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GEOCRES No. 30M4-82

DIST. C.R. REGION

W.P. No. 166-88-00

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. 403

LOCATION Prop. Light Poles,
Hwy 403 at Mowhawk Rd.
No OF PAGES - Hamilton

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

SHAHEEN & PEAKER LIMITED

Consulting Geo-Environmental Engineers

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Etobicoke, Ontario, M9W 5R8

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Project Number: SP2018 Date: February 24, 1998

To: Phillips Planning Engineering

Attention: Mr. Bob McLaughlin

Subject: Highway 403

From: M. Gill, P.Eng.

Your Fax Number: 1-905-335-1414

No. of Pages Including This One: 2

Original Will be Sent to You: ____ Yes-Courier ____ Yes-Mail

Comments:

Attached is the revised Page 3 of the Investigation Report for the High Mast Lighting. Please note that the borehole locations are given on each Log and not in a Drawing.

Yours truly,

M. Gill

cc. MTO
Attention: Mr. Jim Vanbiesbrouck
Mr. Tibor Szekely
Fax: 235-3999

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- Building Envelope Evaluations
- Curtain Wall/Window Tests
- Roofing Installation
- Technical Audits

3. SUBSURFACE CONDITIONS

The detailed subsurface conditions are presented on the logs for boreholes P2, P4, P6 and P14. The locations of the boreholes are given at the top of each log. The soil conditions are summarized as follows.

The soil conditions were found to variable along the site and each location is summarized separately.

Borehole P2 encountered at least 5 m of very loose to compact fill below the pavement. At the surface the fill consisted of granular fill for the roadway pavement structure and then changed to loose to compact sandy silt. At about 5.5 m a layer of very loose silty sand, which was probably fill, extended to about 7 m depth. Below the fill was a layer of firm silty clay to about 8 m and then very stiff to hard clayey silt and clayey silt till.

In Borehole P4 loose to compact fill was found to at least 11 m. The fill consisted of granular fill for the roadway pavement structure at the surface and then loose to compact clayey silt to about 7.6 m. From about 7.6 m to 11 m the fill consisted of compact silty sand and gravel, and sandy silt to silty sand. The presence of angular chert fragments and rootlets in the sample at about 10.7 m depth indicated that this material was fill. Below about 11 m the soil consisted of loose silty sand and gravel, which may also be, fill. At about 13 m the soil consisted of compact silty sand. It could not be determined if this material was fill from the disturbed split-barrel sample.

Borehole P6 encountered about 0.7 m of granular base materials and then compact fill consisting of silt to clayey silt to about 7 m. Below this the soil consisted of very soft to soft silty clay to about 15 m. At 15 m the silty clay became firm to stiff.

Borehole P14 encountered granular base materials to about 0.7 m and then red brown to olive grey shale bedrock of the Queenston Formation. The shale bedrock was heavily weathered to about 3 m where it became sound and unweathered.

3. SUBSURFACE CONDITIONS

The borehole locations are shown on Drawing 1 and detailed subsurface conditions are presented on the logs for boreholes P2, P4, P6 and P14. These are summarized as follows.

The soil conditions were found to variable along the site and each location is summarized separately.

Borehole P2 encountered at least 5 m of very loose to compact fill below the pavement. At the surface the fill consisted of granular fill for the roadway pavement structure and then changed to loose to compact sandy silt. At about 5.5 m a layer of very loose silty sand, which was probably fill, extended to about 7 m depth. Below the fill was a layer of firm silty clay to about 8 m and then very stiff to hard clayey silt and clayey silt till.

In Borehole P4 loose to compact fill was found to at least 11 m. The fill consisted of granular fill for the roadway pavement structure at the surface and then loose to compact clayey silt to about 7.6 m. From about 7.6 m to 11 m the fill consisted of compact silty sand and gravel, and sandy silt to silty sand. The presence of angular chert fragments and rootlets in the sample at about 10.7 m depth indicated that this material was fill. Below about 11 m the soil consisted of loose silty sand and gravel, which may also be, fill. At about 13 m the soil consisted of compact silty sand. It could not be determined if this material was fill from the disturbed split-barrel sample.

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Borehole P14 encountered granular base materials to about 0.7 m and then red brown to olive grey shale bedrock of the Queenston Formation. The shale bedrock was heavily weathered to about 3 m where it became sound and unweathered.

TPM

GEOTECHNICAL INVESTIGATION
PROPOSED LIGHT POLES
HIGHWAY 403 AT MOWHAWK ROAD
HAMILTON, ONTARIO

WP 166-88-00
CENTRAL REGION

Prepared for
PHILIPS PLANNING AND ENGINEERING LIMITED

Prepared by

SHAHEEN & PEAKER LIMITED

Project: SP2018
February 18, 1998

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GEOCRES No 30M4-82

Table of Contents

1. INTRODUCTION

Shaheen & Peaker Limited was retained by Philips Planning and Engineering Limited to carry out a geotechnical investigation for the proposed light poles along Highway 403 at Mowhawk Road in Hamilton, Ontario. Mr. Robert McLaughlin of Philips Planning and Engineering Limited authorized the investigation.

It is understood that caisson foundations would support the light poles.

The purpose of this investigation was to determine the subsurface conditions at 4 borehole locations. From the findings in these engineering recommendations were to be made for the design of the light pole foundations.

This report is provided on the basis of the terms of reference presented above and on the assumption that the design will be in accordance with the applicable codes and standards. If there are any changes in the design features relevant to the geotechnical analyses, or if any questions arise concerning the geotechnical aspects of the codes and standards, this office should be contacted to review the design. It may then be necessary to carry out additional borings and reporting before the recommendations of this office can be relied upon. This report has been prepared for Philips Planning and Engineering Limited and its architect and designers. Third party use of this report with out Shaheen & Peaker Limited consent is prohibited.

2. PROCEDURE

Four boreholes were drilled to depths ranging from 4 to 20.4 m with solid stem continuous flight auger equipment by a drilling sub-contractor under the direction and supervision of Shaheen & Peaker Limited personnel. Samples were retrieved at regular intervals with a 50 mm O.D. split-barrel sampler driven with a hammer weighing 624 N and dropping 760 mm. The samples were logged in the field and returned to the Shaheen & Peaker Limited laboratory for detailed examination by the project engineer and for laboratory testing.

In Borehole P14, shale bedrock was encountered and this borehole was cored from 1.5 to 4.0 m depth with an NQ core barrel.

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

The surveying of the borehole locations was undertaken by Shaheen & Peaker Limited personnel. The ground surface elevations not surveyed.

As well as visual examination in the laboratory, all of the soil samples were tested for moisture content and selected samples for natural unit weight.

4. DISCUSSION

4.1 FOUNDATIONS

It is understood that caisson foundations will support the proposed light poles. The foundation requirements at each borehole location are discussed separately as follows.

4.1.1 Location P2

A suitable end bearing stratum, namely very stiff to hard clayey silt and clayey silt till was found below a depth of about 9 m. At about 9 m a design bearing value of 500 kPa is considered to be available. This can be increased to 750 kPa below about 10.7 m.

Alternatively shaft friction can be used to provide vertical support. A design shaft friction value of 25 kPa is considered to be available in the fill below about 1.5 m depth as well as the underlying soil.

4.1.2 Location P4

The majority of the soil found at this location consisted of fill and end bearing is not considered to be feasible. Instead shaft friction should be used. A design shaft friction value of 25 kPa is considered to be available in the fill and natural deposits below about 1.5 m depth.

4.1.3 Location P6

The majority of the soil found at this location consisted of fill or soft silty clay and end bearing is not considered to be feasible. Instead shaft friction should be used. A design shaft friction value of 25 kPa is considered to be available in the fill below about 0.7 m. In the soft clay this value decreases and is estimated to be about 5 kPa.

4.1.4 Location P14

The shale bedrock is considered to be suitable of supporting a design bearing pressure of 500 kPa below a depth of about 0.8 m. This can be increased to 2500 kPa in the unweathered shale found below a depth of 3 m.

4.2 LATERAL RESISTANCE

The net ultimate lateral resistance of the caissons in the till can be determined from the following expression:

$$R = NB (0.5 Kp \gamma d^2 + 2cd)$$

Where R = the passive resistance of the soil developed below the ground surface in front of the caisson to a depth 'd'. The upper 1.2 m of soil should be neglected to allow for frost action.

N = factor to account for three dimensional resistance around the caisson. A value of N = 2 is considered to be applicable.

B = diameter of concrete filled hole

γ = density of soil

Kp = estimated passive earth pressure coefficient

C = cohesion of the soil

The value of 'd' is computed by trial and error by taking moments of the earth pressure force and the passive resistance 'R' about the base of the caisson. A factor of safety of 3 should be applied to the above equation to determine the allowable unit lateral resistance. The resistance in the upper 1.2 m, estimated frost depth, must not be included in the above calculation. The value of 'd' must not exceed 6B below the 1.2 m frost depth.

The following soil parameters are considered to be applicable for the various borehole locations.

Borehole	Soil Density (kN/m3)	Kp	Cohesion (kPa)
P2	21.0	3	0
P4	21.0	3	0
P6	20.0	3	0

The net ultimate lateral resistance on the shafts of caissons socketed into the shale bedrock at depth z can be determined from the following equation:

$$Pu = 3 B c z$$

where
- Pu = the net ultimate lateral resistance
- z = depth to a maximum depth of 6B
- B = diameter of caisson
- c = assume 200 kPa for the rock to a depth of 3 m and then 400 kPa below 3 m.

A factor of safety of 3 should be applied to the above equation to determine the allowable unit lateral resistance. The resistance in the upper 1.2 m, estimated frost depth, must not be included in the above calculation.

4.3 GENERAL

It should be noted that the recommended bearing capacities have been calculated by Shaheen & Peaker Limited from the borehole information for the design stage only. The investigation and comments are necessarily on going, as new information of the underground conditions becomes available. For example, more specific information is available with respect to conditions between boreholes when foundation construction is underway. The interpretation between boreholes and the recommendations of this report must therefore be checked through field

inspections provided by Shaheen & Peaker Limited to validate the information for use during the construction stage.

5. GENERAL COMMENTS

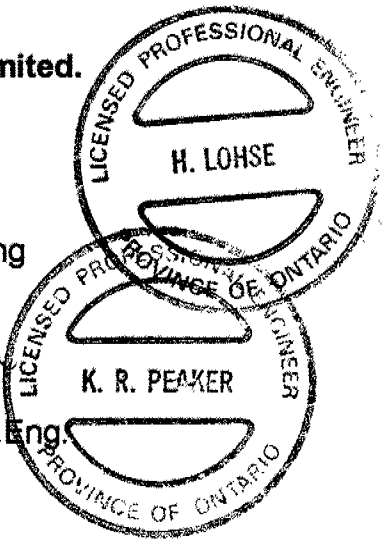
Shaheen & Peaker Limited should be retained for a general review of the final design and specifications to verify that this report has been properly interpreted and implemented. If not accorded the privilege of making this review, Shaheen & Peaker Limited will assume no responsibility for interpretation of the recommendations in the report.

The comments given in this report are intended only for the guidance of design engineers. The number of boreholes required to determine the localized underground conditions between boreholes affecting construction costs, techniques, sequencing, equipment, scheduling, etc., would be much greater than has been carried out for design purposes. Contractors bidding on or undertaking the works should, in this light, decide on their own investigations, as well as their own interpretations of the factual borehole results, so that they may draw their own conclusions as to how the subsurface conditions may affect them.

The information in this report in no way reflects on the environmental aspects of the soil and has not been addressed in this report, since this aspect is beyond the scope and terms of reference. Should specific information be required, additional testing may be required.

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

Shaheen & Peaker Limited.



H Lohse
Holger Lohse, P.Eng

K.R. Peaker, Ph.D., P.Eng.

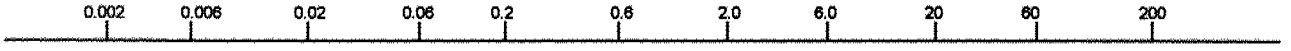
Drawings

Notes On Sample Descriptions

1. All sample descriptions included in this report follow the Canadian Foundations Engineering Manual soil classification system. This system follows the standard proposed by the International Society for Soil Mechanics and Foundation Engineering. Laboratory grain size analyses provided by Shaheen & Peaker Limited also follow the same system. Different classification systems may be used by others; one such system is the Unified Soil Classification. Please note that, with the exception of those samples where a grain size analysis has been made, all samples are classified visually. Visual classification is not sufficiently accurate to provide exact grain sizing or precise differentiation between size classification systems.

ISSMFE SOIL CLASSIFICATION

CLAY	SILT			SAND			GRAVEL			COBBLES	BOULDERS
	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE		



EQUIVALENT GRAIN DIAMETER IN MILLIMETRES

CLAY (PLASTIC) TO	FINE	MEDIUM	CRS.	FINE	COARSE
SILT (NONPLASTIC)	SAND			GRAVEL	

UNIFIED SOIL CLASSIFICATION

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

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

RECORD OF BOREHOLE No P2 1 OF 1 METRIC

W.P. 166-88-00 LOCATION 13+300, west bound, 0.3 m right of left edge of pavement ORIGINATED BY TB

DIST HWY 403 BOREHOLE TYPE Solid stem augers COMPILED BY HL

DATUM DATE 12.22.97 & CHECKED BY HL

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Ground Surface						0				
0.0	200mm of Asphalt over: **GRAVEL:** with sand , crudhed, brown, wet										
-0.9											
0.9	**FILL:** Sand, with gravel, brown, wet,						-1				
-1.5											
1.5	**FILL:** sandy silt, trace of gravel, occasional pieces of brick and asphaltic concrete, brown to dark brown, moist, very dense, becomes compact to very loose with depth		1	SPT	58		-2			22.4	
			2	SPT	19					21.6	
	trace of wood at 2.5 m		3	SPT	18		-3			22.1	
	trace of wood at 4.6 m		4	SPT	3	▽	-4			20.3	
-5.5							-5				
5.5	**SILTY FINE TO MEDIUM SAND:** trace of gravel, dark brown, wet, very loose (probable fill)		5	SPT	1		-6			20.6	
-7.0							-7				
7.0	**SILTY CLAY:** brown, moist, firm		6	SPT	5		-8			18.4	
-8.0											
8.0	**CLAYEY SILT:** weakly layered, brown, moist, very stiff		7	SPT	18		-9				
-10.0							-10				
10.0	**CLAYEY SILT TILL:** trace of fine gravel, brown, moist, hard		8	SPT	19		-11			19.1	
-11.5											
11.5	**CLAYEY SILT:** grey, moist, very stiff to hard		9	SPT	18		-12			20.7	
-12.7											
12.7	End of Borehole										

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

$\oplus^{20}_{15\ 10\ 5}$ (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No P4 1 OF 1 METRIC

W.P. 166-88-00 LOCATION 12+911, west bound, 0.6 m right of left edge of pavement ORIGINATED BY TP

DIST HWY 403 BOREHOLE TYPE Solid stem augers COMPILED BY HL

DATUM DATE 12.22.97 & CHECKED BY HL

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT / SHEAR STRENGTH kPa (○ UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L / WATER CONTENT (%)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Ground Surface						0				
0.0	180mm of Asphalt over:										
-0.6	**GRAVEL:** with sand, crushed, brown, wet										
0.6	**FILL:** sand, brown, moist, loose Topsoil layer at 1 to 1.5 m										
-1.5							-1				
1.5	**FILL:** clayey silt to sandy silt, trace of gravel, numerous shale fragments at 1.5 to 2 m, brown, moist, compact, becomes loose with depth		1	SPT	16		-2		○	23.0	
			2	SPT	15				○	21.1	
			3	SPT	16		-3		○	21.7	
	Greyish brown at 3.8 m		4	SPT	7		-4	×	○	21.3	
	Clayey silt mixed with black fine to medium sand (possible slag)		5	SPT	15	▽	-5	>>×	○		
	trace of organics at 6.1 m		6	SPT	1		-6	×	○	19.6	
-7.6							-7		○		
7.6	**FILL:** silty sand and gravel, brown, wet, compact		7	SPT	14		-8				
-8.5											
8.5	**Fill:** silt, trace of sand and clay, brown to greyish brown, moist, compact		8	SPT	12		-9	>>×	○	20.4	
-9.8											
9.8	**FILL:** sandy silt to silty sand, contains angular chert fragments and rootlets, brown, wet, compact		9	SPT	11		-10				
-11.0							-11				
11.0	**SILTY SAND AND GRAVEL:** brown, wet, loose (probable fill)		10	SPT	4		-12		○		
-13.0							-13				
13.0	**SILTY SAND:** fine to medium grained, some sand, red brown, wet, compact (possible fill)		11	SPT	17		-14		○		
-14.2											
14.2	End of Borehole										

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

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

RECORD OF BOREHOLE No P6 1 OF 2 METRIC

W.P. 166-88-00 LOCATION 12+550, west bound, 0.1 m left of left edge of pavement ORIGINATED BY TP

DIST HWY 403 BOREHOLE TYPE Solid stem augers COMPILED BY HL

DATUM DATE 12.23.97 & CHECKED BY HL

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES "N" VALUES	GROUND WATER CONDITIONS	UNIT WEIGHT γ kN/m³	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Ground Surface							
0.0	**GRAVEL:** with sand, crushed, brown, moist, loose to compact							
-0.7								
0.7	**FILL:** silt to clayey silt, trace of sand, brown, moist, compact		1	SPT	12			
			2	SPT	23		20.6	
			3	SPT	29		20.2	
			4	SPT	15		20.2	
	dark brown to grey at 4.6 m, contains wood		5	SPT	15	▽	19.9	
	red brown with rootlets and very moist at 6.1 m		6	SPT	13		19.3	
-7.0								
7.0	**SILTY CLAY:** trace of sand, grey, saturated, soft to very soft		7	SPT	2		19.2	
			8	SPT	2		18.4	
			9	SPT	1		18.3	
	Stiff layer at 12.2 m		10	SPT	11		20.1	

ELEVATION SCALE: 0, -1, -2, -3, -4, -5, -6, -7, -8, -9, -10, -11, -12, -13, -14, -15

DYNAMIC CONE PENETRATION RESISTANCE PLOT: 20 40 60 80 100

SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE; 20 40 60 80 100

PLASTIC LIMIT w_P NATURAL MOISTURE CONTENT w LIQUID LIMIT w_L

WATER CONTENT (%): 20 40 60

Continued Next Page

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

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

RECORD OF BOREHOLE No P6 2 OF 2 METRIC

W.P. 166-88-00 LOCATION 12+550, west bound, 0.1 m left of left edge of pavement ORIGINATED BY TP

DIST HWY 403 BOREHOLE TYPE Solid stem augers COMPILED BY HL

DATUM DATE 12.23.97 & CHECKED BY HL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 / SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE 20 40 60 80 100	PLASTIC LIMIT w_P — NATURAL MOISTURE CONTENT w — LIQUID LIMIT w_L / WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	"N" VALUES						
	SILTY CLAY: trace of sand, grey, saturated, firm to stiff		11	SPT	6		-15 -16 -17 -18 -19 -20		○	19.9	
-20.3			12	SPT	9				○	20.1	
20.3	End of Borehole										

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

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

RECORD OF BOREHOLE No P14 1 OF 1 METRIC

W.P. 166-88-00 LOCATION 11+514, west bound, 0.9 m left of left edge of pavement ORIGINATED BY TP

DIST HWY 403 BOREHOLE TYPE Solid stem augers COMPILED BY HL

DATUM DATE 12.23.97 & CHECKED BY HL

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES: NUMBER	SAMPLES: TYPE	SAMPLES: "N" VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa: ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE (20 40 60 80 100)	PLASTIC LIMIT w_P / NATURAL MOISTURE CONTENT w / LIQUID LIMIT w_L — WATER CONTENT (%) (20 40 60)	UNIT WEIGHT γ kN/m^3	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
0.0	Ground Surface						0				
0.0	200mm of Asphalt over: **GRAVEL:** brown, crushed, moist										
-0.7											
0.7	**SHALE:** red brown with olive grey layers, heavily weathered, very dense		1	SPT	109		-1				
			R1	CORE			-2		○		
	RQD = 0										
-3.0							-3				
3.0	**SHALE:** red brown to olvie grey, unweathered **RQD = 90**		R2	CORE							
-4.0							-4				
4.0	End of Borehole										

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

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