORIGINATED BY M.M.
 DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger, Cone Penetration Test COMPILED BY M.M.
 DATUM Geodetic DATE 90/08/30 CHECKED BY D.I.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT 7 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	w _p	w	w _L		
95.1	Ground Surface												
0.0	Heterogeneous mixture of Silt, Sand, Clay and Gravel (Glacial Till) Very Loose to Compact Brown Grey		1	SS	5							19.3	0 3 88 9
			2	SS	5								
			3	SS	21								
			4	SS	26								
			5	SS	9								
90.9						/15cm						23.7	22 33 38 7
4.2	Dolostone Medium Strong Unweathered		6	RC	REC 93%								
89.4													
5.7	End of Borehole												

RECORD OF BOREHOLE No 5

1 OF 1

METRIC

W.P. 121-87-07 LOCATION Co-ords: N 5 019 287.525, E 359 525.7 ORIGINATED BY M.M.
 DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger, Cone Penetration Test COMPILED BY M.M.
 DATUM Geodetic DATE 90/08/30 CHECKED BY D.T.

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					
95.2	Ground Surface												
0.0	Heterogeneous mixture of Silt, Sand, Clay and Gravel (Glacial Till) Compact to Dense Cobbles		1	SS	29							21.9	14 22 51 13
			2	SS	18								
			3	SS	33								
			4	SS	36								
91.8	Rock Core Dolostone Medium Strong Unweathered		5	RC	REC	100%							ROD 99%
3.4													
90.3	End of Borehole												
4.9													

RECORD OF BOREHOLE No 6

1 OF 1

METRIC

W.P. 121-87-07 LOCATION N 5 019 250.2, E 359 567.7 ORIGINATED BY M.M.
 DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger, Cone Penetration Test COMPILED BY M.M.
 DATUM Geodetic DATE 90/08/30 CHECKED BY D.T.

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 7 kN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
95.1	Ground Surface													
0.0	Heterogeneous mixture of Silt, Sand, Clay and Gravel (Glacial Till) Dense to Very Dense		1	SS	32									
			2	SS	47									
			3	SS	33									
			4	SS	71									
	Brown Gray Cobbles		5	SS	54									
90.5														
4.6	Rock Core Dolostone Medium Strong Unweathered		RC	S	52	/152cm								
89.0														
6.1	End of Borehole													

RECORD OF BOREHOLE No 7

1 OF 1 METRIC

W.P. 121-87-07 LOCATION Co-ords: N 5 019 270.4, E 359 584.9 ORIGINATED BY M.M.
 DIST 9 HWY 415 BOREHOLE TYPE Hollow Stem Auger COMPILED BY M.M.
 DATUM Geodetic DATE 90/08/30 CHECKED BY D.T.

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 7 KN/m ³	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
94.4	Ground Surface																
0.0	Heterogeneous mixture of Silt, Sand, Clay and Gravel (Glacial Till) Compact to Very Dense		1	SS	15		94									19.5	0 3 87 10
			2	SS	50		93										
			3	SS	47		92										
			4	SS	45		91										
	Brown Grey Cobbles		5	SS	13		90										
89.4																	
5.0	End of Borehole																

RECORD OF BOREHOLE No 8

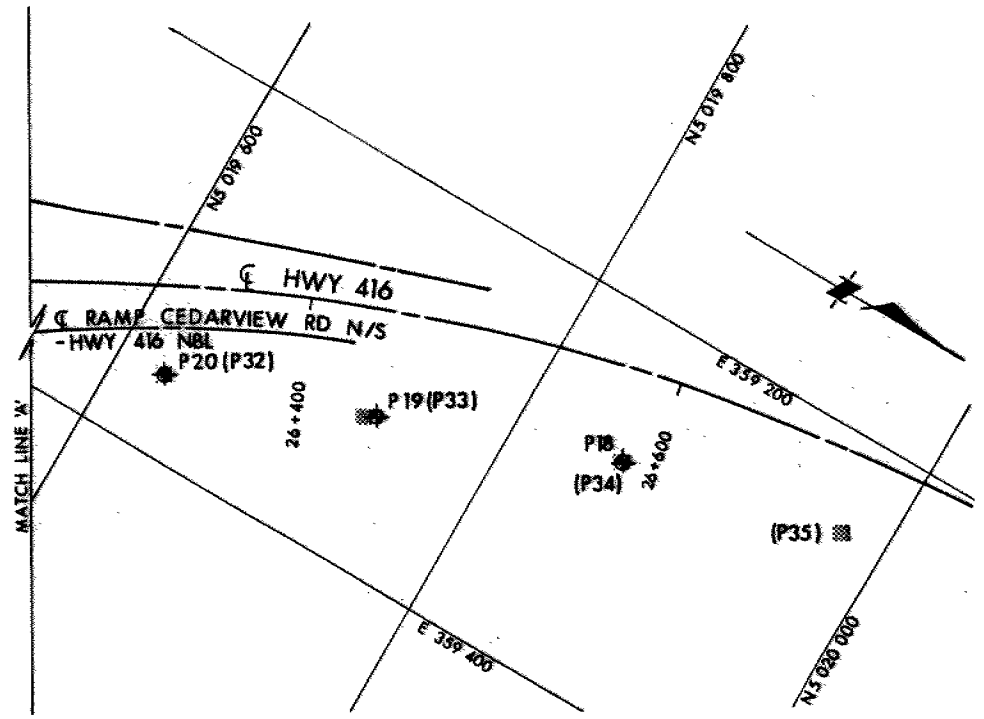
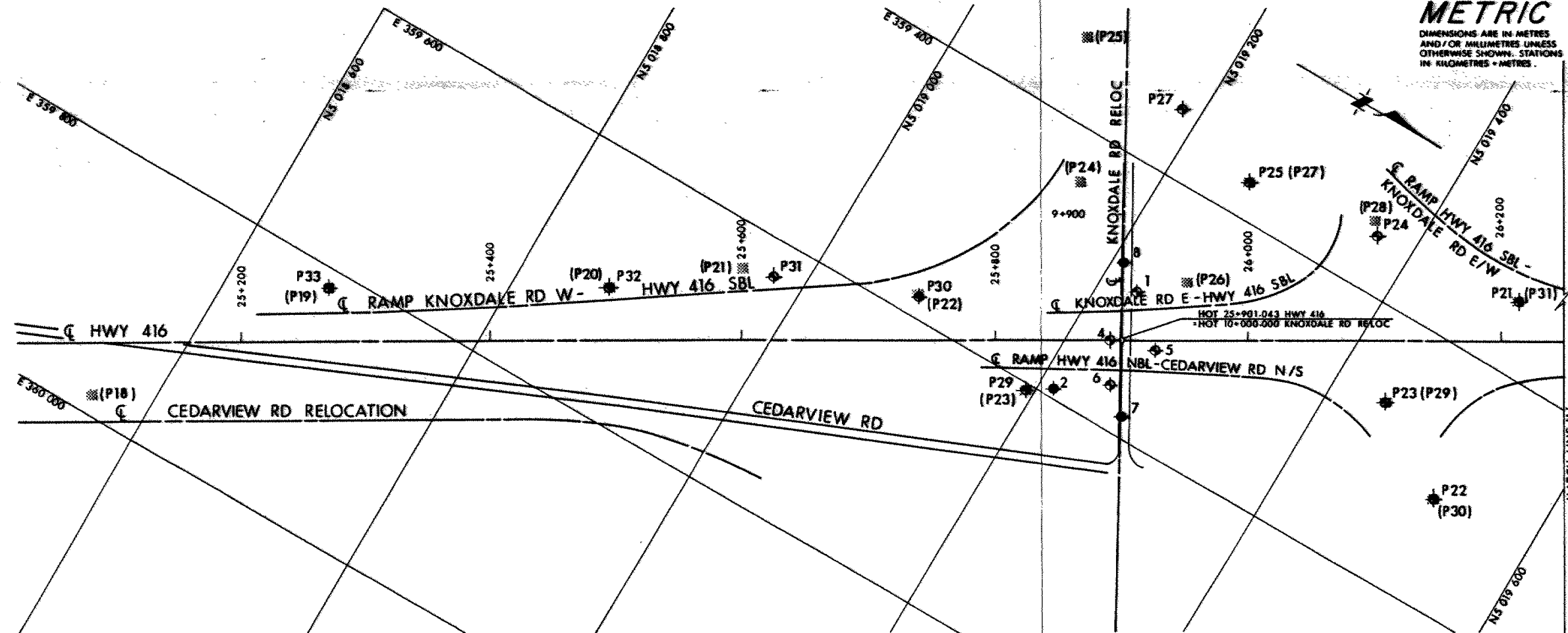
1 OF 1

METRIC

W.P. 121-87-07 LOCATION Co-ords: N 5 019 208.1, E 359 477.8 ORIGINATED BY M.M.
 DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger COMPILED BY M.M.
 DATUM Geodetic DATE 90/08/30 CHECKED BY D.T.

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 7 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					
95.9	Ground Surface															
0.0	Heterogeneous mixture of Silt, Sand, Clay and Gravel (Glacial Till) Compact to Dense		1	SS	12											0 3 90 7
			2	SS	22											
			3	SS	27											
92.8																
3.1	End of Borehole															

For Subsurface details refer to
Record of Borehole Sheets



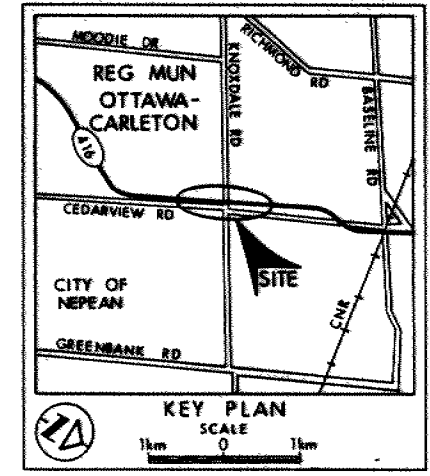
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SCALE
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METRIC
DIMENSIONS ARE IN METRES
AND/OR MILLIMETRES UNLESS
OTHERWISE SHOWN. STATIONS
IN KILOMETRES - METRES.

CONT No
WP No 122-87-00

HIGH MAST LIGHTING
HWY 416
KNOXDALE RD TO FALLOWFIELD RD
BORE HOLE LOCATIONS & SOIL STRATA

SHEET



- 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)
 - Wt at time of investigation
90 08 and 91 04
 - ⊞ High Mast Lighting Pole Locations

HIGH MAST LIGHTING POLE LOCATIONS		
POLE No	CO-ORDINATES NORTH	EAST
(P18)	5 018 554.0	359 987.0
(P19)	5 018 675.0	359 815.0
(P20)	5 018 868.0	359 700.0
(P21)	5 018 953.0	359 636.0
(P22)	5 019 080.0	359 584.0
(P23)	5 019 215.0	359 594.0
(P24)	5 019 148.0	359 440.0
(P25)	5 019 092.0	359 339.0
(P26)	5 019 262.0	359 466.0
(P27)	5 019 260.0	359 366.0
(P28)	5 019 366.0	359 350.0
(P29)	5 019 444.0	359 467.0
(P30)	5 019 515.0	359 515.0
(P31)	5 019 493.0	359 344.0
(P32)	5 019 629.0	359 358.0
(P33)	5 019 742.0	359 309.0
(P34)	5 019 860.0	359 276.0
(P35)	5 019 977.0	359 250.0

No	ELEVATION	CO-ORDINATES NORTH	EAST
P18	94.8	5 019 860.0	359 276.0
P19	94.9	5 019 736.0	359 320.0
P20	95.1	5 019 629.0	359 358.0
P21	94.9	5 019 493.0	359 344.0
P22	94.7	5 019 516.0	359 514.0
P23	95.2	5 019 445.0	359 467.0
P24	95.6	5 019 370.0	359 357.0
P25	95.6	5 019 261.0	359 371.0
P27	95.5	5 019 186.0	359 348.0
P29	94.6	5 019 194.0	359 605.0
P30	94.5	5 019 083.0	359 584.0
P31	94.5	5 018 976.0	359 628.0
P32	94.5	5 018 869.0	359 702.0
P33	94.5	5 018 675.0	359 816.0
1	94.3	5 019 230.7	359 493.5
2	95.0	5 019 213.4	359 593.5
4	95.1	5 019 231.8	359 535.7
5	95.2	5 019 267.5	359 525.7
6	95.1	5 019 250.2	359 567.7
7	94.4	5 019 270.4	359 584.9
8	95.9	5 019 209.1	359 477.8

NOTE
For Subsurface details refer to
Record of Borehole Sheets

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 31G5-184

HWY No 416	DIST 9
SUBMITTAL CHECKED	DATE 91 07 19 SITE
DRAWN BY	APPROVED

DWG 1228700-B