

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30M12-136  
30M13-48

DIST. 6 REGION                     

W.P. No. 49-71-00  
88-78-00

CONT. No.                     

W. O. No.                     

STR. SITE No.                     

HWY. No. 427

LOCATION Rexdale Blvd. to North of  
Humber River

No of PAGES -                     

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.                     

REMARKS:                     

G.I.-30 SEPT. 1976

ENGINEERING MATERIALS OFFICE  
SOIL MECHANICS SECTION

WP 88-78-00 DIST 6  
49-71-00 ✓  
HWY 407 & 427 STR SITE N/A  
Hwy. 407 From  
Airport Road to Jane Street  
Hwy. 427 From  
Finch Avenue to Hwy. 27

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GEOCRES 30M12-136  
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# FOUNDATION INVESTIGATION REPORT

For

Feasibility Study  
of Hwy. 407 From Airport Road  
to Jane Street (Including Hwy. 400)  
W.P. 88-78-00  
and Hwy. 427 From Finch Avenue to Hwy. 27  
W.P. 49-71-00  
District 6, Toronto

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## INTRODUCTION

This report contains the results of a feasibility foundation investigation carried out for the above projects. The fieldwork was carried out from October 13 to November 1, 1978 and consisted of a total of 18 sampled boreholes advanced by means of either solid stem augers or hollow stem augers to depths of 14 to 135 feet below the ground surface. Bedrock was encountered in one boring at a depth of 7 feet and was proven by obtaining 7 feet of BXL size rock core. In addition to our fieldwork we have incorporated in this report 5 borings, B.H. 19 to B.H. 23, that were put down at various pertinent locations by other agencies.

## SITE DESCRIPTION AND GEOLOGY

The area under consideration is located immediately north of the city limits of Metropolitan Toronto within the Regional Municipalities of Peel and York. The area for this portion of Hwy. 407 investigated stretches between Airport Road and Jane Street and is located 500 to 2000 feet north of Steeles Avenue. Extending from Finch Avenue to Hwy. 7 between Indian Line and Hwy. 27, is the area of investigation for the feasibility of Hwy. 427. This investigation includes also the portion of Hwy. 400 which runs from the C.N.R. Halton Subdivision to Langstaff Road.

Topographically the overall area can be described as gently undulating, the exception being where creeks or rivers have cut valleys. Land use in the proposed highway right of ways consists

mainly of cultivated open fields; exceptions occur in the vicinities of the Thackeray Land Fill Site and within areas under the jurisdiction of Metropolitan Toronto and Region Conservation Authority.

Physiographically the study area is wholly located within the region known as the "Peel Plain". This area is found to be at elevation 500 to 750 feet above sea level and has a gradual slope toward Lake Ontario. Across the plain, rivers and streams have cut deep valleys and there is, therefore, no large undrained depressions, swamp or bogs in the whole area. The plain is furthermore characterized by an underlying till or boulder clay. In much of the Peel Plain this has been modified by a veneer of clay which, when deep enough, is clearly seen to be varved. Shown on Drawing No. 887800-A are the boundaries and descriptions of the surficial geology, based on the Quaternary Geology, Map 2272, for the Bolton Area.

#### SUBSURFACE CONDITIONS

Subsurface conditions across the study area are quite variable. Generally the dominant subsurface deposit extending from the ground surface to a depth of up to 105 feet is a heterogeneous mixture of clayey silt, sand and gravel, a glacial till. In some areas a 14 to 25 foot thick deposit of very dense silt and/or sand was encountered within the glacial till deposits.

Exceptions to the above were observed in the areas adjacent to the rivers and creeks.

At Mimico Creek, Plunketts Creek, the west side of Humber River (Main Branch) and at the West Humber River, subsurface conditions consist generally of a surficial deposit of stiff to very stiff clayey silt up to 20 feet thick overlying loose to dense deposits of silt and/or sand followed by a hard glacial till. The glacial till was encountered at depths ranging from 25 to 35 feet below the ground surface in these areas.

Adjacent to Black~~o~~ Creek, subsurface conditions consist of a surficial deposit 18 feet thick of very stiff glacial till overlying up to 115 feet of very stiff to hard stratified cohesive deposits consisting of alternative layers of clayey silt to silty clay overlying hard glacial till.

On the east side of the Humber River (Main Branch) and adjacent to Islington Avenue, it was not possible to carry out borings because of property problems. However, subsurface data obtained by other agencies in this area reveal that the subsurface conditions consist of 20 feet of compact to dense sand and/or silt deposits overlying 60 feet of soft to stiff clay underlain by a hard glacial till.

Because of the complex variations in subsurface conditions no attempt is made to elaborate on detailed descriptions of the various subsoil types. For more detailed descriptions and subsoil/bedrock boundaries, refer to the individual Foundation Data Sheets and the appropriate Borehole Log Sheets. In addition, reference can be made to Drawings No. 887800-B and C on which borehole data is plotted on the  $\phi$  profile.

#### Groundwater Conditions

Groundwater observations were carried out during the field investigation by measuring in the open boreholes. Groundwater was observed at depths of 10 to 30 feet below the ground surface, except adjacent to waterways where the groundwater was at the approximate river water level.

## DISCUSSION AND RECOMMENDATIONS

It is proposed to construct a new east-west expressway, Hwy. 407, to freeway design standards, to be located immediately south of existing Hwy. 7. This report is concerned with that section of Hwy. 407 between Airport Road and Jane Street including the section of existing Hwy. 400 from Langstaff southerly to Steeles Avenue and also the section of proposed Hwy. 427 from Langstaff Road to Finch Avenue. This portion of the project will require the crossing of 5 major waterways, some 10 interchanges including 2 major interchanges and some 16 crossings of railways and minor roads; in all requiring some 50 odd structures. The recommended grade for Hwy. 407 will involve cuts up to 35 feet deep and fills up to 45 feet high.

Our comments for the feasibility, design and construction of the various structures are given on the Foundation Data Sheets included in the Appendix. A data sheet is supplied for each of 31 areas; the area location is described on these sheets and is also shown on Drawing No. 887800-A. An explanation of information supplied on the data sheet is outlined below.

1. The site number given (i.e. A1, A2, etc.) is a numbering system developed for the purposes of the feasibility study only. The actual location is shown on Drawing No. 887800-A.
2. The original ground elevation range given is based on a small scale  $\varnothing$  profile and as such the accuracy is not great.
3. The proposed roadway-railway grades are based on a small scale  $\varnothing$  profile at the intersection of centrelines. The grade given is understood to be preferred by Planning and Design; the grade in brackets is an alternative "second choice" grade under consideration.
4. Subsurface conditions are described here very briefly and are based on generally not more than one boring per area. Consistencies and relative densities, where applicable, are given.

## 5. Recommendations - Structure

The recommendations are discussed separately for abutments and piers. The options for structure foundations are given in preferential order based on geotechnical/economical considerations. Some general details of structure recommendations are given below.

Compacted Granular Pad - This option is for abutments only where subsurface conditions are competent. This option is not recommended for water crossings. The minimum requirements of a compacted granular pad are shown on Figure 1 in the Appendix. Furthermore, the footing for this scheme could be designed using a maximum allowable load of 3.0 t.s.f.

Spread Footings - This option is given for abutments and piers where subsurface conditions are competent. The maximum elevation and corresponding maximum design load is given. It is to be noted the spread footings should be provided with a minimum of 4 feet of earth cover for frost protection purposes. In addition, where the spread footing is to be founded on a cohesive deposit, subject to softening upon exposure, it would be necessary to protect the base of the footing from softening by placing 3 inches of mass concrete upon completion of the footing excavation. Also, where the footing is located in a granular deposit and the water table is at or above the footing founding level, it will be necessary to prevent the base of the footing from boiling due to an unbalanced excess hydrostatic head. In this case a dewatering scheme would be required, thus alternative dewatering schemes are shown on Figure 2 and Figure 3.

End Bearing Piles - This founding scheme is recommended for abutments and piers where appropriate. The recommendation gives the estimated pile tip elevation. Generally, the end bearing piles can be designed for the maximum allowable structural capacity which is dependent on the pile section chosen. For example, the maximum allowable load for a 12BP74 steel 'H' pile would be 110 tons per pile. It is generally assumed steel 'H' piles will be used, however, if a certain

pile section is not suitable at the specific area this fact is mentioned in the data sheet. Pile driving would be field controlled by the Hiley Formula unless it is being driven to the bedrock surface or in clayey subsoil.

Friction Piles - This foundation is recommended for abutments and piers where it is considered to be suitable and economically competitive with an end bearing pile. The loading recommendations are given for a #14 timber pile of specified length. If a different type of friction pile is contemplated the maximum allowable load could be prorated by comparing the surface area of the pile in question and the timber pile.

#### 6. Recommendation - Approaches

The recommendations for fill slopes, cut slopes and berm requirements, are based on the proposed preliminary grades assuming fills are constructed of acceptable earth borrow according to current M.T.C. Specifications. Any changes in profile grade would require a reassessment of these recommendations. Also discussed under this heading is special treatment, i.e. benching, etc., that is anticipated at this location.

#### 7. Remarks


In this column are discussed actual creek/river flood plain and bed conditions, geotechnical preference of schemes if appropriate, and other options or considerations to be evaluated during this stage of design.

#### MISCELLANEOUS

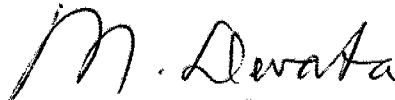
The fieldwork for this investigation was carried out under the supervision of Mr. M. MacLean, Project Engineer, using equipment rented from Master Soil Investigation Limited.



This report was written by Mr. M. MacLean and reviewed by  
Mr. M. Devata, Supervising Engineer



M. MacLean, P. Eng.  
Project Engineer



M. Devata, P. Eng.  
Supervising Engineer

December, 1978



RECORD OF BOREHOLE No 1

W P 88-78-00 LOCATION Hwy. 407 & Mimico Creek Coords. N 15 890 590; E 955 960 ORIGINATED BY M.M.  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers (0-25'), Hollow Stem Augers (24-40) COMPILED BY M.M.  
DATUM Geodetic DATE October 13, 1978 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH										WATER CONTENT (%)		
								20 40 60 80 100										20 40 60		
						○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE														
564.8	Ground Surface																			
0.0	Clayey Silt		1	SS	9		560													
	Stiff		2	SS	16															
556.8	Very Stiff		3	SS	42															
8.0	Silt, Some Sand Dense		4	SS	44															
550.8			5	SS	18		550									0 15 84 1				
14.0	Sand, Some Silt		6	SS	34															
	Compact		7	SS	39															
534.8			8	SS	50/	3"	540													
300.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Occasional Cobbles Hard		9	SS	100/	3"	530													
523.3	Glacial Till																			
41.5	End of Borehole																			

+3, x5: Numbers refer to Sensitivity

20  
15  
10  
5 (%) STRAIN AT FAILURE



## RECORD OF BOREHOLE No 2

W P 88-78-00 LOCATION Hwy. 427 & Finch Avenue ORIGINATED BY MM  
DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 16, 1978 CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
555.0	Ground Surface															
0.0	Clayey Silt Trace Sand Hard		1	SS	32		550									
547.9			2	SS	22											
8.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Glacial Till  Hard		3	SS	73											23 27 40 10
			4	SS	111											
			5	SS	68		540									7 22 58 13
			6	SS	50/	5"										
529.4			7	SS	112		530									
26.5	End of Borehole  Note: Groundwater Not Encountered															

+<sup>3</sup>, x<sup>5</sup>: Numbers refer to  
Sensitivity

20  
15  $\phi$  5 (%) STRAIN AT FAILURE  
10

# RECORD OF BOREHOLE No 3

W P 88-78-00 LOCATION Finch Ave. & West Humber Coords. N 15 891 330; E 967 445 ORIGINATED BY MM  
DIST 6 HWY Finch Ave. BOREHOLE TYPE Hollow Stem Augers & BXL Rock Coring COMPILED BY MM  
DATUM Geodetic DATE October 16, 1978 CHECKED BY z2.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
519.7	Ground Surface																
0.0	Sandy Gravel																
515.7	Loose		1	SS	5												
4.0	Glacial Till		2	SS	48												
512.7	Hard		3	BXL RC	Rec= 60% ROD= 0%		510										
7.0	Bedrock, Layers of Limestone and Weathered Shale		4	BXL RC	Rec= 60% ROD= 0%												
505.7																	
14.0	End of Borehole																
	Note: Groundwater Not Established. Borehole Was Relatively Dry Upon Completion of Augering						490										

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No 4

W P 88-78-00 LOCATION Hwy. 407 & Airport Road ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 16, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
596.3	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Very Stiff to Hard		1	SS	32		590										2 12 46 40
			2	SS	35												
			3	SS	49												
	Brown Grey		4	SS	26												
	Very Stiff to Hard		5	SS	27		580										
			6	SS	40												
571.3			7	SS	68/	6"	570										
25.0	Silt, Some Sand Very Dense		8	SS	125												
564.8																	
31.5	End of Borehole  Note: Groundwater Not Encountered																

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No 5

W P 88-78-00 LOCATION Hwy. 407 & West Humber ORIGINATED BY MM  
Coords. N 15 896 130; E 961 970  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers (0-30') COMPILED BY MM  
Washing (30-35')  
DATUM Geodetic DATE October 17, 1978 CHECKED BY a.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
540.4	Ground Surface																
0.0	Clayey Silt						540										
535.4	Stiff		1	SS	7					+8							
5.0	Heterogeneous Mixture Clayey Silt, Sand & Gravel		2	SS	24							+2000					
	(Glacial Till)		3	SS	12		530										
	Stiff to Hard		4	SS	54					+6							
522.4			5	SS	49												
18.0	Silt, Some Sand		6	SS	26		520										
517.4	Compact																
23.0	Sand, Some Silt Some Gravel Very Dense		7	SS	59												15 62 21 2
510.4							510										
30.0	Heterogeneous Mixture Silt, Sand and Gravel, Very Dense, Glacial Till		8	SS	120/	6"											
503.9																	
			9	SS	60/	2"											
36.5	End of Borehole																



## RECORD OF BOREHOLE No 6

W P 88-78-00 LOCATION Hwy. 407 & Humber Main  
Coords. N 15 903 680; E 977 910 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MM  
DATUM Geodetic DATE October 17, 1978 CHECKED BY ef

[illegible]

OFFICE REPORT ON SOIL EXPLORATION

+3, x5 : Numbers 10 to 20  
Sensitivity



# RECORD OF BOREHOLE No 7

W P 88-78-00 LOCATION Hwy. 407 & Kipling Avenue ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers and Cone Test COMPILED BY MM  
DATUM Geodetic DATE                      CHECKED BY VJ

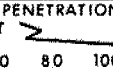
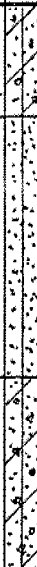
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%) 20 40 60	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
456.5	Ground Surface										
0.0	Sand, Some Silt Some Gravel Loose to Compact		1	SS	6						
447.5			2	SS	21						
9.0	Heterogeneous Mixture Silt, Sand & Gravel (Glacial Till) V. Dense		3	SS	131						
442.5			4	SS	95						
14.0	Sand, Some Silt Some Gravel Compact to Dense		5	SS	45						
			6	SS	11						
			7	SS	50/2"						
	Sand, Some Silt Very Dense		8	SS	108						
420.0			9	SS	94						
36.5	End of Borehole										





# RECORD OF BOREHOLE No 8

W P 88-78-00 LOCATION Hwy. 407 @ Hwy. 427 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 19, 1978 CHECKED BY el J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 				PLASTIC LIMIT	NATURAL MOISTURE CONTENT	LIQUID LIMIT	UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH				W <sub>p</sub>	W	W <sub>L</sub>		
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE								
											WATER CONTENT (%) 20 40 60					
585.8	Ground Surface															
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Very Stiff to Hard (Glacial Till) Red Brown		1	SS	18											
577.8			2	SS	48											
8.0	Sandy Silt		3	SS	9											
	Very Dense		4	SS	62											
			5	SS	109											
			6	SS	84											
558.8			7	SS	50											
27.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Hard  (Glacial Till)  Red Brown		8	SS	138											
			9	SS	122											
544.3			10	SS	106											
41.5	End of Borehole  Note: Water Level Not Established															

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 9

W P 88-78-00 LOCATION Hwy. 427 & Steeles Ave.  
Coords. N 15 897 460; E 965 250 ORIGINATED BY MM  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 19, 1978 CHECKED BY *al.f.*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH					
								○ UNCONFINED + FIELD VANE						
								● QUICK TRIAXIAL x LAB VANE						
578.0	Ground Surface													
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel		1	SS	39		570							
			2	SS	45									
			3	SS	87									
	Brown Grey		4	SS	117									
	Hard (Glacial Till)		5	SS	119									
560.0							560							
18.0	Sandy Silt Very Dense		6	SS	67									
551.5			7	SS	57									
26.5	End of Borehole													

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No 10

W P 88-78-00 LOCATION Hwy. 407 & 427 Ramps E of Hwy. 427  
Coords. N 15 899 190; E 966 570 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 20, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
569.1	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel Hard, Brown Glacial Till		1	SS	30												
			2	SS	45												
558.1			3	SS	124		560										
11.0	Sandy Silt Some Gravel Very Dense		4	SS	100/6"												
			5	SS	100/6"		550										28 32 35 5
			6	SS	50/3"		540										P2
529.1							530										
40.0	Heterogeneous Mixture Clayey Silt, Sand & Gravel, Hard, Glacial Till																
44.0	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 11

W P 88-78-00 LOCATION Hwy. 407 & Hwy. 50 Coords. N 15 827 380; E 963 020 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 20, 1978 CHECKED BY J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100										SHEAR STRENGTH			WATER CONTENT (%)		
																		○ UNCONFINED	+ FIELD VANE				
578.8	Ground Surface																						
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel (Glacial Till) v. Stiff Brown Hard		1	SS	22																		
			2	SS	33																		
			3	SS	65																		
			4	SS	120																		
			5	SS	120																		
	Very Dense		6	SS	125																		
555.8																							
23.0	Sandy Silt Very Dense		7	SS	72																		
544.8																							
34.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Hard (Glacial Till)		8	SS	69																		
537.3			9	SS	70/2"																		
41.5	End of Borehole																						



# RECORD OF BOREHOLE No 12

W P 88-78-00 LOCATION Hwy. 407 & Hwy. 27 ORIGINATED BY MM  
Coords. N 15 899 840; E 969 280  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 23, 1978 CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
562.5	Ground Surface															
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel (Glacial Till) Hard		1	SS	58		560									
	Brown		2	SS	55											
	Grey		3	SS	46											
			4	SS	56		550									
			5	SS	58											
			6	SS	80											
							540									
536.1			7	SS	78											
26.5	End of Borehole															
	Note: Groundwater Not Encountered															

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 13

W P 88-78-00 LOCATION Hwy. 407 & Martingrove Road  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers Coords. N 15 900 900; E 972 020  
DATUM Geodetic DATE October 23, 1978  
ORIGINATED BY MM  
COMPILED BY MM  
CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
559.1	Ground Surface																
0.0			1	SS	12												
			2	SS	27												
			3	SS	39												
			4	SS	49												
			5	SS	26												
			6	SS	26												
			7	SS	49												
			8	SS	40												
			9	SS	50												
			10	SS	37												
			11	SS	86												
			12	SS	81												
			13	SS	100/ 5"												
			14	SS	100/ 2"												
487.6																	
71.5	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No 14

W P 88-78-00 LOCATION Hwy. 407 & Pine Valley Drive  
Coords. N 15 905 450; E 981 320 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 24, 1978 CHECKED BY *W.J.*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT $\Sigma$					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
531.9	Ground Surface																
0.0	Silty Sand Compact						530										
526.9			1	SS	24												
5.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Very Stiff (Glacial Till)		2	SS	31												
520.9			3	SS	21		520										
11.0	Clayey Silt Very Stiff		4	SS	10												
			5	TW	PH												
512.9																	
19.0	Silty Sand to Sandy Silt Some Gravel Compact to Loose		6	SS	26		510										
			7	SS	18												
			8	SS	0		500										
			9	SS	7												
493.9																	
38.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel Hard (Glacial Till)		10	SS	86		490										
			11	SS	45												
			12	SS	29		480										
476.9																	
55.0	Silty Sand to Sand, Trace Gravel Dense to Very Dense		13	SS	74		470										
			14	SS	28		460										
457.9																	
74.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel Hard (Glacial Till)		15	SS	131/ 6"		450										
440.4			16	SS	60/ 3"												
91.5	End of Borehole																
	Note: Low 'N' value of 0 blows/foot resulted from excess hydrostatic pressure during sampling procedures.					Casing Boiling											



RECORD OF BOREHOLE No 15

Hwy. 407 & Weston Road

W P 88-78-00 LOCATION Coords. N 15 908 250; E 987 850 ORIGINATED BY MM

DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM

DATUM Geodetic DATE October 25, 1978 CHECKED BY J.F.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100									
625.0	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Hard		1	SS	13												
	Brown		2	SS	40												
	Grey		3	SS	64												
	(Glacial Till)		4	SS	103												
			5	SS	113												
	Sand		6	SS	136												
			7	SS	75/	5"											
			8	SS	75/	5"											
			9	SS	60/	5"											
583.5			10	SS	60/	4"											
41.5	End of Borehole																





# RECORD OF BOREHOLE No 16

W P 88-78-00 LOCATION Hwy. 407 & Jane St. ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 25-30, 1978 CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT Wp	NATURAL MOISTURE CONTENT W	LIQUID LIMIT Wl	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					WATER CONTENT (%) 20 40 60				
652.7	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Very Stiff (Glacial Till)  Red Brown Grey		1	SS	17		650										
			2	SS	19												
			3	SS	39												
			4	SS	62		640										
			5	SS	72												
634.7			6	SS	34												
18.0	Clayey Silt Trace Sand Stratified Grey  Very Stiff to Hard		7	SS	20		630										
			8	SS	21												
			9	SS	36		620										
			10	SS	25												
			11	SS	39		610										
			12	SS	73		600										
			13	SS	54		590										
			14	SS	38		580										
			15	SS	94		570										
			16	SS	62		560										
			552.7														
100.0	Cont.																



RECORD OF BOREHOLE No 16 cont

Hwy. 407 & Jane St.

Coords. N 15 910 080; E 993 940

W P 88-78-00

LOCATION

ORIGINATED BY MM

DIST 6 HWY 407

BOREHOLE TYPE

Hollow Stem Augers

COMPILED BY MM

DATUM Geodetic

DATE

October 25-30, 1978

CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
552.7																	
100.0	Clayey Silt Trace Sand Stratified Grey Very Stiff to Hard		17	SS	32		550										
			18	SS	39		540										
			19	SS	38		530										
520.7																	
132.0	Silty Sand, Trace		20	SS	150/	6"	520										
517.7	Gravel, Very Dense																
135.0	End of Borehole																

## RECORD OF BOREHOLE No 20

Borehole Data Obtained From C.N.R.

W P 88-78-00 LOCATION CNR & Humber Main East Bank  
Coords. N 15 903 050; E 978 100 ORIGINATED BY CNR

DIST 6 HWY 407 BOREHOLE TYPE N/A COMPILED BY MM

DATUM Geodetic DATE N/A CHECKED BY D.J.

[illegible]

120      End of Borehole

+3, x<sup>5</sup>: Numbers refer to Sensitivity

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 17

W P 88-78-00 LOCATION Hwy. 400 & Langstaff Rd. Coords. N 15 918 013; E 988 502 ORIGINATED BY MM  
DIST 6 HWY 400 BOREHOLE TYPE Hollow Stem Augers and Washboring COMPILED BY MM  
DATUM Geodetic DATE October 31, 1978 CHECKED BY E.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
673.1	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Red Brown Very Stiff (Glacial Till) Hard Grey		1	SS	19		670							OH			
			2	SS	19												
			3	SS	27												
			4	SS	51		660										2 22 55 21
			5	SS	38												
			6	SS	60												
			7	SS	30		650										
			8	SS	31												
			9	SS	131		640										
628.1							630										
45.0	Clayey Silt Grey Hard Varved		10	SS	41		620										
618.1							610										
55.0	Sand, Trace Silt Trace Gravel Compact to Very Dense		11	SS	36		600										
594.1																	
79.0																	
	Clayey Silt * Grey Hard Varved						580										
672.1																	
101.0	Glacial Till *						570										
568.1	Hard																
105.0	End of Borehole * Note: Description based on wash return, nature of washboring operation and other borings in vicinity.																



RECORD OF BOREHOLE No 19

Borehole Data Obtained From C.N.R.

W P 88-78-00 LOCATION CNR S-E Corner & Indian Line Coords. N 15 894 450; E 964 997 ORIGINATED BY C.N.R.  
DIST 6 HWY 427 BOREHOLE TYPE N/A COMPILED BY MM  
DATUM Geodetic DATE N/A CHECKED BY ef.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
561.4	Ground Surface																
0.0	Silty Clay Very Stiff		1	SS	22		560										
555.0			2	SS	22												
6.4	Sandy Silt Some Gravel		3	SS	83												
550.0	Very Dense		4	SS	69												
11.4	Sandy Silt Some Gravel		5	SS	62		550										
	Very Dense		6	SS	29												
			7	SS	82												
			8	SS	100		540										
531.7			9	SS	100												
29.7	Probably Grey Silt Sand and Gravel						530										
	Very Dense																
522.0																	
39.4	End of Borehole																
	Note: No groundwater observed																



# RECORD OF BOREHOLE No 18

W P 88-78-00 LOCATION Hwy. 400 & Hwy. 427 ORIGINATED BY MM  
DIST 6 HWY 400 BOREHOLE TYPE Hollow Stem Augers COPILED BY MM  
DATUM Geodetic DATE November 1, 1978 CHECKED BY ed.f.

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	VALUES		20	40	60	80	100					
630.0	Ground Surface															
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel, Red (Glacial Till) Brown Very Stiff Hard		1	SS	24											
			2	SS	43											
			3	SS	60/	3"										
			4	SS	105											
			5	SS	147											
			6	SS	130											
603.5			7	SS	100/	5"										
26.5	End of Borehole															



RECORD OF BOREHOLE No 21 Borehole Data Obtained From C.N.R.

W P 88-78-00 LOCATION CNR West Side & Islington Ave. Coords. N 15 903 450; E 979 500 ORIGINATED BY CNR  
DIST 6 HWY 407 BOREHOLE TYPE N/A COMPILED BY CNR  
DATUM Geodetic DATE N/A CHECKED BY P.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
523.5	0.0 Sand, Medium to Coarse With Gravel						520										
513.5	10.0 Sandy Silt			SS	26		510										
507.5	Compact			SS	17												
16.0	Silty Clay						500										
	Very Soft to Stiff						490										
							480										
							470										
472.5							460										
51.0	Heterogeneous Mixture			SS	26		450										
	Clayey Silt																
	Sand and Gravel			SS	39												
	Stiff to Very Stiff																
	(Glacial Till)			SS	27												
				SS	27												
				SS	18												
				SS	41												
442.0				SS	20												
81.5	End of Borehole																
	* Note: This borehole data obtained from CNR																



RECORD OF BOREHOLE No 22 Borehole Data Obtained From C.N.R.

W P 88-78-00 LOCATION CNR & Hwy. 400 Coords. N 15 906 450; E 990 470 ORIGINATED BY CNR  
DIST 6 HWY 400 BOREHOLE TYPE N/A COMPILED BY MM  
DATUM Geodetic DATE N/A CHECKED BY e.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
619.0	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel Dense to Very Dense (Glacial Till)																
604.0																	
15.0	Sandy Silt																
598.0	Very Dense																
21.0	Sand, Fine to Medium  Dense to Very Dense																
584.0																	
35.0	Heterogeneous Mixture Silt Sand and Gravel Very Dense																
570.0																	
50.0	End of Borehole																





RECORD OF BOREHOLE No 23

(This data obtained from  
Metropolitan Toronto and Region  
Conservation Authority)

W P 88-78-00

LOCATION East Side of Clairville Dam  
Coords. N 15 89.0 220; E 965 600

ORIGINATED BY Geocon

DIST 6 HWY 427

BOREHOLE TYPE N/A

COMPILED BY MM

DATUM Geodetic

DATE N/A

CHECKED BY a.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
542.0	Ground Surface																
0.0	Topsoil																
1.0	Heterogeneous Mixture Silt, Sand and Gravel Grey to Brown  (Glacial Till) Compact to Very Dense																
504.0																	
38.0	Soft Grey Interbedded Shale and Limestone																
500.0	Bedrock																
42.0	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION

## APPENDIX

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A1 LOCATION Hwy. 407 at Airport Road  
ORIGINAL GROUND ELEV. 594-597 PROPOSED HWY. 407 GRADE ELEV. 595+  
Proposed Airport Road Grade Elevation 616+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 4 0-25' glacial till very stiff to hard 25'-32'+ silt, some sand very dense	<u>Abutments</u> 1. Compacted granular pad 2. Spread footings at or below elevation 592.0, designed for maximum allowable load of 3.0 t.s.f. 3. End bearing piles. Estimated tip elevation 565.0. Designed for maximum allowable structural capacity per pile.  <u>Piers</u> 1. Spread footings as discussed above 2. End bearing piles as discussed above	Fill heights up to 22 ft. will be stable with forward and side slopes of 2:1.	
<u>Groundwater</u> Not encountered			

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A2 LOCATION Hwy. 407 at Bramport Terminal Spurline

ORIGINAL GROUND ELEV. 575-580 PROPOSED HWY. 407 GRADE ELEV. 580+ (630+)

Proposed Bramport terminal spurline grade elevation 601+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A3 LOCATION Hwy. 407 at Mimico Creek  
ORIGINAL GROUND ELEV. 560 to 575 PROPOSED HWY. 407 GRADE ELEV. 581+ (624+)  
Mimico Creek H.W.L. 573+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 1 0-8'    clayey silt stiff to very stiff 8-14'    silt, some sand dense 14-30'    sand, some silt compact 30-42'    + glacial till hard  <u>Groundwater</u>	<u>Abutments</u> 1.    Spread footings at or below elevation 555.0. Design for maximum allowable load of 2.5 tsf. Dewatering scheme required. 2.    End bearing piles. Estimated tip elevation 525.0. Designed for maximum allowable structural capacity per pile.  <u>Piers</u> 1.    End bearing piles as discussed above.	Fill heights up to 30 ft. will be stable with forward and side slopes of 2:1.  Fills heights up to 64 feet will be stable with a 40' wide mid height counter balancing berm with slopes of 2:1.  The higher profile grade would result in fill heights up to 64 feet. Fill heights of this magnitude would have inherent settlement.  Future maintenance on such embankments would be appreciable and thus the higher grade is to be discouraged.	At this location during the fieldwork the creek had depth of water up to 1 foot with imperceptable flow. The creek bed is undefined, concealed by long grass.  At this location a concrete box type culvert or steel pipe or pipe arch is suitable based on geotechnical considerations.

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A4 LOCATION Hwy. 407 at Goreway Drive

ORIGINAL GROUND ELEV. 572-576 PROPOSED HWY. 1 GRADE ELEV. 586<sup>+</sup>

Proposed Goreway Drive Grade Elevation 607 $\pm$

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A5 LOCATION Hwy. 407 at West Humber River  
 ORIGINAL GROUND ELEV. 555-565 PROPOSED HWY. 407 GRADE ELEV. 565-567  
 Claireville Lake H.W.L. 556+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<p><u>Reference Boreholes</u>    5</p> <p><u>West Bank</u></p> <p>0-5' clayey silt, stiff</p> <p>5-18' glacial till stiff to hard</p> <p>18-23' silt, some sand compact</p> <p>23-30' sand, some silt some gravel very dense</p> <p><u>East Bank</u></p> <p>Exposed face is composed of very stiff glacial till</p> <p><u>Groundwater</u></p> <p>At 5 feet below ground surface</p>	<p><u>Abutments and Piers</u></p> <p>End bearing piles Estimated tip elevation 505.0 Designed for maximum allowable structural capacity per pile</p>	<p>Fill heights up to 25 ft. will be stable with forward and side slopes of 2:1.</p> <p>It will be necessary to key the approach fill into the flood plains' steep east bank.</p> <p>Grading the east slope would be required for a distance of some 50 feet north and south of the highway.</p> <p>In addition, protective measures against river erosion of the approach fills would be required.</p>	<p>West Humber at this location is 50 feet wide and flows within a floodplain 100-300 feet wide. The river bottom is expected to be comprised of firm clayey silt with trace organics. The floodplain west bank has a gentle slope, whereas the east bank slope is as steep as 75° and up to 30 feet high.</p>

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A6 LOCATION Hwy. 407 at Hwy. 50  
 ORIGINAL GROUND ELEV. 578-583 PROPOSED HWY. 407 GRADE ELEV. 565+  
 Proposed Hwy. 50 Grade Elevation 585+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 11  0-13' glacial till very stiff to hard  13-23' glacial till very dense  23-34' sandy silt very dense  34-42'+ glacial till hard	<u>Abutments</u>  1. Compacted granular pad  2. Spread footing at or below elevation 575.0. Design for maximum allowable load of 3.5 tsf.  3. End bearing piles Estimated tip elevation 540.0 Designed for maximum allowable structural capacity per pile  <u>Piers</u>  1. Spread footings at or below elevation 565.0. Design for maximum allowable load of 5 t.s.f.	Fill heights up to 20 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 20 feet deep will be stable with slopes of 2:1.	
<u>Groundwater</u>  28' below ground Level			



# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A7 LOCATION Hwy. 407 at Hwy. 427  
ORIGINAL GROUND ELEV. 580-585 PROPOSED HWY. 407 GRADE ELEV. 569+(567+)  
Proposed Hwy. 427 Proposed Grade Elevation 597+ (Associated Ramps Grade 611 to 633)

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A8 LOCATION Hwy. 427 at Steeles Avenue  
ORIGINAL GROUND ELEV. 575-578 PROPOSED HWY. 427 GRADE ELEV. 599+ (Ramps P/G Approximate Elev.620)  
Proposed Steeles Ave. Grade Elevation 578+.

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A9 LOCATION Hwy. 427 at Albion Road  
ORIGINAL GROUND ELEV. 565-568 PROPOSED HWY. 427 GRADE ELEV. 606+  
Proposed Albion Road Grade Elevation 568+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A10 LOCATION Hwy. 427 at C.N.R. Mactier Sub.

ORIGINAL GROUND ELEV. 565+ PROPOSED HWY. 427 GRADE ELEV. 595-597

Proposed CNR MacTier Sub. Grade Elevation 565+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A11 LOCATION Hwy. 407-Hwy. 427 Ramps Immediately East of Hwy. 427  
ORIGINAL GROUND ELEV. 570-575 PROPOSED HWY. 407 GRADE ELEV. 575+ (566+)  
Proposed Ramp Grade Elevation 600+ (591+) [Assumed Ramp Grades]

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A12 LOCATION Hwy. 407 at Hwy. 27  
ORIGINAL GROUND ELEV. 560-565 PROPOSED HWY. 407 GRADE ELEV. 562+ (544+)  
Proposed Hwy. 27 Grade Elevation 584+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 12 0-27' + glacial till hard	<u>Abutments</u> 1. Compacted granular pad  2. Spread footings at or below elevation 559.0 using maximum allowable load 5 t.s.f.  <u>Piers</u> 1. Spread footings as discussed above.	Fill heights up to 24 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 11 feet will be stable with slopes of 2:1.	
<u>Groundwater</u>  Not encountered			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A13 LOCATION Hwy. 407 at Martingrove Road  
ORIGINAL GROUND ELEV. 560+ PROPOSED HWY. 407 GRADE ELEV. 539+ (544+)  
Proposed Martingrove Road Grade Elevation 565+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A14 LOCATION Hwy. 407 at Kipling Avenue  
 ORIGINAL GROUND ELEV. 460-470 PROPOSED HWY. 407 GRADE ELEV. 498+ (496+)  
 Proposed Kipling Avenue Grade Elevation 470+ Invert Elevation Plunketts Creek 448+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 6  0-9'    sand, some silt some gravel loose to compact  9-14'    glacial till very dense  14-25'    sand, some silt some gravel compact to dense  25-37'+    sand, some silt very dense          <u>Groundwater</u>  5' below ground surface	<u>Abutments</u>  1.    Compacted granular pad  2.    End bearing piles Estimated tip elevation 425.0 Designed for maximum structural capacity per pile  <u>Piers</u>  1.    End bearing piles as discussed above.	Fill heights up to 38 ft. will be stable with forward and side slopes of 2:1.	It is understood Plunketts Creek will be relocated slightly and the crossing of Kipling Ave. and Hwy. 407 would be accomplished by a culvert. A concrete box culvert or structural plate pipe or pipe arch would be suitable at this location.



# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A15 LOCATION Kipling Ave. at C.N.R. Halton Sub.  
 ORIGINAL GROUND ELEV. 465-509 PROPOSED HWY. C.N.R. GRADE ELEV. 509+  
 Proposed Kipling Ave. Grade Elevation 436+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 7  0-9' sand, some silt some gravel loose to compact  9-14' glacial till, hard  14-25' sand, some silt compact to dense  25-37' + glacial till very dense   <u>Groundwater</u>  5' below ground surface	<u>Abutments and Piers</u>  End bearing Piles Estimated tip elevation 425.0 Designed for maximum allowable structural capacity of the pile.	Fill heights up to 35 ft. will be stable with forward and side slopes of 2:1.  Fill heights in excess of 35 feet would be in- herently unstable due to erosion of the slope surface. In view of this fill heights up to 44 feet would require a 10 foot wide 1/3 height berm to reduce future maintenance costs.   detoured railway embankment (78'). The slopes of the detoured railway embankment would require a 20' wide mid height berm for stability purposes.	In order to con- struct Kipling Ave. through the existing embankment three alternatives could be adopted.  A/ Tunnel Kipling Ave. through the existing C.N.R. embankment  B/ Underpin the C.N.R. track during con- struction of Kipling  C/ Detour the C.N.R. north during con- struction. Detouring north is preferred to detouring south because of the unfav- ourable subsoil con- ditions within the Thackeray Land Fill Site. Furthermore, the Plunkett Creek culvert would be required to be designed for the full surcharge of the

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A16 LOCATION Hwy. 407 at Humber River  
 ORIGINAL GROUND ELEV. 445-503 PROPOSED HWY. 407 GRADE ELEV. 476+  
 Humber River H.W.L. 457+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> <u>West Side B.H. 6</u> 0-11' sand to gravelly sand, loose to compact 11-24' clayey silt to silty clay, stiff to very stiff 24-34' silt of slight plasticity very stiff 34-52'+ glacial till, hard <u>East Side B.H. 20</u> <u>Variable subsoil conditions</u> 0-15' sandy silt, some gravel 15-35' clayey silt, stiff to very stiff 35-105' glacial till, dense 105-120'+ glacial till, hard <u>Groundwater</u> At 9' below ground surface	<u>Abutments and Piers</u> <u>West Side</u> 1. End bearing piles Estimated tip elevation 400.0 Design for maximum allowable structural capacity of the pile.. <u>East Side</u> 1. End bearing piles Estimated tip elevation 385.0 Design for maximum allowable structural capacity of the pile. 2. Friction piles #14 timber piles 45' long designed for maximum allowable load per pile of 30 tons.	<u>West Side</u> Fill heights up to 31 ft. will be stable with forward and side slopes of 2:1. Furthermore, on the west approach, consolidation of the underlying clayey silt will occur. Settlement of the 31' fill will be in the order of 3-4", 90% of which will occur within 6 months of completion of the embankment. In order to minimize post construction settlements preloading for 6 months may be required. <u>East Side</u> It is anticipated the east approach will be in a partial cut through very soft to stiff silty clay. Because of property problems it was not possible to gain access to the concerned area, obtain necessary samples and perform the required testing. Although specific data is lacking it is postulated that nominal berms 10' wide mid height may be required in the cut areas.	At this location river is 50' wide and 3' deep. The river banks are about 8 feet high and slopes about 75°.

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A17 LOCATION Hwy. 407 at C.P. R. Mactier Sub.  
 ORIGINAL GROUND ELEV. 480-503 PROPOSED HWY. 407 GRADE ELEV. 484<sup>+</sup>  
 Proposed C.P.R. Mactier Sub. Grade Elevation 503<sup>+</sup>

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<p><u>Reference Boreholes</u></p> <p>Because of property access problems it was not possible to carry out the necessary testing, and for feasibility purposes we have used data from the nearby CNR-Islington crossing.</p> <p><u>B.H. 21</u></p> <p>0-10' sand medium to coarse          10-16' sandy silt, compact          16-51' silty clay, very soft to stiff          51-82'+ stiff to very stiff glacial till</p> <p><u>Groundwater</u></p> <p>Not established</p>	<p><u>Abutments and Piers</u></p> <p>1. Friction Piles          #14 timber piles 45' long          Design load 25 tons per pile</p>	<p>Fill heights up to 23 ft. will be stable with forward and side slopes of 2:1.</p> <p>It is anticipated that the approaches will be located in partial cuts through very soft to stiff silty clay. Although specific data is lacking it is postulated that nominal berms 10' wide mid height may be required.</p>	

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A19 LOCATION Hwy. 407 at Pine Valley Drive  
 ORIGINAL GROUND ELEV. 530-535 PROPOSED HWY. 407 GRADE ELEV. 537+  
 Proposed Pine Valley Drive Grade Elevation 556+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 14  0-5' silty sand, compact  5-11' glacial till very stiff  11-19' clayey silt, stiff  19-38' sandy silt to silty sand, some gravel loose to compact  38-55' glacial till, hard  55-74' silty sand dense to very dense  74'-92'+ glacial till, hard   <u>Groundwater</u>  25' below ground surface	<u>Abutments and Piers</u>  1. End bearing piles Driven to estimated tip elevation 445.0 Designed for maximum allowable structural capacity of the pile.	Fill heights up to 26 ft. will be stable with forward and side slopes of 2:1.	

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A20 LOCATION Hwy. 407 at Weston Road  
ORIGINAL GROUND ELEV. 630-635 PROPOSED HWY. 407 GRADE ELEV. 602+ (633+)  
Proposed Weston Road Grade Elevation 635+ (655+)

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A21 LOCATION Hwy. 407 at Hwy. 400  
ORIGINAL GROUND ELEV. 630-635 PROPOSED HWY. 407 GRADE ELEV. 615+ (660+)  
Proposed Hwy. 400 Grade Elevation 635+ (635+)

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 13 0-27'+ glacial till, very stiff to hard	<u>Abutments</u> 1. Compacted granular pad 2. Spread footings located at or below elevation 624.0. Designed for maximum allowable load of 5 t.s.f.  <u>Piers</u> 1. Spread footings as discussed above.	Fill heights up to 30 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 15 feet will be stable with slopes of 2:1.	
<u>Groundwater</u> 12' below ground surface			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A23 LOCATION Hwy. 400 at Hwy. 7  
ORIGINAL GROUND ELEV. 647 - 630 PROPOSED HWY. 407 GRADE ELEV. 647+  
Proposed Hwy. 7 Grade Elevation 665+

[illegible]

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A24 LOCATION Hwy. 407 at Jane Street

[illegible]

Proposed Jane Street Grade Elevation 665+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 16  0-18' glacial till very stiff  18-132' clayey silt stratified, very stiff to hard  132-135'+ silty sand very dense	<u>Abutments and Piers</u>  1. Friction Piles #14 timber piles 45' long designed for maximum allowable load per pile of 30 tons.  2. End bearing piles Driven to approximate tip elevation 515. Designed for maximum allowable structural capacity of the pile.	Fill heights up to 20 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 5 feet will be stable with side slopes of 2:1.	
<u>Groundwater</u>  28' below ground level			



# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A25 LOCATION Hwy. 400 at C.N.R. Halton Sub.  
ORIGINAL GROUND ELEV. 611-639 PROPOSED HWY. 400 GRADE ELEV. 639<sup>+</sup>  
Proposed C.N.R. Halton Sub. Grade Elevation 611<sup>+</sup>

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 22 0-15' glacial till dense to very dense  15-21' sandy silt very dense  21-35' sand, dense to very dense  35-50' glacial till hard	<u>Abutments</u>  1. Compacted granular pad  2. Spread footings located at or below elevation 615. Designed for maximum allowable load of 3.5 t.s.f.  <u>Piers</u>  1. Spread footings as mentioned above.	Fill heights up to 28 ft. will be stable with forward and side slopes of 2:1.	Existing structure founded on spread footings.
<u>Groundwater</u>  19' below ground surface			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A26 LOCATION Hwy. 400 at Langstaff Road  
ORIGINAL GROUND ELEV. 680+ PROPOSED HWY. 400 GRADE ELEV. 680+  
Proposed Langstaff Road Grade Elevation 700+

[illegible]

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A27 LOCATION Hwy. 427 Over West Humber River  
ORIGINAL GROUND ELEV. 525-555 PROPOSED HWY. 427 GRADE ELEV. 546-557  
West Humber River High Water Level 525+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A28 LOCATION Hwy. 427 at Finch Avenue  
ORIGINAL GROUND ELEV. 553-555 PROPOSED HWY. 427 GRADE ELEV. 544+  
Proposed Finch Avenue Grade Elevation 567+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> <sup>2</sup> 0-8' clayey silt, hard 8-27'+ glacial till, hard	<u>Abutments</u> 1. Compacted granular pad 2. Spread footings at or below elevation 547.0. Design for maximum allowable load of 5 t.s.f. 3. End bearing piles. Estimated tip elevation 535.0. Designed for maximum allowable load per pile.  <u>Piers</u> 1. Spread footings as above.	Fill heights up to 13 ft. will be stable with forward and side slopes of 2:1.  Roadway cuts up to 12 feet deep will be stable with slopes of 2:1.	
<u>Groundwater</u> Not encountered			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A29 LOCATION Finch Avenue Over West Humber River  
 ORIGINAL GROUND ELEV. 515-555 PROPOSED HWY. \_\_\_\_\_ GRADE ELEV. 548-555  
 West Humber River High Water Level 515+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<p><u>Reference Boreholes</u>    3</p> <p><u>West of River</u></p> <p>0-4'    sandy gravel, loose</p> <p>4-7'    glacial till, hard</p> <p>7-14' + bedrock, poor           quality, layers           of limestone and           weathered shale</p> <p><u>East of River</u> <u>(in exposed bank)</u></p> <p>0-10'+ clayey silt           very stiff</p> <p>10'+ glacial till, hard</p> <p><u>Groundwater</u></p> <p>Boring was relatively dry upon completion of augering. Groundwater level was not established.</p>	<p>Because of the numerous possibilities of abutment pier locations and foundation elevations the following founding options are provided.</p> <p><u>Abutments and Piers</u></p> <ol style="list-style-type: none"> <li>1. Spread footings founded on bedrock at or below elevation 512.0. Design for maximum allowable load of 7 t.s.f.</li> <li>2. End bearing piles driven to bedrock. Estimated tip elevation 512.0. Designed for maximum allowable load per pile.</li> </ol>	<p>Fill heights up to 35 ft. will be stable with forward and side slopes of 2:1.</p> <p>It will be necessary to key the roadway fill into the flood plains' steep banks. Cutting back the east bank slope to a stable 2:1 would be required for a distance of some 150 feet north and south of the roadway. In addition, protective measures against erosion of the roadway fill and east bank will be required. Furthermore, it will be advantageous to permanently divert the river 100 to 500 feet to the west.</p>	<p>At this location during the field investigation the depth of water was 1-2'. Boulders and cobbles are strewn in creek bed.</p>

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A30 LOCATION Hwy. 427 & Hwy. 7  
 ORIGINAL GROUND ELEV. 590-595 PROPOSED HWY. 407 GRADE ELEV. 590 + 6115+  
 Proposed Hwy. 7 Grade Elevation 614+ (593+)

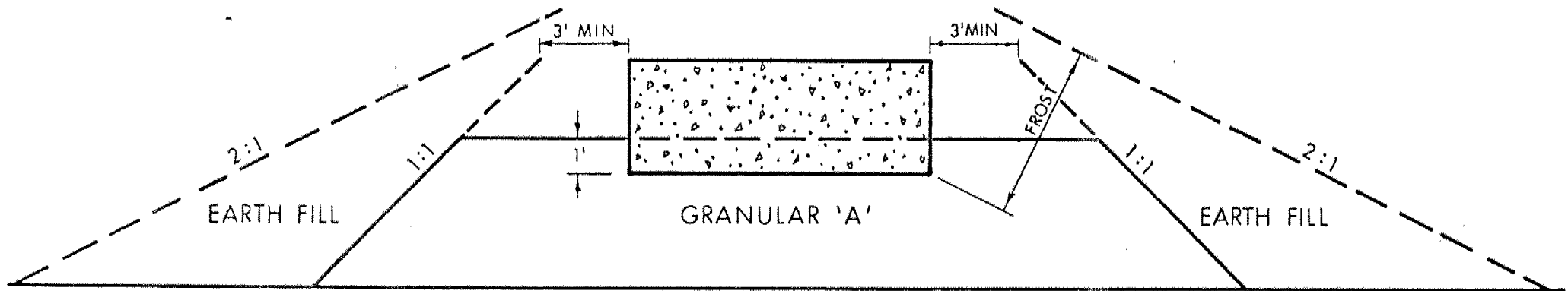
SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u>  The request for this area was received after completion of the fieldwork and specific data is lacking. However, based on available data it can be assumed the subsurface conditions here consist of about 50' of hard glacial till overlying bedrock.	<u>Abutments and Piers</u>  End bearing piles. Estimated pile tip elevation 525'. Designed for maximum allowable load per pile.	Fill heights up to 25 ft. will be stable with forward and side slopes of 2:1.	Geotechnical data is lacking to positively compare the underpass-overpass alternative. However, based on available data it is speculated that sub-soil conditions here are similarly competent for either an overpass or underpass scheme and the decision should be based on other considerations.
<u>Groundwater</u>			

# FOUNDATION DATA SHEET

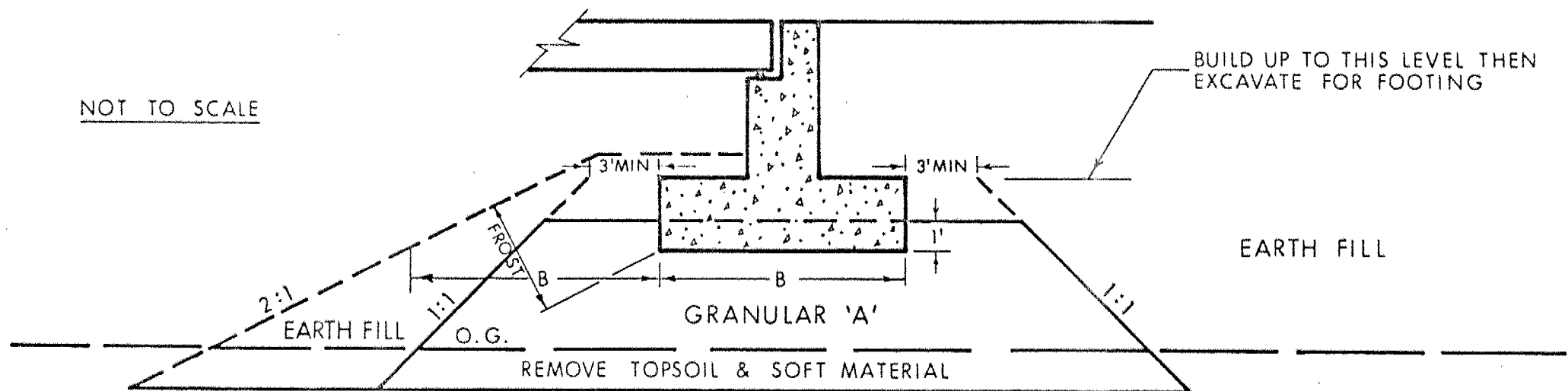
W.P. 88-78-00 SITE A31 LOCATION Hwy. 427 at Plunkett's Creek  
 ORIGINAL GROUND ELEV. 570-600 PROPOSED HWY. 427 GRADE ELEV. 588+  
 Plunkett's Creek W.L. 570+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u>  The request for this area was received after completion of fieldwork and hence no specific data was obtained for the area. However, based on available data, it can be assumed the subsurface conditions here consist of about 80' of very stiff to hard glacial till overlying bedrock.	<u>Abutments and Piers</u>  End bearing piles. Estimated tip elevation 490.0. Designed for maximum allowable structural load per pile.	Fill heights up to 18 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 12 feet deep will be stable with side slopes of 2:1.	
<u>Groundwater</u>			

# ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



X SECTION

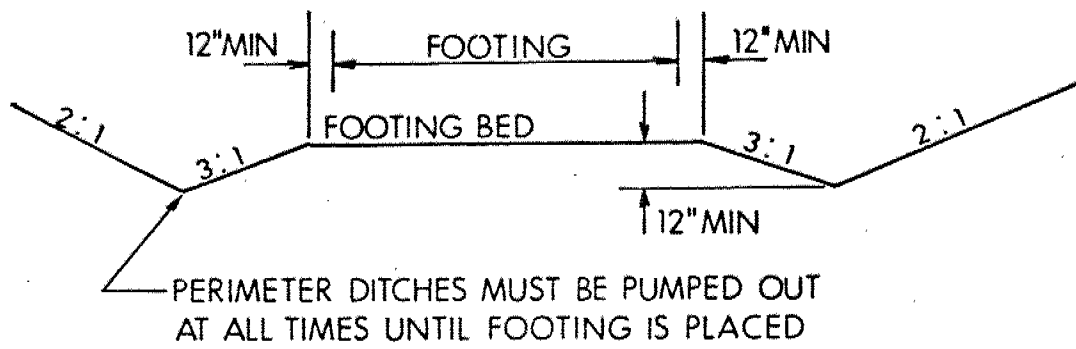


LONGITUDINAL SECTION

## NOTES:

- 1- REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' & EARTH FILL.
- 2- PLACE GRANULAR 'A' & EARTH FILL TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.
- 3- EXCAVATE COMPACTED GRANULAR 'A' & EARTH FILL FOR FOOTING.





## OVERSIZE EXCAVATION WITH PERIMETER DRAINS

FIG No 2

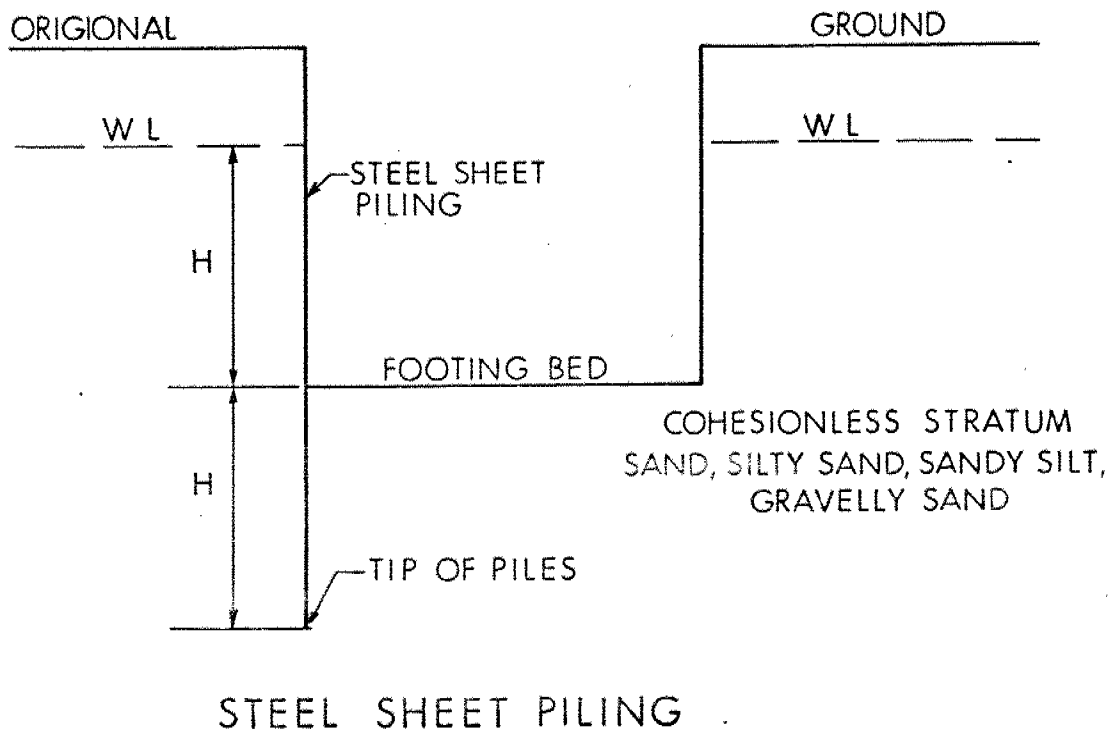
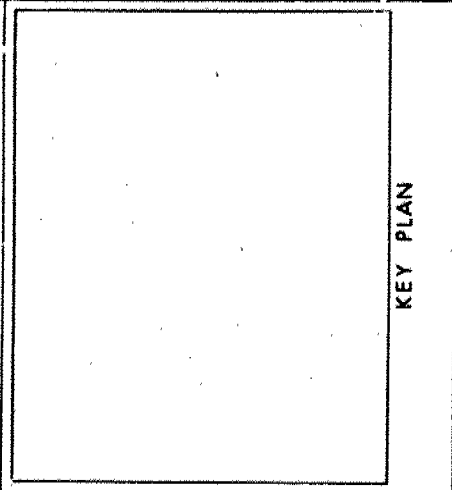


FIG No 3

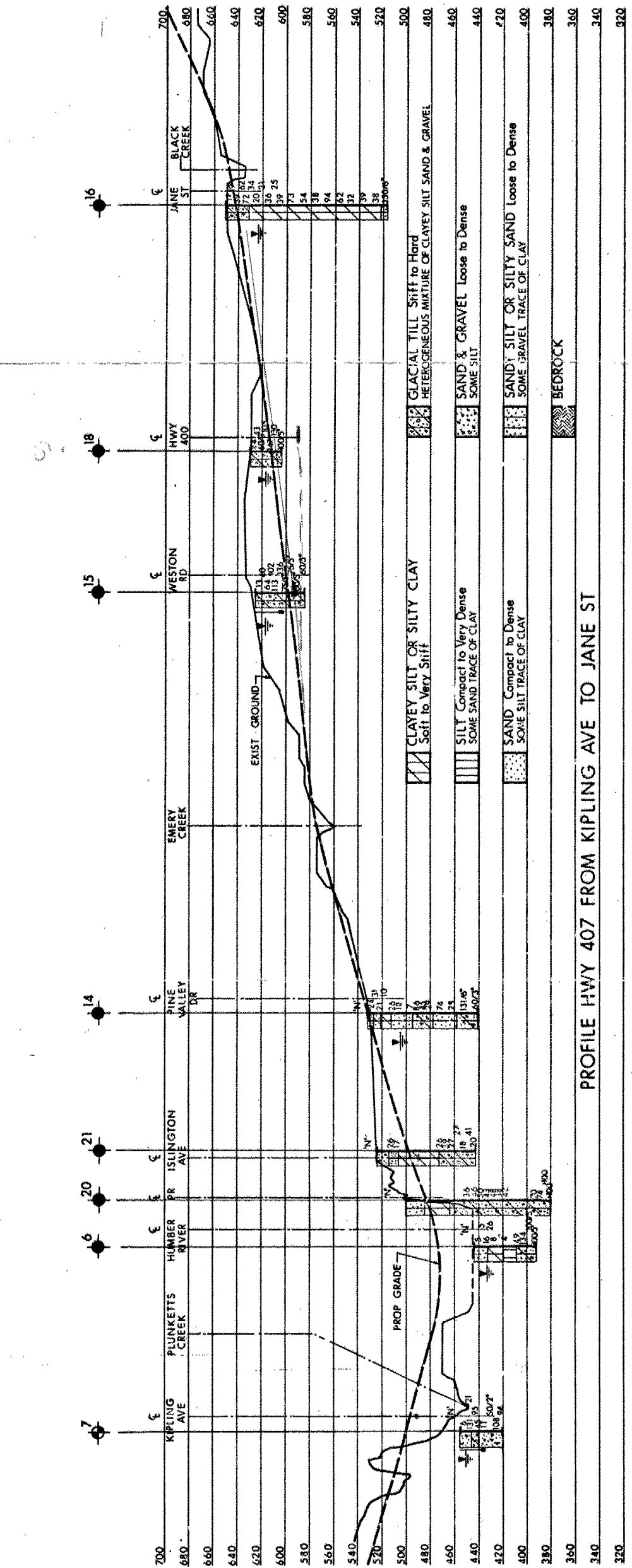
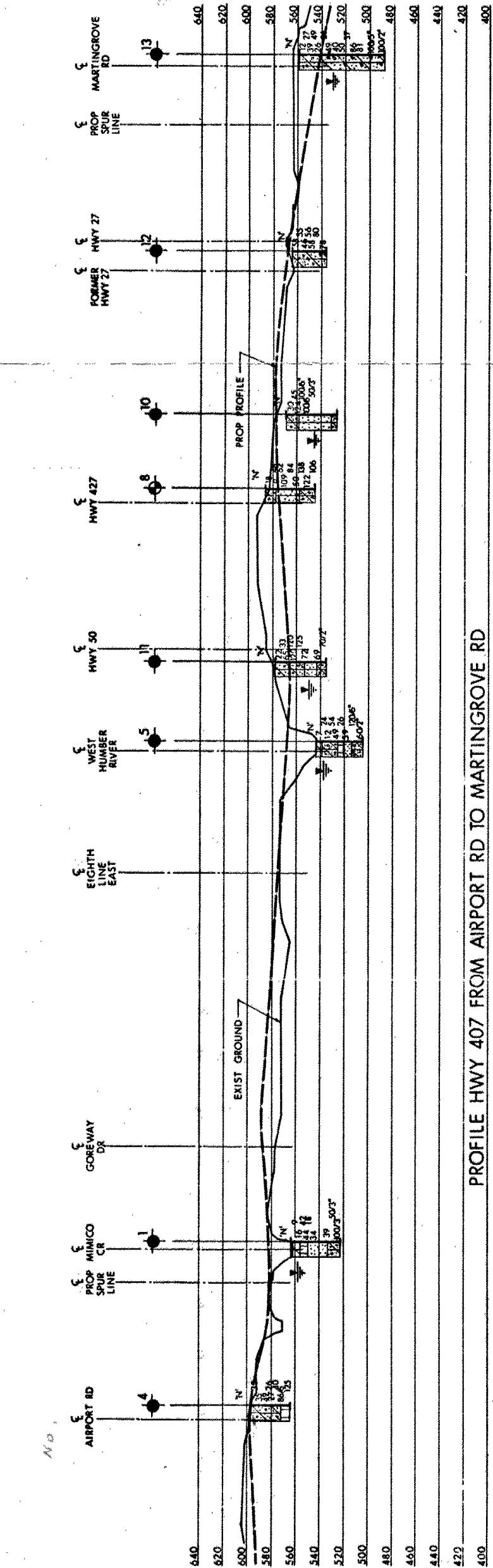


LEGEND	
	Bore Hole
	Dynamic Cone Penetration Test (Cone)
	Bore Hole & Cone
	Blows/ft (Std Pen Test 350 ft lbs energy)
	CONE Blows/ft (60° Cone, 350 ft lbs energy)
	WL at time of investigation
	NO WL Established in BH No 2 3 4 8 12 19 20 21 & 23

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	564.8	15 890 390	955 950
2	555.9	15 891 020	966 305
3	519.7	15 891 330	967 445
4	596.3	15 888 480	954 140
5	540.4	15 896 130	961 970
6	443.5	15 903 680	977 910
7	456.5	15 902 520	975 330
8	585.8	15 898 530	965 070
9	578.0	15 897 460	965 250
10	569.1	15 899 190	966 570
11	578.8	15 897 380	963 020
12	562.6	15 899 840	949 280
13	559.1	15 900 900	972 020
14	531.9	15 905 450	981 320
15	625.0	15 908 250	987 850
16	652.7	15 910 080	993 940
17	673.1	15 918 013	988 502
18	630.0	15 908 830	989 950
19	561.4	15 894 450	964 997
20	500.0	15 903 050	978 100
21	523.5	15 903 450	979 500
22	619.0	15 906 450	990 470
23	542.0	15 890 220	965 600

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

REVISIONS	
DATE	DESCRIPTION

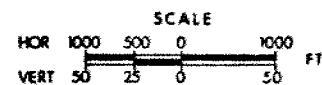
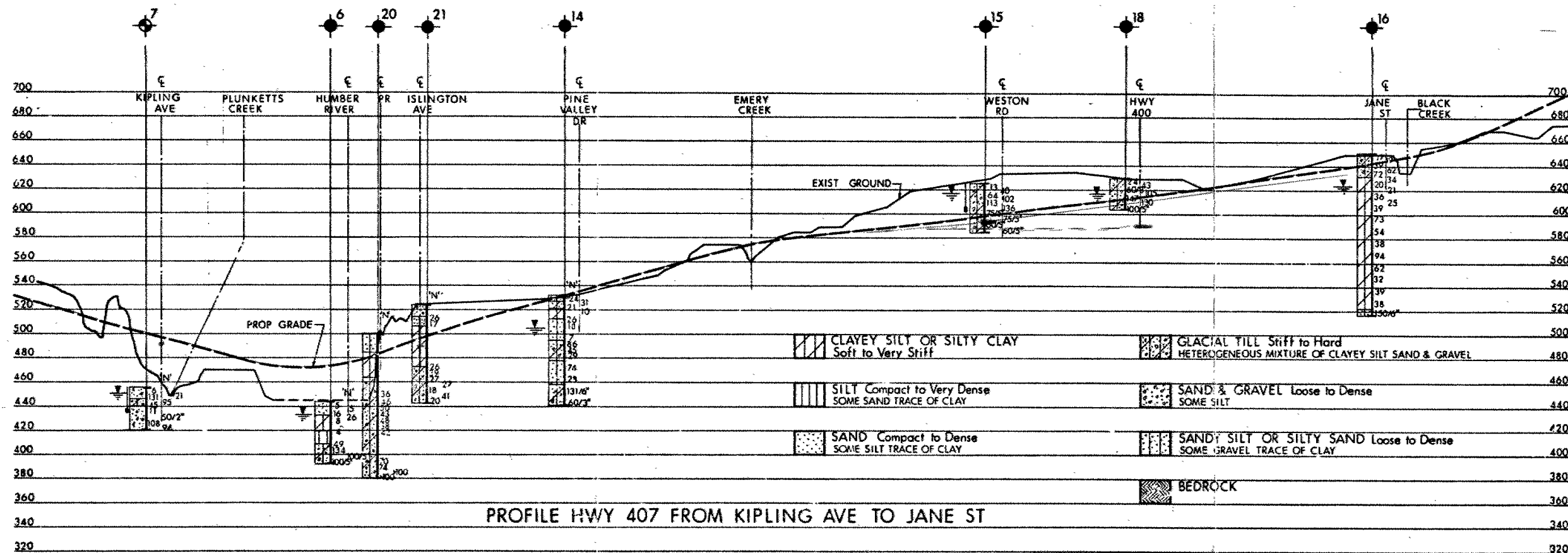
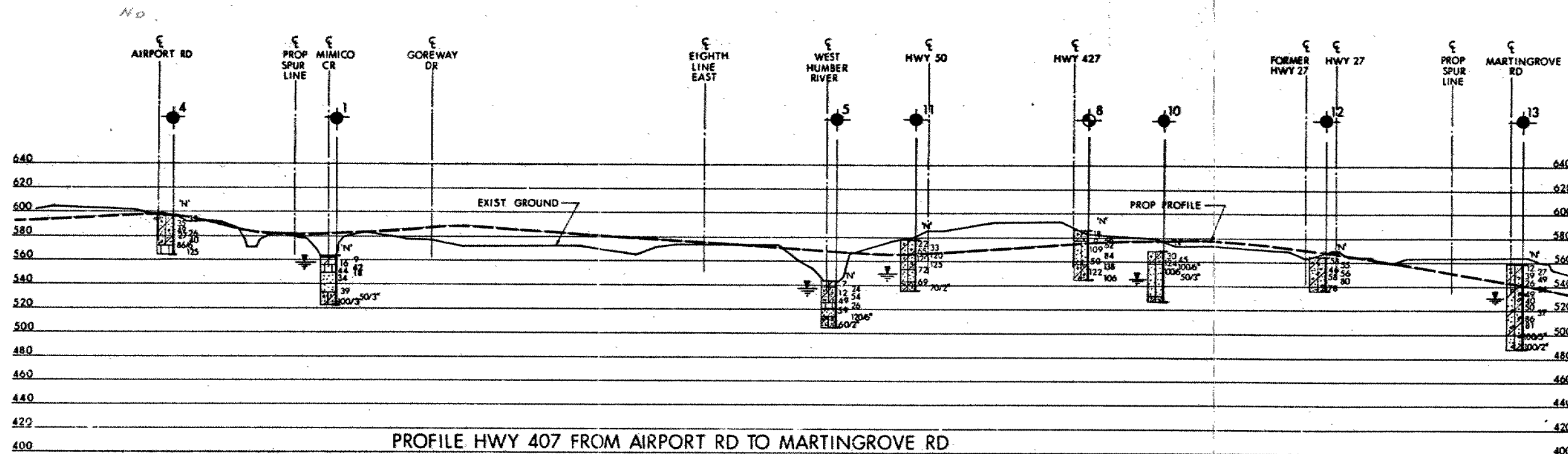


CONT No  
WP No 88-78-00

HWY 407

BORE HOLE LOCATIONS & SOIL STRATA

SHEET



# LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350ft lbs energy)
- CONE Blows/ft (60° Cone, 350ft lbs energy)
- WL at time of investigation
- NO WL Established in BH No 2 3 4 8 12 19 20 21 & 23

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	564.8	15 890 590	955 760
2	555.9	15 891 020	966 305
3	519.7	15 891 330	967 445
4	596.3	15 888 480	954 140
5	540.4	15 896 130	961 970
6	443.5	15 903 680	977 910
7	456.5	15 902 520	975 330
8	585.8	15 898 530	965 070
9	578.0	15 897 460	965 250
10	569.1	15 899 190	966 570
11	578.8	15 897 380	963 020
12	562.6	15 899 840	969 280
13	559.1	15 900 900	972 020
14	531.9	15 905 450	981 320
15	625.0	15 908 250	987 850
16	652.7	15 910 080	993 940
17	673.1	15 918 013	988 502
18	630.0	15 908 830	989 950
19	561.4	15 894 450	964 997
20	500.0	15 903 050	978 100
21	523.5	15 903 450	979 500
22	619.0	15 906 450	990 470
23	542.0	15 890 220	965 600

## -NOTE-

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

REVISIONS	DATE	BY	DESCRIPTION

HWY No 407	DIST 6
SUBMITTED BY	CHECKED BY
DRAWN BY	CHECKED BY
DATE 78 12 18	SITE
APPROVED	QWG 887800-8

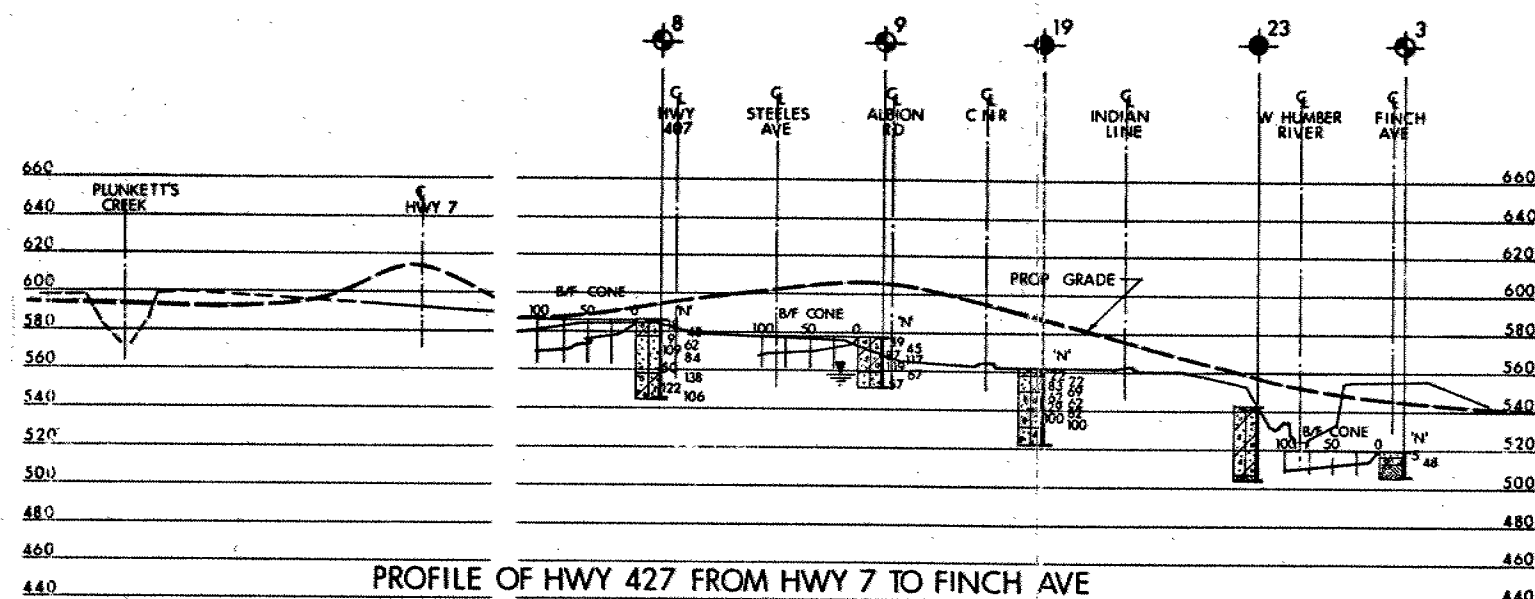
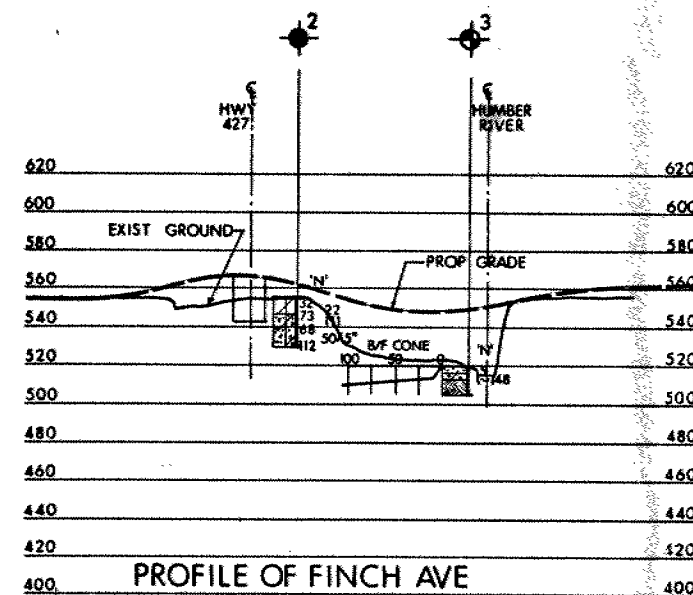
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, OTTAWA

CONT No  
WP No 88-78-00

HWY 427 400 & FINCH AVE

BORE HOLE LOCATIONS & SOIL STRATA

SHEET



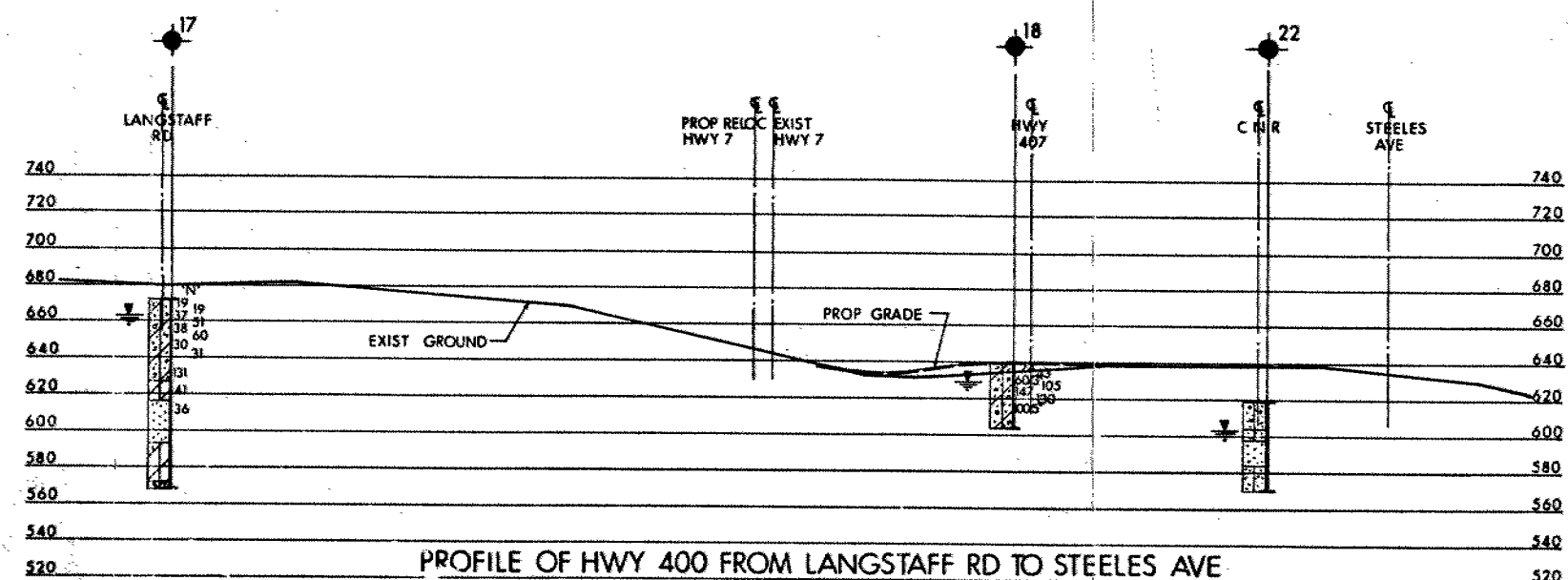
KEY PLAN

LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N' Blows/ft (Std Pen Test 350ft lbs energy)
- CONE Blows/ft (60° Cone, 350ft lbs energy)
- WL at time of investigation

No	ELEVATION		

- CLAYEY SILT OR SILTY CLAY Soft to Very Stiff
- SILT Compact to Very Dense SOME SAND TRACE OF CLAY
- SAND Compact to Dense SOME SILT TRACE OF CLAY
- GLACIAL TILL Stiff to Hard HET MIXTURE OF CLAYEY SILT SAND & GRAVEL
- SAND & GRAVEL Loose to Dense SOME SILT
- SANDY SILT OR SILTY SAND Loose to Dense SOME GRAVEL TRACE OF CLAY
- BEDROCK



SCALE  
HOR 1000 500 0 1000 FT  
VERT 50 25 0 50

-NOTE-

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

REVISIONS	DATE	BY	DESCRIPTION

HWY No 427 400 DIST 6  
SUBMITAL CHECKED DATE 78 12 18 SITE  
DRAWING CHECKED APPROVED DWG 887800-C

**GENERAL NOTES**  
**CLASS OF CONCRETE**

APPROACH SLABS : 20 MPa  
CONCRETE SLOPE PAVING : 20 MPa  
**REINFORCING STEEL**  
GRADE 400. BAR MARKS WITH THE SUFFIX "C" SHALL BE COATED BARS.

**CLEAR COVER TO REINF. STEEL**  
APPROACH SLABS : 2" EXCEPT AS NOTED  
SIDEWALKS & MEDIAN : 2"  
REMAINDER : 3"

**NOTE**  
STRUCTURAL WORK ON THIS CONTRACT INCLUDES ONLY THE FOLLOWING:  
C) CONCRETE SLOPE PAVING, APPROACH SLABS, ASPHALT & WATER PROOFING AT SITE 37-1084  
D) APPROACH SLABS, ASPHALT AND WATERPROOFING AT SITE 37-633 A  
C) ASPHALT & WATERPROOFING AT SITE 37-633 B

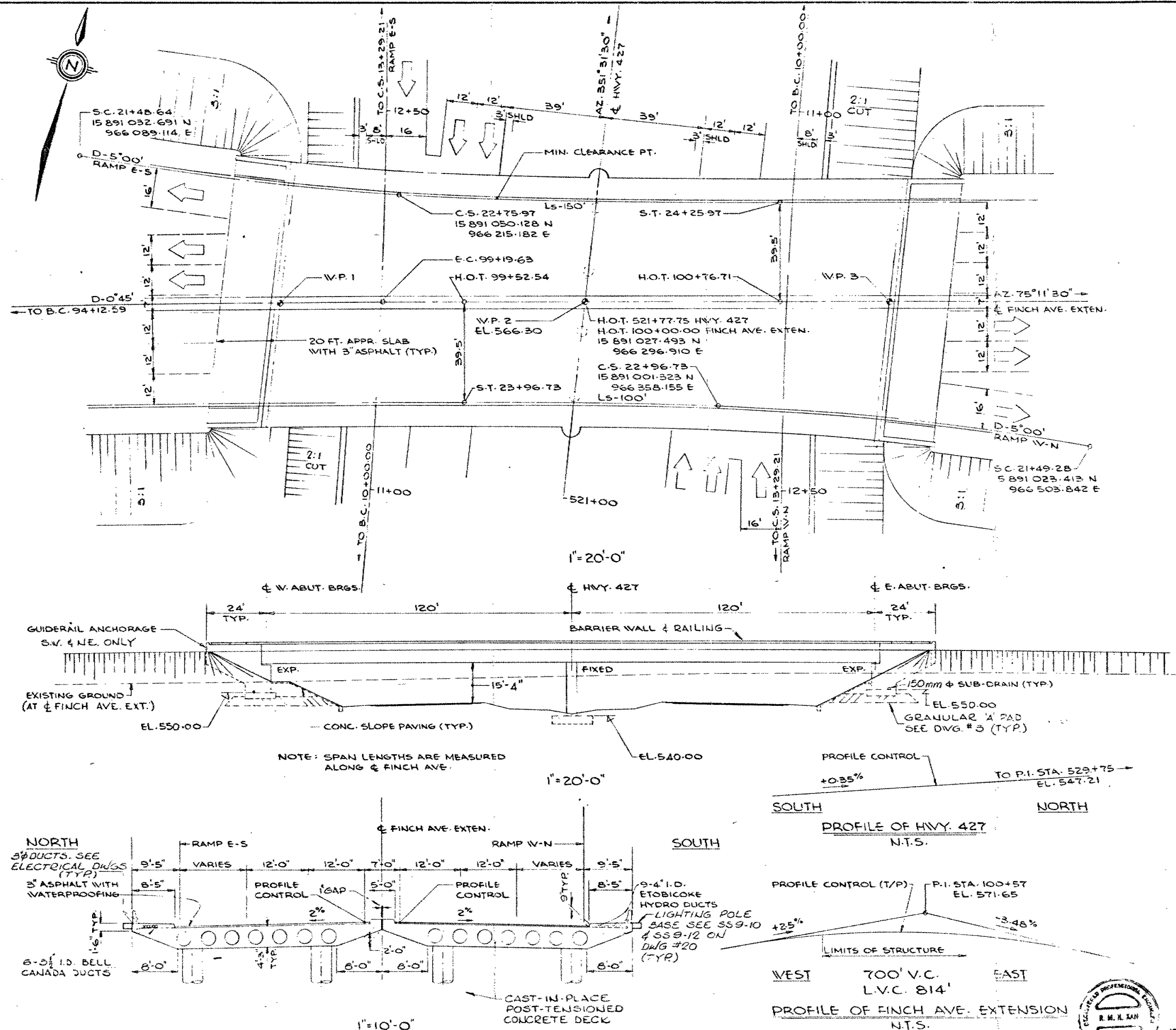
**LIST OF DRAWINGS**

- 1 GENERAL ARRANGEMENT I
- 2 20 FT. APPROACH SLAB
- 3 DETAILS OF CONC. SLOPE PAVING
- 4 GENERAL ARRANGEMENT II
- 5 20 FT. APPROACH SLAB
- 6 GENERAL ARRANGEMENT III

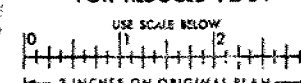
**CONCRETE QUANTITIES**

CONCRETE QUANTITIES ARE LISTED BELOW FOR THE APPROPRIATE CONCRETE LUMP SUM TENDER ITEMS:

SITE 37-1084 { APP. SLABS - 134 cu. yds.  
CONC. SLOPE PAVING - 97 cu. yds.  
SITE 37-633A - APP. SLABS - 79 cu. yds.

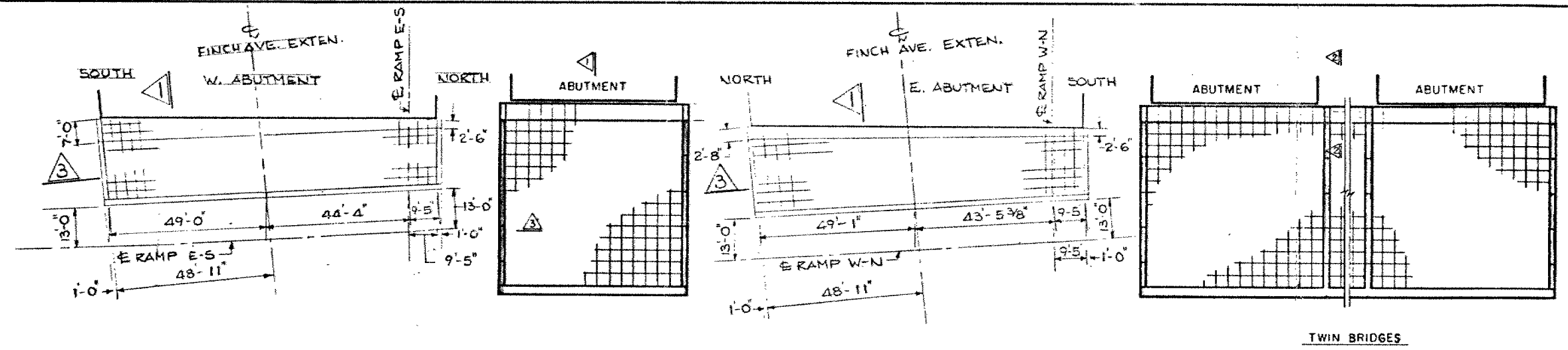


FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			
6			
7			
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10			

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS ONTARIO DS-BK-15

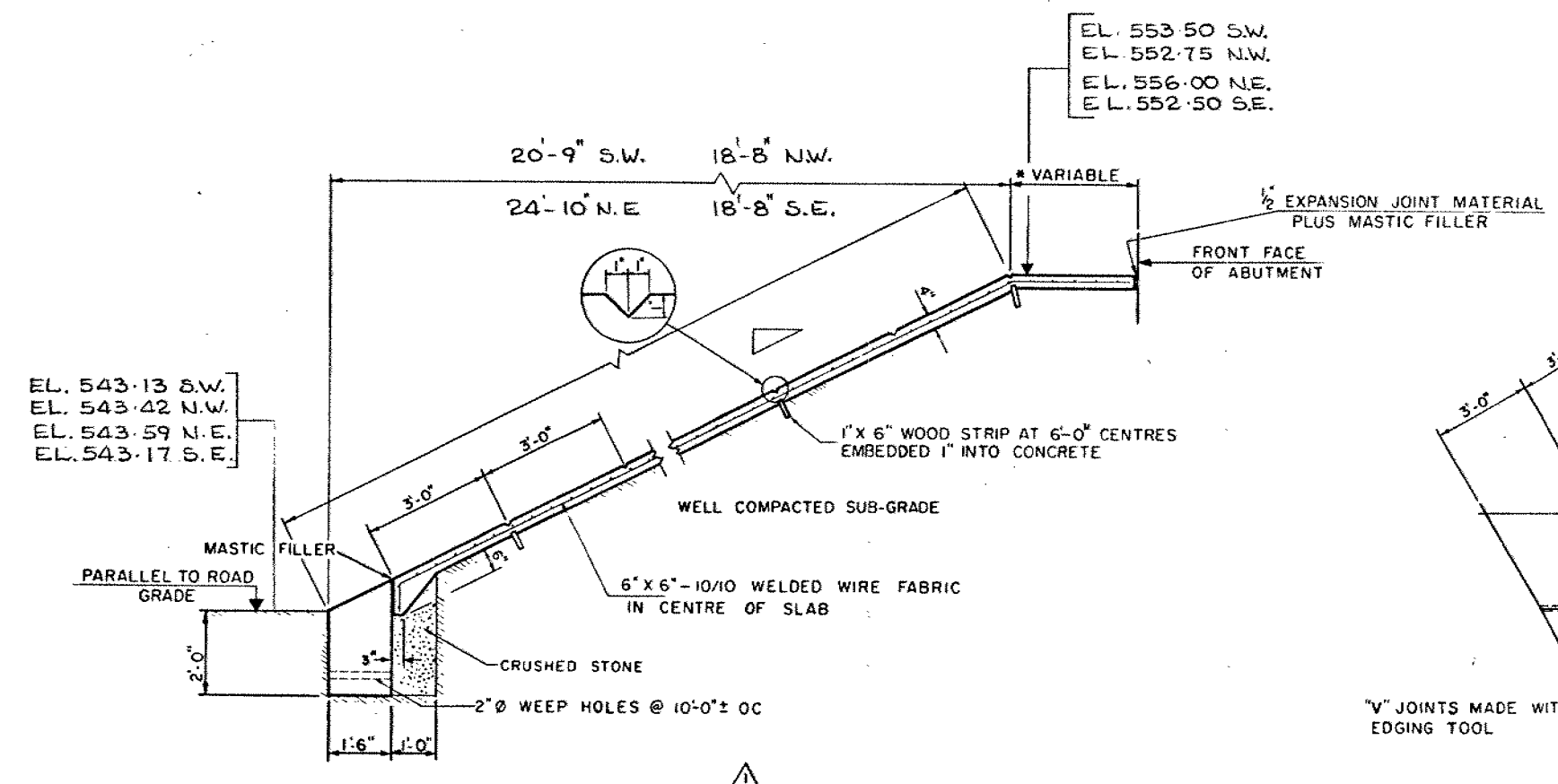


SLOPE PAVING LAYOUTS

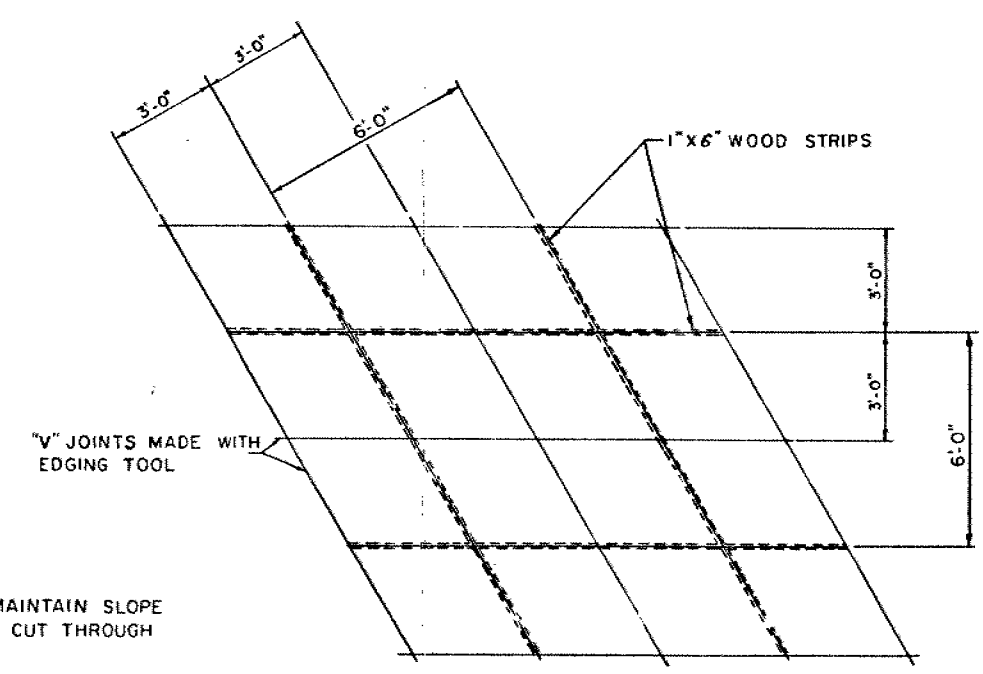
CONT No  
WP No 49-71-01

RD. 427  
REDALE BLVD. TO HUMBER RIVER  
DETAILS OF CONC SLOPE PAVING

SHEET

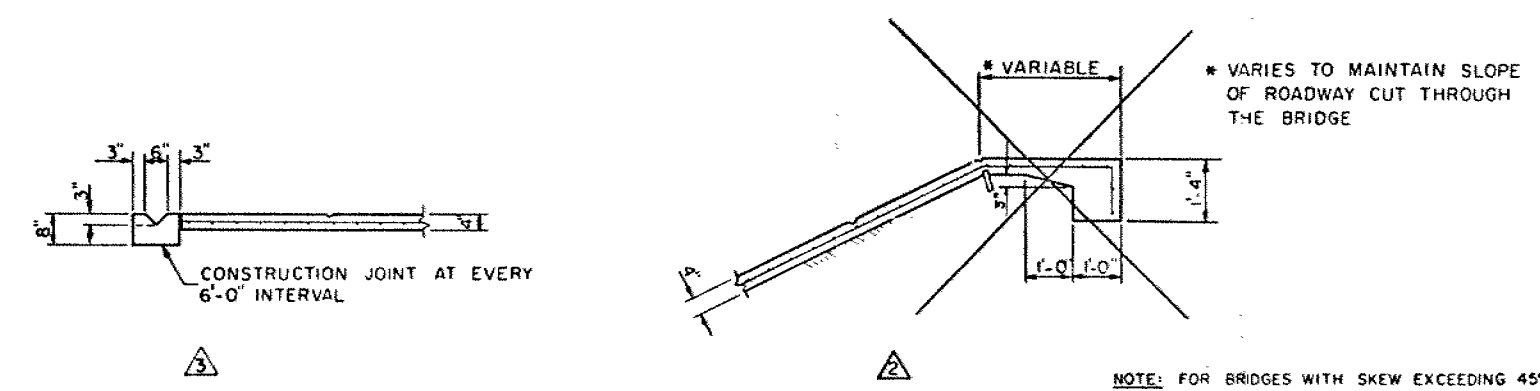


- NOTES
- CLASS OF CONCRETE 20 MPa - INSITU.
  - THE GROOVES SHALL BE PARALLEL TO THE ROAD GRADE IN ONE DIRECTION AND PARALLEL TO THE SKEW IN THE OTHER DIRECTION



WOOD FRAME AND "V" JOINT LAYOUT

NOTE  
SECTIONS AND DETAILS  
TYPICAL FOR ALL LAYOUTS



NOTE: FOR BRIDGES WITH SKEW EXCEEDING 45°  
"V" GROOVES SHALL BE PROVIDED AT 6' O C  
OVER WOOD FRAME STRIPS ONLY

STANDARD DRAWING MAY 1977		SS 116 - 10	
REVISIONS	DATE	BY	DESCRIPTION
DESIGN		CHECK	LOADING
DRAWING		CHECK	SITE No
			DATE
			DWG



Ontario

Ministry of  
Transportation and  
Communications

Structural Section,  
Central Region,  
3501 Dufferin Street,  
Downsview, Ontario.  
M3K 1N6  
Telephone: 248-3097

March 28, 1979

Mr. E.N. Mroz, P. Eng.,  
Proctor & Redfern Limited,  
75 Eglinton Avenue East,  
Toronto, Ontario.

Dear Sir:

Re: Hwy. 427, Rexdale Blvd. to North of Humber River  
W.P. 49-71-01 District 6, Toronto

The following preliminary structural foundation information is provided for your use in the design of the above project. Subsurface conditions are based in general on only one boring per area. General details of the structure recommendations are given below.

a) Morning Star Drive U'Pass

No preliminary foundation investigation was carried out at this site, but it may be assumed that steel H-Piles will be required for the abutment foundations and spread footings for the centre pier. This is based on requirements at the Rexdale Blvd. structure to the south.

b) Finch Avenue U'Pass - Site A 28

Preliminary borehole (BH 2) was advanced at this area. Recommendations are given in the attached foundation Data Sheet which shows the preferential order for the abutment and pier foundations.

These recommendations as  
per our report and previous MM  
verbal discussions with  
K. Pilgrim. MM 79 03 30

Files

WP 88-78-00



..... 2

c) Finch Ave. Crossing of Humber River - Site A 29

Preliminary borehole (BH 3) was advanced at this area and recommendations are given on the attached foundation Data Sheet with preferential order shown.

d) Hwy. 427, Crossing of Humber River (including ramps) Site A 27

Borehole BH 23 at the existing dam was used to determine recommendations shown on the foundation Data Sheet.

Compacted Granular Pad - This option is for abutments only where subsurface conditions are competent. This option is not recommended for water crossings. The minimum requirements of a compacted granular pad are shown on Figure 1 in the Appendix. Furthermore, the footing for this scheme could be designed using a maximum allowable load of 3.0 t.s.f.

Spread Footings - This option is given for abutments and piers where subsurface conditions are competent. The maximum elevation and corresponding maximum design load is given. It is to be noted the spread footings should be provided with a maximum of 4 feet of earth cover for frost protection purposes. In addition, where the spread footing is to be founded on a cohesive deposit, subject to softening upon exposure, it would be necessary to protect the base of the footing from softening by placing 3 inches of mass concrete upon completion of the footing excavation.

End Bearing Piles - This founding scheme is recommended for abutments and piers where appropriate. The recommendation gives the estimated pile tip elevation. Generally, the end bearing piles can be designed for the maximum allowable structural capacity which is dependent on the pile section chosen. For example, the maximum allowable load for a 12BP74 steel 'H' pile would be 110 tons per pile. It is generally assumed steel 'H' piles will be used, however, if a certain pile section is not suitable at the specific area this fact is mentioned in the data sheet. Pile driving would be field controlled by the Hiley Formula unless it is being driven to the bedrock surface or in clayey subsoil.

Recommendation - Approaches

The recommendations for fill slopes, cut slopes and berm requirements, are based on the proposed preliminary grades assuming fills are constructed of acceptable earth borrow according to current M.T.C. Specifications. Any changes in profile grade would require a reassessment of these recommendations.



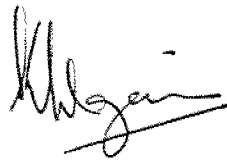
Remarks

In this column are discussed actual creek/river flood plain and bed conditions, geotechnical preference of schemes if appropriate, and other options or considerations to be evaluated during this stage of design.

The above recommendations are excerpts from a preliminary foundation Investigation and Design Report, which was prepared mainly for the proposed highway 407 Structures.

The fieldwork for that investigation was carried out under the supervision of Mr. M. MacLean, Project Engineer, M.T.C. Soil Mechanics Section.

Please do not hesitate to contact this office if any further information is required.



KP:lc  
Attach.

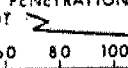
K. Pilgrim,  
Senior Structural Engineer,  
for:  
G.C.E. Burkhardt,  
Head, Structural Section.

cc: M. MacLean ✓  
P. Penev



## RECORD OF BOREHOLE No 2

W P 88-78-00 LOCATION Hwy. 427 & Finch Avenue ORIGINATED BY MM  
DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 16, 1978 CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH					WATER CONTENT (%)				
								○ UNCONFINED    + FIELD VANE ● QUICK TRIAXIAL    x LAB VANE				20    40    60					
555.0	Ground Surface																
0.0	Clayey Silt Trace Sand Hard		1	SS	32		550										
547.9			2	SS	22												
8.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Glacial Till  Hard		3	SS	73		540									23 27 40 10	
			4	SS	111												
			5	SS	68												7 22 58 13
			6	SS	50/	5"											
			7	SS	112												
529.4							530										
26.5	End of Borehole  Note: Groundwater Not Encountered																

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A28 LOCATION Hwy. 427 at Finch Avenue  
ORIGINAL GROUND ELEV. 553-555 PROPOSED HWY. 427 GRADE ELEV. 544+  
Proposed Finch Avenue Grade Elevation 567+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<p><u>Reference Boreholes</u>    2</p> <p>0-8' clayey silt, hard</p> <p>8-27'+ glacial till, hard</p>       <p><u>Groundwater</u></p> <p>Not encountered</p>	<p><u>Abutments</u></p> <ol style="list-style-type: none"> <li>1. Compacted granular pad</li> <li>2. Spread footings at or below elevation 547.0. Design for maximum allowable load of 5 t.s.f.</li> <li>3. End bearing piles. Estimated tip elevation 535.0. Designed for maximum allowable load per pile.</li> </ol> <p><u>Piers</u></p> <ol style="list-style-type: none"> <li>1. Spread footings as above.</li> </ol>	<p>Fill heights up to 13 ft. will be stable with forward and side slopes of 2:1.</p> <p>Roadway cuts up to 12 feet deep will be stable with slopes of 2:1.</p>	

# RECORD OF BOREHOLE No 3

W P 88-78-00 LOCATION Finch Ave. & West Humber ORIGINATED BY MM  
 Coords. N 15 891 330; E 967 445  
 DIST 6 HWY Finch Ave. BOREHOLE TYPE Hollow Stem Augers & BXL Rock Coring COMPILED BY MM  
 DATUM Geodetic DATE October 16, 1978 CHECKED BY MM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
519.7	Ground Surface																
0.0	Sandy Gravel		1	SS	5												
515.7	Loose		2	SS	48												
4.0	Glacial Till																
512.7	Hard		3	BXL RC	Rec= 60% RQD= 0%												
7.0	Bedrock, Layers of Limestone and Weathered Shale		4	BXL RC	Rec= 60% RQD= 0%												
505.7																	
14.0	End of Borehole																
	Note: Groundwater Not Established. Borehole Was Relatively Dry Upon Completion of Augering																

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A29 LOCATION Finch Avenue Over West Humber River  
 ORIGINAL GROUND ELEV. 515-555 PROPOSED HWY. \_\_\_\_\_ GRADE ELEV. 548-555  
 West Humber River High Water Level 515+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<p><u>Reference Boreholes</u> 3</p> <p><u>West of River</u></p> <p>0-4' sandy gravel, loose</p> <p>4-7' glacial till, hard</p> <p>7-14' + bedrock, poor quality, layers of limestone and weathered shale</p> <p><u>East of River</u> (in exposed bank)</p> <p>0-10' + clayey silt very stiff</p> <p>10' + glacial till, hard</p> <p><u>Groundwater</u></p> <p>Boring was relatively dry upon completion of augering. Groundwater level was not established.</p>	<p>Because of the numerous possibilities of abutment pier locations and foundation elevations the following founding options are provided.</p> <p><u>Abutments and Piers</u></p> <ol style="list-style-type: none"> <li>1. Spread footings founded on bedrock at or below elevation 512.0. Design for maximum allowable load of 7 t.s.f.</li> <li>2. End bearing piles driven to bedrock. Estimated tip elevation 512.0. Designed for maximum allowable load per pile.</li> </ol>	<p>Fill heights up to 35 ft. will be stable with forward and side slopes of 2:1.</p> <p>It will be necessary to key the roadway fill into the flood plains' steep banks. Cutting back the east bank slope to a stable 2:1 would be required for a distance of some 150 feet north and south of the roadway. In addition, protective measures against erosion of the roadway fill and east bank will be required. Furthermore, it will be advantageous to permanently divert the river 100 to 500 feet to the west.</p>	<p>At this location during the field investigation the depth of water was 1-2'. Boulders and cobbles are strewn in creek bed.</p>



HIGHWAY ENGINEERING DIVISION-ENGINEERING MATERIALS OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 23

(This data obtained from  
Metropolitan Toronto and Region  
Conservation Authority)

W P 88-78-00

LOCATION

East Side of Clairville Dam  
Coords. N 15 89 0 220; E 965 600

ORIGINATED BY Geocon

DIST 6 HWY 427

BOREHOLE TYPE N/A

COMPILED BY MM

DATUM Geodetic

DATE N/A

CHECKED BY *W.J.*

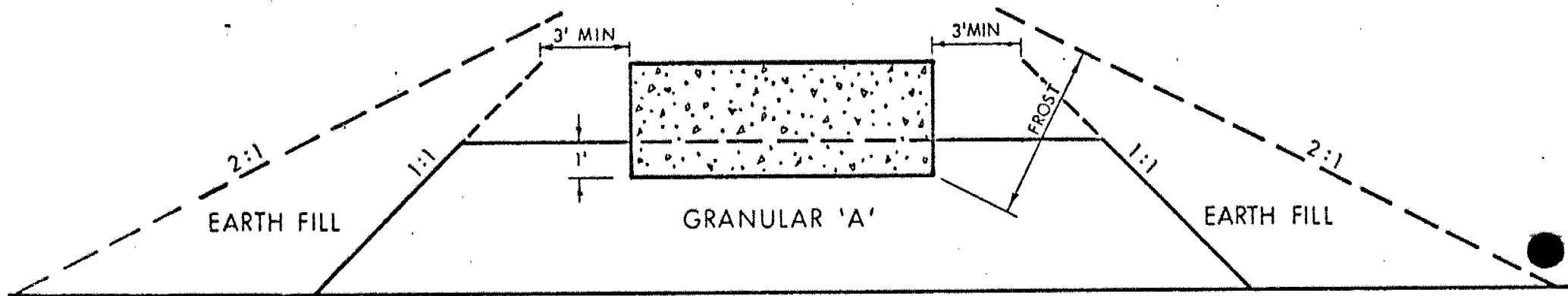
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH					
542.0	Ground Surface													
0.0	Topsoil													
1.0	Heterogeneous Mixture Silt, Sand and Gravel Grey to Brown (Glacial Till) Compact to Very Dense						540							
							530							
							520							
							510							
504.0														
38.0	Soft Grey Interbedded Shale and Limestone													
500.0	Bedrock						500							
42.0	End of Borehole													

# FOUNDATION DATA SHEET

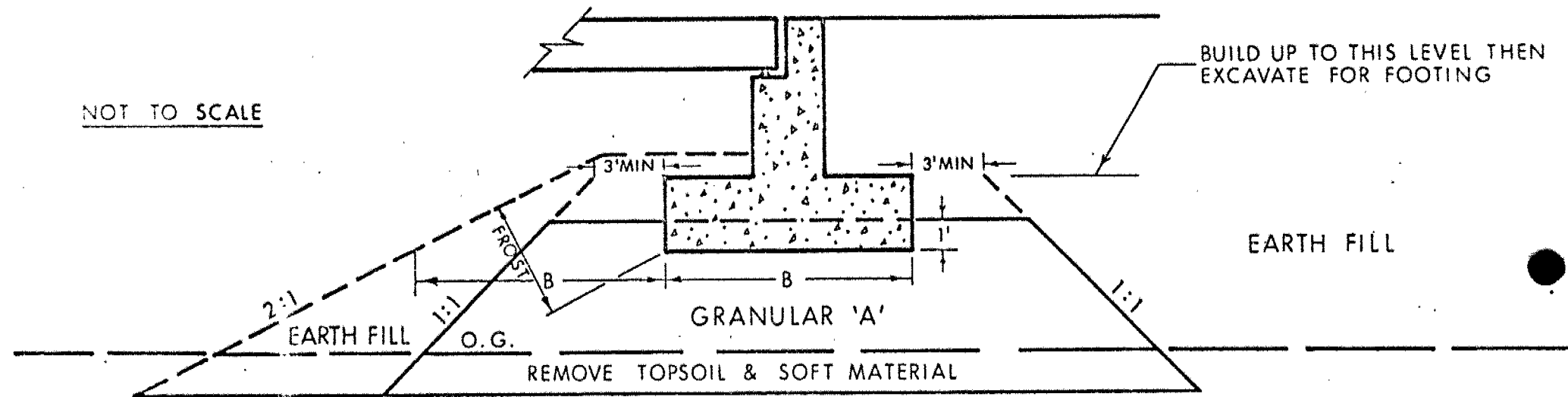
W.P. 88-78-00 SITE A27 LOCATION Hwy. 427 Over West Humber River  
ORIGINAL GROUND ELEV. 525-555 PROPOSED HWY. 427 GRADE ELEV. 546-557  
West Humber River High Water Level 525+

[illegible]

# ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



X SECTION



LONGITUDINAL SECTION

## NOTES:

- 1-REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' & EARTH FILL.
- 2-PLACE GRANULAR 'A' & EARTH FILL TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.
- 3-EXCAVATE COMPACTED GRANULAR 'A' & EARTH FILL FOR FOOTING.



# EXPLANATION OF TERMS USED IN REPORT

'N' VALUE: AN INDICATOR OF SUBSOIL QUALITY. IT IS OBTAINED FROM THE STANDARD PENETRATION TEST (CSA STD. A119.1). SPT 'N' VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 2 INCH O.D. SPLIT-BARREL SAMPLER TO PENETRATE 12 INCHES INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WEIGHING 140 POUNDS, FALLING FREELY A DISTANCE OF 30 INCHES. FOR PENETRATIONS OF LESS THAN 12 INCHES 'N' VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. 'N' VALUES CORRECTED FOR OVERBURDEN PRESSURE ARE DENOTED THUS  $N_c$ .

DYNAMIC CONE PENETRATION TEST (CSA STD. A119.3): CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (2" O.D. 60 CONE ANGLE) DRIVEN BY 150 FT-LB IMPACTS ON 1/2" SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 12 INCH ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOIL QUALITY: SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSITY.

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

$S_u$ (PSF)	0 - 250	250 - 500	500 - 1000	1000 - 2000	2000 - 4000	> 4000
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

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

'N' (BLOW/FT)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCK QUALITY: 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 DRILLED IN THAT CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE NATURALLY FRACTURED CORE PIECES, 4" IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

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

JOINTING AND BEDDING:

SPACING	2"	2" - 12"	1' - 3'	3' - 10'	> 10'
JOINTING	VERY CLOSE	CLOSE	MED. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

## ABBREVIATIONS & SYMBOLS

### LABORATORY TESTING

TRIAxIAL TESTS ARE DESCRIBED IN TERMS OF WHETHER THEY ARE CONSOLIDATED (C) OR NOT (U) ISOTROPICALLY (I) OR NOT (A) AND SHEARED DRAINED (D) OR UNDRAINED (U) WITH PORE PRESSURE MEASUREMENTS (BAR OVER SYMBOLS) EG. CIU = CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENT UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

### FIELD SAMPLING

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

### EARTH PRESSURE TERMS

$\mu$  COEFFICIENT OF FRICTION  
 $\delta$  ANGLE OF WALL FRICTION  
 $k_o$  COEFFICIENT OF EARTH PRESSURE AT REST  
 $k_A$  COEFFICIENT OF ACTIVE EARTH PRESSURE  
 $k_P$  COEFFICIENT OF PASSIVE EARTH PRESSURE  
 $i$  ANGLE OF INCLINATION OF SURCHARGE  
 $w$  SLOPE ANGLE-BACKFACE OF WALL  
 $\beta$  ANGLE OF SLOPE  
 $N, N_q, N_c$  BEARING CAPACITY FACTORS  
 $D_f$  DEPTH OF FOOTING  
 $B, L$  FOOTING DIMENSIONS

### INDEX PROPERTIES

$\gamma$  UNIT WEIGHT OF SOIL (BULK DENSITY)  
 $\gamma_w$  UNIT WEIGHT OF WATER  
 $\gamma_d$  UNIT DRY WEIGHT OF SOIL (DRY DENSITY)  
 $\gamma'$  UNIT WEIGHT OF SUBMERGED SOIL  
 $G_s$  SPECIFIC GRAVITY OF SOLIDS  
 $e$  VOIDS RATIO  
 $e_o$  INITIAL VOIDS RATIO  
 $e_{max}$   $e$  IN LOOSEST STATE  
 $e_{min}$   $e$  IN DENSEST STATE  
 $D_r$  RELATIVE DENSITY =  $\frac{e_{max} - e}{e_{max} - e_{min}}$   
 $n$  POROSITY  
 $w$  WATER CONTENT  
 $w_L$  LIQUID LIMIT  
 $w_P$  PLASTIC LIMIT  
 $w_S$  SHRINKAGE LIMIT  
 $I_p$  PLASTICITY INDEX =  $w_L - w_P$   
 $I_L$  LIQUIDITY INDEX =  $\frac{w - w_P}{w_L - w_P}$   
 $I_c$  CONSISTENCY INDEX =  $\frac{w_L - w}{w_L - w_P}$   
 $A_c$  ACTIVITY =  $\frac{I_p}{w_L - w_P}$   
 $O_m$  ORGANIC MATTER CONTENT

### STRENGTH PARAMETERS

$\phi$  ANGLE OF SHEARING RESISTANCE  
 $\tau_f$  PEAK SHEAR STRENGTH  
 $\tau_R$  RESIDUAL SHEAR STRENGTH  
 $c$  COHESION INTERCEPT  
 $\sigma_1, \sigma_2, \sigma_3$  NORMAL PRINCIPAL STRESSES  
 $u$  PORE WATER PRESSURE  
 $u_e$  EXCESS  $u$   
 $q_u$  PORE PRESSURE RATIO  
 $q_u$  UNCONFINED COMPRESSIVE STRENGTH  
 $s_u$  UNDRAINED SHEAR STRENGTH  
 $\epsilon$  LINEAR STRAIN  
 $\gamma$  SHEAR STRAIN  
 $\nu$  POISSON'S RATIO  
 $E$  MODULUS OF ELASTICITY  
 $G$  MODULUS OF SHEAR DEFORMATION  
 $k_s$  MODULUS OF SUBGRADE REACTION  
 $m, n$  STABILITY COEFFICIENTS  
 $A, B$  PORE PRESSURE COEFFICIENTS

### HYDRAULIC TERMS

$h$  HYDRAULIC HEAD OR POTENTIAL  
 $q$  RATE OF DISCHARGE  
 $v$  VELOCITY OF FLOW  
 $i$  HYDRAULIC GRADIENT  
 $j$  SEEPAGE FORCE PER UNIT VOLUME  
 $\eta$  COEFFICIENT OF VISCOSITY  
 $k$  COEFFICIENT OF HYDRAULIC CONDUCTIVITY  
 $k_h$   $k$  IN HORIZONTAL DIRECTION  
 $k_v$   $k$  IN VERTICAL DIRECTION  
 $\alpha_v$  COEFFICIENT OF VOLUME CHANGE  
 $c_v$  COEFFICIENT OF CONSOLIDATION  
 $C_c$  COMPRESSION INDEX  
 $C_r$  RECOMPRESSION INDEX  
 $d$  DRAINAGE PATH DISTANCE  
 $T_v$  TIME FACTOR  
 $U$  DEGREE OF CONSOLIDATION

NOTE: EFFECTIVE STRESS PARAMETERS ARE DENOTED BY USE OF APOSTROPHE ABOVE THE SYMBOLS



## Memorandum

To: Mr. G.C.E. Burkhardt  
Head, Structural Section  
Central Region  
3501 Dufferin St., Downsview

From: Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building

Attention:  
Mr. K. Pilgrim

Date: 78 11 06

Our File Ref.

In Reply to

Subject: Re: Feasibility Study, Hwy. 407 From Airport Road  
to Jane Street, W.P. 88-78-00  
Hwy. 427 from Finch Avenue to Hwy. 406, W.P. 49-71-00 ✓

### Introduction

Further to your request of September 11, 1978 we have completed the foundation investigation fieldwork for the above mentioned project. As per your verbal request of September 8, 1978 we are hereby providing you with our preliminary assessment of the subsoil conditions, general recommendations on structure foundations and the stability of embankments and a preliminary assessment of problem areas.

### Fieldwork

The fieldwork was carried out during the period from October 3 to November 1, 1978 and consisted of a total of 18 sampled boreholes advanced by means of either solid stem augers or hollow stem augers to depths of 14 to 135 feet below ground surface. Bedrock was encountered in one boring (within the floodplain of the West Humber River at the proposed Finch Ave. crossing) at a depth of 7 feet and was proven by obtaining 7 feet of BXL size rock core.

In addition to our fieldwork we have assembled a number of boring records located within the study area that have been previously carried out by ourselves and other agencies. This data enabled us to reduce significantly the necessary fieldwork and we will incorporate portions of the data in our report.

### Subsurface Conditions

The study area for this portion of Hwy. 407-Hwy. 427-Hwy. 400 is wholly located within the physiographic region known as the "Peel Plain". This area is found to be at elevation 500 to 750 feet above sea level and has a gradual slope toward Lake Ontario. Across the plain, rivers and streams have cut deep valleys and there is, therefore, no large undrained depressions, swamp or bogs in the whole area. The plain is furthermore characterized by an underlying till or boulder clay. In much of the Peel Plain this has been modified by a veneer of clay which when deep enough is clearly seen to be varved.

The fieldwork revealed that across the study area generally favourable conditions exist for structure and embankment foundations. Generally, the dominant subsurface deposit extending from the ground surface to a depth of up to 105 feet is a heterogeneous mixture of clayey silt, sand and gravel, a glacial till. The consistency is very stiff ('N' values 18 to 58 blows per foot) in the upper 10 feet and becoming very hard ('N' values greater than 100 blows per foot) at depths ranging from 15 to 100 feet being generally in the order of 40 feet below the ground surface. In some locations a 14 to 25 foot thick deposit of very dense silty sand was encountered within the glacial till deposit. Exceptions to the above occur adjacent to the major water courses in the study area. At Mimico Creek, Plunketts Creek, the west side of Humber River (Main Branch) and at the West Humber River, subsurface conditions consist of generally a surficial deposit of stiff to very stiff clayey silt up to 20 feet thick overlying loose to dense deposits of silt, silty sand and sand overlying a very hard glacial till ('N' values greater than 100 blows per foot). The glacial till was encountered at depths ranging from 25 to 35 feet below the ground surface. Adjacent to Blacks Creek subsurface conditions consist of a surficial deposit 18 feet thick of very stiff glacial till overlying up to 115 feet of very stiff to hard varved silty clay overlying hard glacial till. Because of property problems it was not possible to place a boring on the east side of the Humber River (Main Branch) at Islington Avenue. However, other borings carried out in this area indicate subsurface conditions consist of 20 feet of compact to dense sand and silt deposits overlying 60 feet of soft to stiff silty clay overlying a very hard glacial till.

Groundwater was encountered at depths of about 10 to 30 feet below the ground surface, except adjacent to waterways where the groundwater was at the approximate river water level.

#### Discussion and Recommendations

It is proposed to construct a new east-west highway, Hwy. 407, constructed to freeway design standards, to be located immediately south of existing Hwy. 7. This report is concerned with that section of Hwy. 407 between Airport Road and Jane Street including the section of Hwy. 400 from Langstaff southerly to Steeles Avenue and also the section of Hwy. 427 from Hwy. 407 to Finch Avenue. This portion of the project will require the crossing of 5 major waterways, some 10 interchanges including 2 major interchanges, and some 16 crossings of railways and minor roads; in all requiring some 50 odd structures. The recommended grade for Hwy. 407 will involve roadway cuts up to 35 feet deep and roadway fills up to 45 feet high.

cont'd.....

Subsurface conditions across the site are generally favourable for structure and embankment foundations.

In Table 1 attached we have listed the areas where it is proposed to construct structures. Beside each is indicated the suitability for various structure foundation possibilities as follows.

Compacted Granular 'A' Pad - For abutments only, where the maximum allowable bearing pressure is in the order of 3.5 tsf.

Spread Footings - For abutments or piers where the maximum allowable loading will be in excess of 2.5 to 3.0 tsf.

Short End-Bearing Piles - For abutments or piers where the estimate pile tip elevation is 30 to 50 feet below the existing ground surface and the piles can be loaded to the maximum allowable load.

Long End-Bearing Piles - For abutments or piers where the estimated pile tip elevations is 80 to 140 feet below the existing ground surface and the piles can be loaded to the maximum allowable load.

Friction Piles - For abutments or piers where a competent end-bearing stratum is in the order of 80 feet deep and 45 foot #14 timber piles can be used at a loading of 30 tons/pile.

Embankments can be constructed using 2:1 cut slopes in the majority of areas. Where berms in the fill or cut slope may be required for stability purposes this is noted beside the appropriate area.

There are two areas where additional comment is thought necessary at this time. One area is the Hwy. 407-Islington Avenue location and vicinity. Here subsoil conditions consist of up to 20 feet of compact to dense sand and silt deposits overlying up to 60 feet of soft to stiff silty clay overlying hard glacial till. The proposed grade at this location will require a 35 foot cut. It is anticipated that berms will be required for stability purposes at this location. The second area is the Hwy. 407-Weston Road area and vicinity. Here the profile grade also requires a 35 foot cut. Subsoil conditions here consist of up to 42 feet of hard glacial till with a water bearing silty sand deposit 15 to 20 feet below ground surface. Slope protection measures will be required at this location to control seepage from the water bearing stratum.

cont'd.....

It is to be noted that the recommendations contained herein are very general and for the purposes of the Structural Planning Office to proceed with their discussions. In the final feasibility report we will provide more detailed recommendations for the structure and embankment foundation.

If you have any questions please do not hesitate to contact this office.

*M MacLean*

M. MacLean  
Project Engineer

MM/gs

Attach.

cc: Files ✓

TABLE 1

Area Description		Structure Foundations				Berm Required	
		Compacted Granular Fill	Spread Footings	End Bearing Piles Short	Long		Friction Piles
A1	Hwy. 407 @ Airport Rd.	X	X				
A2	Hwy. 407 @ Brampton Terminal Spurline		X	X			
A3	Hwy. 407 @ Mimico Creek			X			
A4	Hwy. 407 @ Goreway Dr.	X		X			
A5	Hwy. 407 @ West Humber			X			
A6	Hwy. 407 @ Hwy. 50	X	X				
A7	Hwy. 407 @ Hwy. 427	X	X				
A8	Hwy. 427 @ Steeles Ave.	X	X				
A9	Hwy. 427 @ Albion Rd.	X	X				
A10	Hwy. 427 @ C.N.R.			X			
A11	Hwy. 407-Hwy. 427 Ramps East of Hwy. 427	X	X				
A12	Hwy. 407 @ Hwy. 27	X	X				
A13	Hwy. 407 @ Martingrove		X	X			
A14	Hwy. 407 @ Kipling			X			POSSIBLE
A15	Kipling @ C.N.R.			X			POSSIBLE
A16	Hwy. 407 @ Humber			X			
A17	Hwy. 407 @ C.P.R.				X		
A18	Hwy. 407 @ Islington				X		YES
A19	Hwy. 407 @ Pine Valley Dr.				X		

TABLE 1

		Structure Foundations				Berm Required	
		Compacted Granular Fill	Spread Footings	End Bearing Piles Short	Long		Friction Piles
Area	Description						
A20	Hwy. 407 @ Weston		X				POSSIBLE
A21	Hwy. 407 @ Hwy. 400	X	X				
A22	Hwy. 400-Hwy. 407 Ramps N. of Hwy. 407	X	X				
A23	Hwy. 400 @ Hwy. 7	X	X				
A24	Hwy. 407 @ Jane St.	X			X	X	
A25	Hwy. 400 @ C.N.R.	X	X				
A26	Hwy. 400 @ Langstaff				X	X	
A27	Hwy. 427 @ West Humber			X			
A28	Hwy. 427 @ Finch	X	X				
A29	Finch @ West Humber	X	X	X			

Legend

X denotes suitability for structure foundations according to the following.

Compacted Granular 'A' Pad: Abutments Only, Max. Allowable Load 3.5 tsf.

Spread Footings: Pier of Abutments Max. Allowable Load in Excess of 2.5 to 3.0 tsf.

Short End-Bearing Piles: Piers or Abutments Estimated Pile Tip Elev. 30-50' Below Ground Level  
Max. Allowable Load Per Pile

Long End-Bearing Piles: Piers of Abutments Estimated Pile Tip Elev. 80-140' Below Ground Level  
Max. Allowable Load Per Pile

Friction Piles: Piers or Abutments 45' Long #14 Timber Piles @ Load 30 tons/pile

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M12-136  
30M13-48

DIST. 6 REGION \_\_\_\_\_

W.P. No. 88-78-00

CONT. No. \_\_\_\_\_

W. O. No. \_\_\_\_\_

STR. SITE No. \_\_\_\_\_

HWY. No. 407

LOCATION Hwy 407

(FROM Airport Rd To JANE ST)

No. of PAGES - \_\_\_\_\_

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. \_\_\_\_\_

REMARKS: \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_



ENGINEERING MATERIALS OFFICE  
SOIL MECHANICS SECTION

WP 88-78-00 DIST 6  
49-71-00

HWY 407 & 427 STR SITE N/A

Hwy. 407 From  
Airport Road to Jane Street  
Hwy. 427 From  
Finch Avenue to Hwy. 27

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GEOCRES 30M12-136  
30M13-48

DATE

# FOUNDATION INVESTIGATION REPORT

For

Feasibility Study  
of Hwy. 407 From Airport Road  
to Jane Street (Including Hwy. 400)  
W.P. 88-78-00  
and Hwy. 427 From Finch Avenue to Hwy. 27  
W.P. 49-71-00  
District 6, Toronto

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## INTRODUCTION

This report contains the results of a feasibility foundation investigation carried out for the above projects. The fieldwork was carried out from October 13 to November 1, 1978 and consisted of a total of 18 sampled boreholes advanced by means of either solid stem augers or hollow stem augers to depths of 14 to 135 feet below the ground surface. Bedrock was encountered in one boring at a depth of 7 feet and was proven by obtaining 7 feet of BXL size rock core. In addition to our fieldwork we have incorporated in this report 5 borings, B.H. 19 to B.H. 23, that were put down at various pertinent locations by other agencies.

## SITE DESCRIPTION AND GEOLOGY

The area under consideration is located immediately north of the city limits of Metropolitan Toronto within the Regional Municipalities of Peel and York. The area for this portion of Hwy. 407 investigated stretches between Airport Road and Jane Street and is located 500 to 2000 feet north of Steeles Avenue. Extending from Finch Avenue to Hwy. 7 between Indian Line and Hwy. 27, is the area of investigation for the feasibility of Hwy. 427. This investigation includes also the portion of Hwy. 400 which runs from the C.N.R. Halton Subdivision to Langstaff Road.

Topographically the overall area can be described as gently undulating, the exception being where creeks or rivers have cut valleys. Land use in the proposed highway right of ways consists

mainly of cultivated open fields; exceptions occur in the vicinities of the Thackeray Land Fill Site and within areas under the jurisdiction of Metropolitan Toronto and Region Conservation Authority.

Physiographically the study area is wholly located within the region known as the "Peel Plain". This area is found to be at elevation 500 to 750 feet above sea level and has a gradual slope toward Lake Ontario. Across the plain, rivers and streams have cut deep valleys and there is, therefore, no large undrained depressions, swamp or bogs in the whole area. The plain is furthermore characterized by an underlying till or boulder clay. In much of the Peel Plain this has been modified by a veneer of clay which, when deep enough, is clearly seen to be varved. Shown on Drawing No. 887800-A are the boundaries and descriptions of the surficial geology, based on the Quaternary Geology, Map 2272, for the Bolton Area.

#### SUBSURFACE CONDITIONS

Subsurface conditions across the study area are quite variable. Generally the dominant subsurface deposit extending from the ground surface to a depth of up to 105 feet is a heterogeneous mixture of clayey silt, sand and gravel, a glacial till. In some areas a 14 to 25 foot thick deposit of very dense silt and/or sand was encountered within the glacial till deposits.

Exceptions to the above were observed in the areas adjacent to the rivers and creeks.

At Mimico Creek, Plunketts Creek, the west side of Humber River (Main Branch) and at the West Humber River, subsurface conditions consist generally of a surficial deposit of stiff to very stiff clayey silt up to 20 feet thick overlying loose to dense deposits of silt and/or sand followed by a hard glacial till. The glacial till was encountered at depths ranging from 25 to 35 feet below the ground surface in these areas.

Adjacent to Blacks Creek, subsurface conditions consist of a surficial deposit 18 feet thick of very stiff glacial till overlying up to 115 feet of very stiff to hard stratified cohesive deposits consisting of alternative layers of clayey silt to silty clay overlying hard glacial till.

On the east side of the Humber River (Main Branch) and adjacent to Islington Avenue, it was not possible to carry out borings because of property problems. However, subsurface data obtained by other agencies in this area reveal that the subsurface conditions consist of 20 feet of compact to dense sand and/or silt deposits overlying 60 feet of soft to stiff clay underlain by a hard glacial till.

Because of the complex variations in subsurface conditions no attempt is made to elaborate on detailed descriptions of the various subsoil types. For more detailed descriptions and subsoil/bedrock boundaries, refer to the individual Foundation Data Sheets and the appropriate Borehole Log Sheets. In addition, reference can be made to Drawings No. 887800-B and C on which borehole data is plotted on the  $\phi$  profile.

#### Groundwater Conditions

Groundwater observations were carried out during the field investigation by measuring in the open boreholes. Groundwater was observed at depths of 10 to 30 feet below the ground surface, except adjacent to waterways where the groundwater was at the approximate river water level.

## DISCUSSION AND RECOMMENDATIONS

It is proposed to construct a new east-west expressway, Hwy. 407, to freeway design standards, to be located immediately south of existing Hwy. 7. This report is concerned with that section of Hwy. 407 between Airport Road and Jane Street including the section of existing Hwy. 400 from Langstaff southerly to Steeles Avenue and also the section of proposed Hwy. 427 from Langstaff Road to Finch Avenue. This portion of the project will require the crossing of 5 major waterways, some 10 interchanges including 2 major interchanges and some 16 crossings of railways and minor roads; in all requiring some 50 odd structures. The recommended grade for Hwy. 407 will involve cuts up to 35 feet deep and fills up to 45 feet high.

Our comments for the feasibility, design and construction of the various structures are given on the Foundation Data Sheets included in the Appendix. A data sheet is supplied for each of 31 areas; the area location is described on these sheets and is also shown on Drawing No. 887800-A. An explanation of information supplied on the data sheet is outlined below.

1. The site number given (i.e. A1, A2, etc.) is a numbering system developed for the purposes of the feasibility study only. The actual location is shown on Drawing No. 887800-A.
2. The original ground elevation range given is based on a small scale  $\varnothing$  profile and as such the accuracy is not great.
3. The proposed roadway-railway grades are based on a small scale  $\varnothing$  profile at the intersection of centrelines. The grade given is understood to be preferred by Planning and Design; the grade in brackets is an alternative "second choice" grade under consideration.
4. Subsurface conditions are described here very briefly and are based on generally not more than one boring per area. Consistencies and relative densities, where applicable, are given.

pile section is not suitable at the specific area this fact is mentioned in the data sheet. Pile driving would be field controlled by the Hiley Formula unless it is being driven to the bedrock surface or in clayey subsoil.

Friction Piles - This foundation is recommended for abutments and piers where it is considered to be suitable and economically competitive with an end bearing pile. The loading recommendations are given for a #14 timber pile of specified length. If a different type of friction pile is contemplated the maximum allowable load could be prorated by comparing the surface area of the pile in question and the timber pile.

6. Recommendation - Approaches

The recommendations for fill slopes, cut slopes and berm requirements, are based on the proposed preliminary grades assuming fills are constructed of acceptable earth borrow according to current M.T.C. Specifications. Any changes in profile grade would require a reassessment of these recommendations. Also discussed under this heading is special treatment, i.e. benching, etc., that is anticipated at this location.

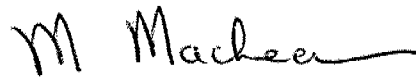
7. Remarks

In this column are discussed actual creek/river flood plain and bed conditions, geotechnical preference of schemes if appropriate, and other options or considerations to be evaluated during this stage of design.

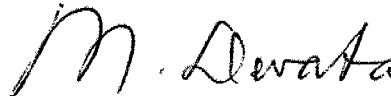
MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of Mr. M. MacLean, Project Engineer, using equipment rented from Master Soil Investigation Limited.

This report was written by Mr. M. MacLean and reviewed by  
Mr. M. Devata, Supervising Engineer

A handwritten signature in cursive script, appearing to read "M. MacLean".

M. MacLean, P. Eng.  
Project Engineer

A handwritten signature in cursive script, appearing to read "M. Devata".

M. Devata, P. Eng.  
Supervising Engineer

December, 1978

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A1 LOCATION Hwy. 407 at Airport Road

ORIGINAL GROUND ELEV. 594-597 PROPOSED HWY. 407 GRADE ELEV. 595+

Proposed Airport Road Grade Elevation 616+

[illegible]



# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A2 LOCATION Hwy. 407 at Bramport Terminal Spurline

ORIGINAL GROUND ELEV. 575-580 PROPOSED HWY. 407 GRADE ELEV. 580+ (630+)

Proposed Bramport terminal spurline grade elevation 601+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A3 LOCATION Hwy. 407 at Mimico Creek  
ORIGINAL GROUND ELEV. 560 to 575 PROPOSED HWY. 407 GRADE ELEV. 581+ (624+)  
Mimico Creek H.W.L. 573+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A4 LOCATION Hwy. 407 at Goreway Drive  
ORIGINAL GROUND ELEV. 572-576 PROPOSED HWY. GRADE ELEV. 586+  
Proposed Goreway Drive Grade Elevation 607+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A5 LOCATION Hwy. 407 at West Humber River  
 ORIGINAL GROUND ELEV. 555-565 PROPOSED HWY. 407 GRADE ELEV. 565-567  
 Claireville Lake H.W.L. 556+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 5  <u>West Bank</u>  0-5' clayey silt, stiff  5-18' glacial till stiff to hard  18-23' silt, some sand compact  23-30' sand, some silt some gravel very dense  <u>East Bank</u>  Exposed face is composed of very stiff glacial till   <u>Groundwater</u>  At 5 feet below ground surface	<u>Abutments and Piers</u>  End bearing piles Estimated tip elevation 505.0 Designed for maximum allowable structural capacity per pile	Fill heights up to 25 ft. will be stable with forward and side slopes of 2:1.  It will be necessary to key the approach fill into the flood plains' steep east bank.  Grading the east slope would be required for a distance of some 50 feet north and south of the highway.  In addition, protective measures against river erosion of the approach fills would be required.	West Humber at this location is 50 feet wide and flows within a floodplain 100-300 feet wide. The river bottom is expected to be comprised of firm clayey silt with trace organics. The floodplain west bank has a gentle slope, whereas the east bank slope is as steep as 75° and up to 30 feet high.

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A6 LOCATION Hwy. 407 at Hwy. 50  
 ORIGINAL GROUND ELEV. 578-583 PROPOSED HWY. 407 GRADE ELEV. 565+  
 Proposed Hwy. 50 Grade Elevation 585+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 11  0-13' glacial till very stiff to hard  13-23' glacial till very dense  23-34' sandy silt very dense  34-42'+ glacial till hard	<u>Abutments</u>  1. Compacted granular pad  2. Spread footing at or below elevation 575.0. Design for maximum allowable load of 3.5 tsf.  3. End bearing piles Estimated tip elevation 540.0 Designed for maximum allowable structural capacity per pile  <u>Piers</u>  1. Spread footings at or below elevation 565.0. Design for maximum allowable load of 5 t.s.f.	Fill heights up to 20 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 20 feet deep will be stable with slopes of 2:1.	
<u>Groundwater</u>  28' below ground Level			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A7 LOCATION Hwy. 407 at Hwy. 427  
ORIGINAL GROUND ELEV. 580-585 PROPOSED HWY. 407 GRADE ELEV. 569+(567+)  
Proposed Hwy. 427 Proposed Grade Elevation 597+ (Associated Ramps Grade 611 to 633)

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A8 LOCATION Hwy. 427 at Steeles Avenue  
ORIGINAL GROUND ELEV. 575-578 PROPOSED HWY. 427 GRADE ELEV. 599+ (Ramps P/G Approximate Elev. 620)  
Proposed Steeles Ave. Grade Elevation 578+.

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A9 LOCATION Hwy. 427 at Albion Road  
ORIGINAL GROUND ELEV. 565-568 PROPOSED HWY. 427 GRADE ELEV. 606+  
Proposed Albion Road Grade Elevation 568+

[illegible]



# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A10 LOCATION Hwy. 427 at C.N.R. Mactier Sub.

ORIGINAL GROUND ELEV. 565+ PROPOSED HWY. 427 GRADE ELEV. 595-597

Proposed CNR MacTier Sub. Grade Elevation 565+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE All LOCATION Hwy. 407-Hwy. 427 Ramps Immediately East of Hwy. 427  
 ORIGINAL GROUND ELEV. 570-575 PROPOSED HWY. 407 GRADE ELEV. 575+ (566+)  
 Proposed Ramp Grade Elevation 600+ (591+) [Assumed Ramp Grades]

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes 10</u>  0-11' glacial till hard  11-40' sandy silt some gravel, very dense  40-44' glacial till hard          <u>Groundwater</u>  At 23' below ground surface.	<u>Abutments</u>  1. Compacted granular pad  2. Spread footings at or below elevation 564.0 using maximum allowable load of 4 t.s.f.  <u>Piers</u>  1. Spread footings as discussed above.	Fill heights up to 30 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 9 feet deep will be stable with slopes of 2:1.	

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A12 LOCATION Hwy. 407 at Hwy. 27  
ORIGINAL GROUND ELEV. 560-565 PROPOSED HWY. 407 GRADE ELEV. 562+ (544+)  
Proposed Hwy. 27 Grade Elevation 584+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 12 0-27' + glacial till hard	<u>Abutments</u> 1. Compacted granular pad  2. Spread footings at or below elevation 559.0 using maximum allowable load 5 t.s.f.  <u>Piers</u> 1. Spread footings as discussed above.	Fill heights up to 24 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 11 feet will be stable with slopes of 2:1.	
<u>Groundwater</u>  Not encountered			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A13 LOCATION Hwy. 407 at Martingrove Road  
ORIGINAL GROUND ELEV. 560+ PROPOSED HWY. 407 GRADE ELEV. 539+ (544+)  
Proposed Martingrove Road Grade Elevation 565+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A14 LOCATION Hwy. 407 at Kipling Avenue  
ORIGINAL GROUND ELEV. 460-470 PROPOSED HWY. 407 GRADE ELEV. 498+ (496+)  
Proposed Kipling Avenue Grade Elevation 470+ Invert Elevation Plunketts Cree!  
448+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A15 LOCATION Kipling Ave. at C.N.R. Halton Sub.  
 ORIGINAL GROUND ELEV. 465-509 PROPOSED HWY. C.N.R. GRADE ELEV. 509+  
 Proposed Kipling Ave. Grade Elevation 436+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 7  0-9' sand, some silt some gravel loose to compact  9-14' glacial till, hard  14-25' sand, some silt compact to dense  25-37' + glacial till very dense   <u>Groundwater</u>  5' below ground surface	<u>Abutments and Piers</u>  End bearing Piles Estimated tip elevation 425.0 Designed for maximum allowable structural capacity of the pile.	Fill heights up to 35 ft. will be stable with forward and side slopes of 2:1.  Fill heights in excess of 35 feet would be in- herently unstable due to erosion of the slope surface. In view of this fill heights up to 44 feet would require a 10 foot wide 1/3 height berm to reduce future maintenance costs.   detoured railway embankment (78'). The slopes of the detoured railway embankment would require a 20' wide mid height berm for stability purposes.	In order to con- struct Kipling Ave. through the existing embankment three alternatives could be adopted.  A/ Tunnel Kipling Ave. through the existing C.N.R. embankment  B/ Underpin the C.N.R. track during con- struction of Kipling  C/ Detour the C.N.R. north during con- struction. Detouring north is preferred to detouring south because of the unfav- ourable subsoil con- ditions within the Thackeray Land Fill Site. Furthermore, the Plunkett Creek culvert would be required to be designed for the full surcharge of the

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A16 LOCATION Hwy. 407 at Humber River  
 ORIGINAL GROUND ELEV. 445-503 PROPOSED HWY. 407 GRADE ELEV. 476+  
 Humber River H.W.L. 457+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> <u>West Side B.H. 6</u> 0-11' sand to gravelly sand, loose to compact 11-24' clayey silt to silty clay, stiff to very stiff 24-34' silt of slight plasticity very stiff 34-52'+ glacial till, hard <u>East Side B.H. 20</u> Variable subsoil conditions 0-15' sandy silt, some gravel 15-35' clayey silt, stiff to very stiff 35-105' glacial till, dense 105-120'+ glacial till, hard <u>Groundwater</u> At 9' below ground surface	<u>Abutments and Piers</u> <u>West Side</u> 1. End bearing piles Estimated tip elevation 400.0 Design for maximum allowable structural capacity of the pile.. <u>East Side</u> 1. End bearing piles Estimated tip elevation 385.0 Design for maximum allowable structural capacity of the pile. 2. Friction piles #14 timber piles 45' long designed for maximum allowable load per pile of 30 tons.	<u>West Side</u> Fill heights up to 31 ft. will be stable with forward and side slopes of 2:1. Furthermore, on the west approach, consolidation of the underlying clayey silt will occur. Settlement of the 31' fill will be in the order of 3-4", 90% of which will occur within 6 months of completion of the embankment. In order to minimize post construction settlements preloading for 6 months may be required. <u>East Side</u> It is anticipated the east approach will be in a partial cut through very soft to stiff silty clay. Because of property problems it was not possible to gain access to the concerned area, obtain necessary samples and perform the required testing. Although specific data is lacking it is postulated that nominal berms 10' wide mid height may be required in the cut areas.	At this location river is 50' wide and 3' deep. The river banks are about 8 feet high and slopes about 75°.

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A17 LOCATION Hwy. 407 at C.P. R. Mactier Sub.  
 ORIGINAL GROUND ELEV. 480-503 PROPOSED HWY. 407 GRADE ELEV. 484<sup>+</sup>  
 Proposed C.P.R. Mactier Sub. Grade Elevation 503<sup>+</sup>

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u>  Because of property access problems it was not possible to carry out the necessary testing, and for feasibility purposes we have used data from the nearby CNR-Islington crossing.  <u>B.H. 21</u> 0-10' sand medium to coarse 10-16' sandy silt, compact 16-51' silty clay, very soft to stiff 51-82'+ stiff to very stiff glacial till   <u>Groundwater</u> Not established	<u>Abutments and Piers</u>  1. Friction Piles #14 timber piles 45' long Design load 25 tons per pile	Fill heights up to 23 ft. will be stable with forward and side slopes of 2:1.  It is anticipated that the approaches will be located in partial cuts through very soft to stiff silty clay. Although specific data is lacking it is postulated that nominal berms 10' wide mid height may be required.	



# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A18 LOCATION Hwy. 407 at Islington Avenue  
ORIGINAL GROUND ELEV. 520-525 PROPOSED HWY. 407 GRADE ELEV. 497+  
Proposed Islington Avenue Grade Elevation 525+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A19 LOCATION Hwy. 407 at Pine Valley Drive  
 ORIGINAL GROUND ELEV. 530-535 PROPOSED HWY. 407 GRADE ELEV. 537+  
 Proposed Pine Valley Drive Grade Elevation 556+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 14 0-5' silty sand, compact 5-11' glacial till very stiff 11-19' clayey silt, stiff 19-38' sandy silt to silty sand, some gravel loose to compact 38-55' glacial till, hard 55-74' silty sand dense to very dense 74'-92'+ glacial till, hard  <u>Groundwater</u> 25' below ground surface	<u>Abutments and Piers</u>  1. End bearing piles Driven to estimated tip elevation 445.0 Designed for maximum allowable structural capacity of the pile.	Fill heights up to 26 ft. will be stable with forward and side slopes of 2:1.	

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A20 LOCATION Hwy. 407 at Weston Road  
ORIGINAL GROUND ELEV. 630-635 PROPOSED HWY. 407 GRADE ELEV. 602+ (633+)  
Proposed Weston Road Grade Elevation 635+ (655+)

[illegible]

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A21 LOCATION Hwy. 407 at Hwy. 400  
ORIGINAL GROUND ELEV. 630-635 PROPOSED HWY. 407 GRADE ELEV. 615+ (660+)  
Proposed Hwy. 400 Grade Elevation 635+ (635+)

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 13 0-27'+ glacial till, very stiff to hard	<u>Abutments</u> 1. Compacted granular pad  2. Spread footings located at or below elevation 624.0. Designed for maximum allowable load of 5 t.s.f.  <u>Piers</u> 1. Spread footings as discussed above.	Fill heights up to 30 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 15 feet will be stable with slopes of 2:1.	
<u>Groundwater</u> 12' below ground surface			

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A23 LOCATION Hwy. 400 at Hwy. 7  
ORIGINAL GROUND ELEV. 647 - 630 PROPOSED HWY. 407 GRADE ELEV. 647+  
Proposed Hwy. 7 Grade Elevation 665+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 18  As discussed under A21	As discussed under A21	Fill heights up to 27 ft. will be stable with forward and side slopes of 2:1.	Existing structure founded on spread footings.
<u>Groundwater</u>			

# FOUNDATION DATA SHEET

W. P. 88-78-00 SITE A24 LOCATION Hwy. 407 at Jane Street

ORIGINAL GROUND ELEV. 650-665+ PROPOSED HWY. 407 GRADE ELEV. 645+

Proposed Jane Street Grade Elevation 665+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes 16</u>  0-18' glacial till very stiff  18-132' clayey silt stratified, very stiff to hard  132-135'+ silty sand very dense	<u>Abutments and Piers</u>  1. Friction Piles #14 timber piles 45' long designed for maximum allowable load per pile of 30 tons.  2. End bearing piles Driven to approximate tip elevation 515. Designed for maximum allowable structural capacity of the pile.	Fill heights up to 20 ft. will be stable with forward and side slopes of 2:1.  Earth cuts up to 5 feet will be stable with side slopes of 2:1.	
<u>Groundwater</u>  28' below ground level			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A25 LOCATION Hwy. 400 at C.N.R. Halton Sub.  
ORIGINAL GROUND ELEV. 611-639 PROPOSED HWY. 400 GRADE ELEV. 639±  
Proposed C.N.R. Halton Sub. Grade Elevation 611±

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 22 0-15' glacial till dense to very dense  15-21' sandy silt very dense  21-35' sand, dense to very dense  35-50' glacial till hard	<u>Abutments</u>  1. Compacted granular pad  2. Spread footings located at or below elevation 615. Designed for maximum allowable load of 3.5 t.s.f.  <u>Piers</u>  1. Spread footings as mentioned above.	Fill heights up to 28 ft. will be stable with forward and side slopes of 2:1.	Existing structure founded on spread footings.
<u>Groundwater</u>  19' below ground surface			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A26 LOCATION Hwy. 400 at Langstaff Road  
ORIGINAL GROUND ELEV. 680+ PROPOSED HWY. 400 GRADE ELEV. 680+  
Proposed Langstaff Road Grade Elevation 700+

[illegible]



# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A27 LOCATION Hwy. 427 Over West Humber River  
ORIGINAL GROUND ELEV. 525-555 PROPOSED HWY. 427 GRADE ELEV. 546-557  
West Humber River High Water Level 525+

[illegible]

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A28 LOCATION Hwy. 427 at Finch Avenue  
ORIGINAL GROUND ELEV. 553-555 PROPOSED HWY. 427 GRADE ELEV. 544+  
Proposed Finch Avenue Grade Elevation 567+.

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u> 2 0-8' clayey silt, hard 8-27'+ glacial till, hard	<u>Abutments</u> 1. Compacted granular pad 2. Spread footings at or below elevation 547.0. Design for maximum allowable load of 5 t.s.f. 3. End bearing piles. Estimated tip elevation 535.0. Designed for maximum allowable load per pile.  <u>Piers</u> 1. Spread footings as above.	Fill heights up to 13 ft. will be stable with forward and side slopes of 2:1.  Roadway cuts up to 12 feet deep will be stable with slopes of 2:1.	
<u>Groundwater</u> Not encountered			

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A29 LOCATION Finch Avenue Over West Humber River  
 ORIGINAL GROUND ELEV. 515-555 PROPOSED HWY. GRADE ELEV. 548-555  
 West Humber River High Water Level 515+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<p><u>Reference Boreholes</u> 3</p> <p><u>West of River</u></p> <p>0-4' sandy gravel, loose</p> <p>4-7' glacial till, hard</p> <p>7-14' + bedrock, poor quality, layers of limestone and weathered shale</p> <p><u>East of River</u> <u>(in exposed bank)</u></p> <p>0-10'+ clayey silt very stiff</p> <p>10'+ glacial till, hard</p> <p><u>Groundwater</u></p> <p>Boring was relatively dry upon completion of augering. Groundwater level was not established.</p>	<p>Because of the numerous possibilities of abutment pier locations and foundation elevations the following founding options are provided.</p> <p><u>Abutments and Piers</u></p> <ol style="list-style-type: none"> <li>1. Spread footings founded on bedrock at or below elevation 512.0. Design for maximum allowable load of 7 t.s.f.</li> <li>2. End bearing piles driven to bedrock. Estimated tip elevation 512.0. Designed for maximum allowable load per pile.</li> </ol>	<p>Fill heights up to 35 ft. will be stable with forward and side slopes of 2:1.</p> <p>It will be necessary to key the roadway fill into the flood plains' steep banks. Cutting back the east bank slope to a stable 2:1 would be required for a distance of some 150 feet north and south of the roadway. In addition, protective measures against erosion of the roadway fill and east bank will be required. Furthermore, it will be advantageous to permanently divert the river 100 to 500 feet to the west.</p>	<p>At this location during the field investigation the depth of water was 1-2'. Boulders and cobbles are strewn in creek bed.</p>

# FOUNDATION DATA SHEET

W.P. 88-78-00 SITE A30 LOCATION Hwy. 427 & Hwy. 7  
 ORIGINAL GROUND ELEV. 590-595 PROPOSED HWY. 407 GRADE ELEV. 590 + 6115+  
 Proposed Hwy. 7 Grade Elevation 614+ (593+)

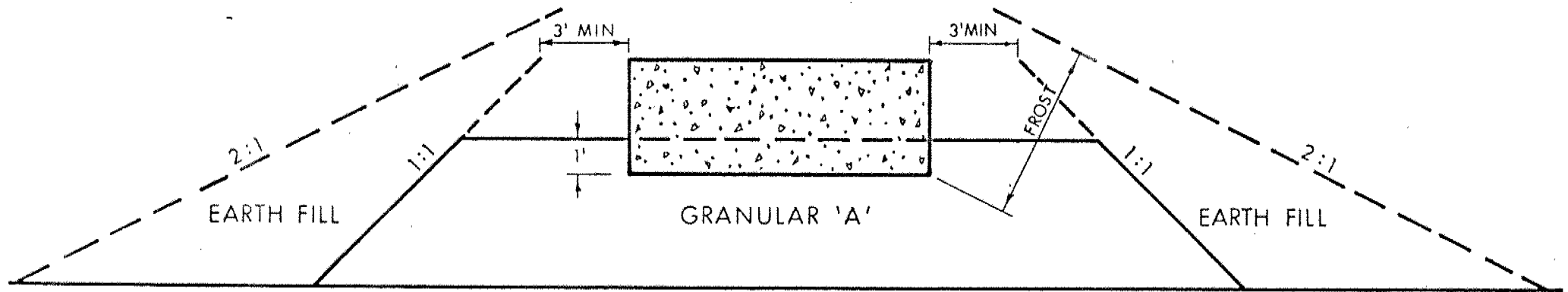
SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<u>Reference Boreholes</u>  The request for this area was received after completion of the fieldwork and specific data is lacking. However, based on available data it can be assumed the subsurface conditions here consist of about 50' of hard glacial till overlying bedrock.	<u>Abutments and Piers</u>  End bearing piles. Estimated pile tip elevation 525'. Designed for maximum allowable load per pile.	Fill heights up to 25 ft. will be stable with forward and side slopes of 2:1.	Geotechnical data is lacking to positively compare the underpass-overpass alternative. However, based on available data it is speculated that sub-soil conditions here are similarly competent for either an overpass or underpass scheme and the decision should be based on other considerations.
<u>Groundwater</u>			

# FOUNDATION DATA SHEET

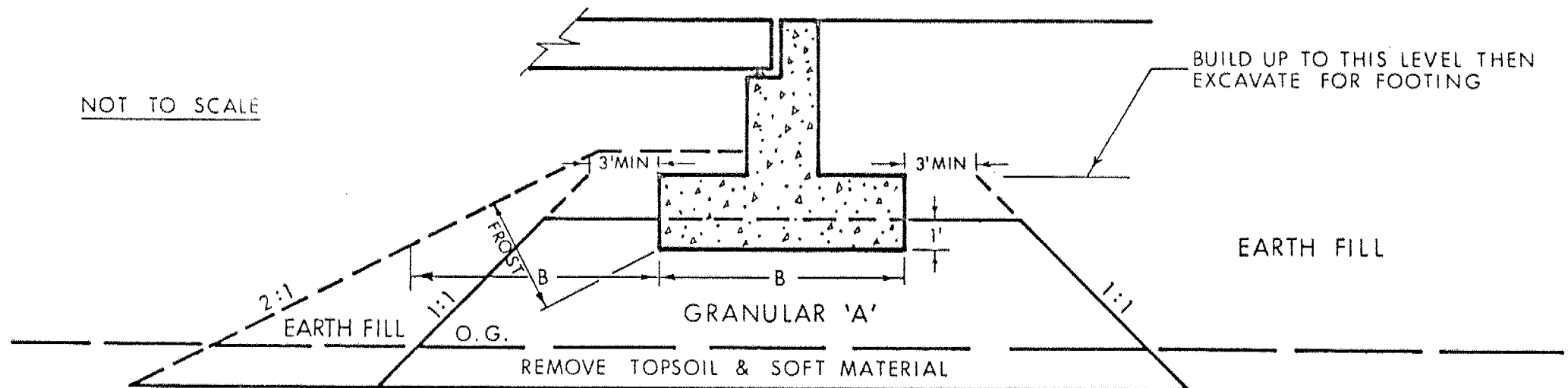
W.P. 88-78-00 SITE A31 LOCATION Hwy. 427 at Plunkett's Creek  
ORIGINAL GROUND ELEV. 570-600 PROPOSED HWY. 427 GRADE ELEV. 588+  
Plunkett's Creek W.L. 570+

SUBSURFACE CONDITIONS	RECOMMENDATIONS		REMARKS
	STRUCTURE	APPROACHES	
<p><u>Reference Boreholes</u></p> <p>The request for this area was received after completion of fieldwork and hence no specific data was obtained for the area. However, based on available data, it can be assumed the subsurface conditions here consist of about 80' of very stiff to hard glacial till overlying bedrock.</p> <p><u>Groundwater</u></p>	<p><u>Abutments and Piers</u></p> <p>End bearing piles. Estimated tip elevation 490.0. Designed for maximum allowable structural load per pile.</p>	<p>Fill heights up to 18 ft. will be stable with forward and side slopes of 2:1.</p> <p>Earth cuts up to 12 feet deep will be stable with side slopes of 2:1.</p>	

# ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



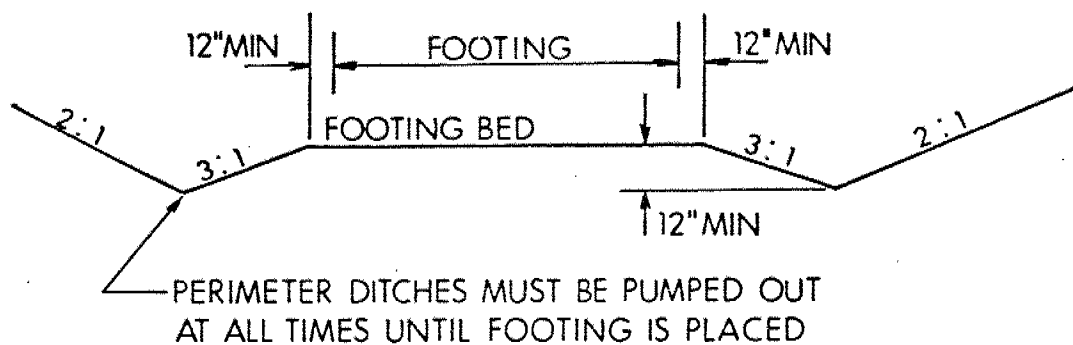
X SECTION



LONGITUDINAL SECTION

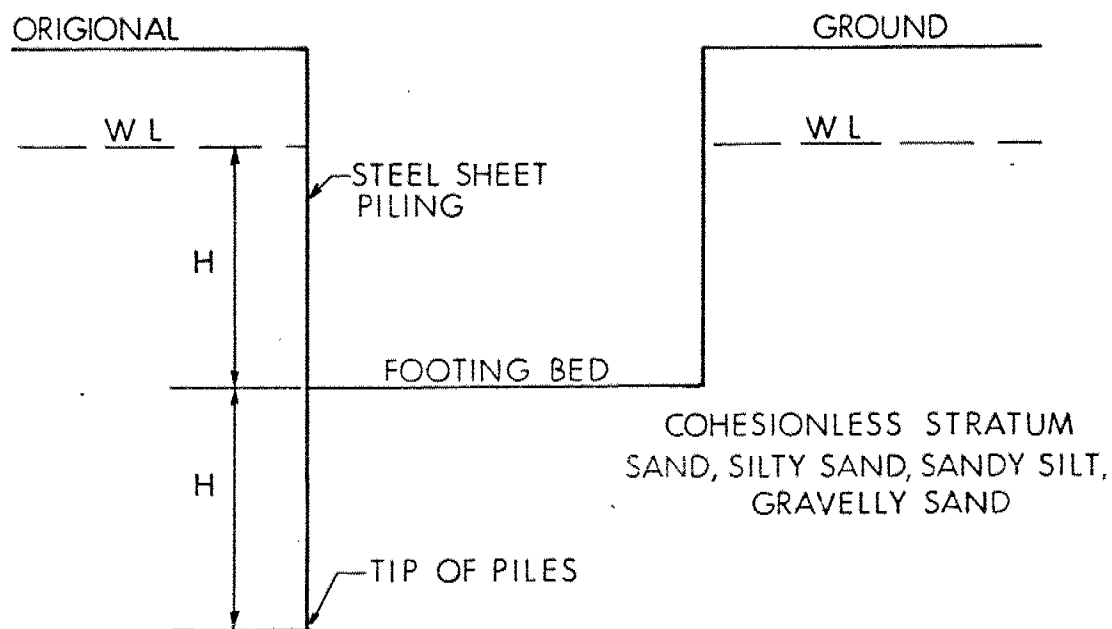
## NOTES:

- 1-REMOVE TOPSOIL &/OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' & EARTH FILL.
- 2-PLACE GRANULAR 'A' & EARTH FILL TO TOP OF FOOTING LEVEL, COMPACTED ACCORDING TO CURRENT M.T.C. STANDARDS.
- 3-EXCAVATE COMPACTED GRANULAR 'A' & EARTH FILL FOR FOOTING.



## OVERSIZE EXCAVATION WITH PERIMETER DRAINS

FIG No 2



## STEEL SHEET PILING

FIG No 3

# EXPLANATION OF TERMS USED IN REPORT

**'N' VALUE:** AN INDICATOR OF SUBSOIL QUALITY. IT IS OBTAINED FROM THE STANDARD PENETRATION TEST (CSA STD. A119.1). SPT 'N' VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 2 INCH O.D. SPLIT-BARREL SAMPLER TO PENETRATE 12 INCHES INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WEIGHING 140 POUNDS, FALLING FREELY A DISTANCE OF 30 INCHES. FOR PENETRATIONS OF LESS THAN 12 INCHES 'N' VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. 'N' VALUES CORRECTED FOR OVERBURDEN PRESSURE ARE DENOTED THUS  $N_c$ .

**DYNAMIC CONE PENETRATION TEST (CSA STD. A119.3):** CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (2" O.D. 60 CONE ANGLE) DRIVEN BY 350 FT-LB IMPACTS ON "A" SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 12 INCH ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

**SOIL QUALITY:** SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSITY.

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

$S_u$ (PSF)	0 - 250	250 - 500	500 - 1000	1000 - 2000	2000 - 4000	> 4000
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

**DENSENESS:** COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF SPT 'N' VALUES AS FOLLOWS:

'N' (BLOW/FT)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

**ROCK QUALITY:** 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 DRILLED IN THAT CORING RUN.

**MODIFIED RECOVERY:** SUM OF THOSE NATURALLY FRACTURED CORE PIECES, 4" IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

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

**JOINTING AND BEDDING:**

SPACING	2"	2" - 12"	1' - 3'	3' - 10'	> 10'
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

## ABBREVIATIONS & SYMBOLS

### LABORATORY TESTING

TRIAXIAL TESTS ARE DESCRIBED IN TERMS OF WHETHER THEY ARE CONSOLIDATED (C) OR NOT (U) ISOTROPICALLY (I) OR NOT (A) AND SHEARED DRAINED (D) OR UNDRAINED (U) WITH PORE PRESSURE MEASUREMENTS (BAR OVER SYMBOLS) EG.  $CUU$  = CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENT UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

### FIELD SAMPLING

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

### EARTH PRESSURE TERMS

$\mu$  COEFFICIENT OF FRICTION  
 $\delta$  ANGLE OF WALL FRICTION  
 $k_o$  COEFFICIENT OF EARTH PRESSURE AT REST  
 $k_A$  COEFFICIENT OF ACTIVE EARTH PRESSURE  
 $k_P$  COEFFICIENT OF PASSIVE EARTH PRESSURE  
 $i$  ANGLE OF INCLINATION OF SURCHARGE  
 $\alpha$  SLOPE ANGLE-BACKFACE OF WALL  
 $\beta$  ANGLE OF SLOPE  
 $\lambda, \lambda_q, \lambda_c$  BEARING CAPACITY FACTORS  
 $D_f$  DEPTH OF FOOTING  
 $B, L$  FOOTING DIMENSIONS

### INDEX PROPERTIES

$\gamma$  UNIT WEIGHT OF SOIL (BULK DENSITY)  
 $\gamma_w$  UNIT WEIGHT OF WATER  
 $\gamma_d$  UNIT DRY WEIGHT OF SOIL (DRY DENSITY)  
 $\gamma'$  UNIT WEIGHT OF SUBMERGED SOIL  
 $G_s$  SPECIFIC GRAVITY OF SOLIDS  
 $e$  VOIDS RATIO  
 $e_o$  INITIAL VOIDS RATIO  
 $e_{max}$   $e$  IN LOOSEST STATE  
 $e_{min}$   $e$  IN DENSEST STATE  
 $D_r$  RELATIVE DENSITY =  $\frac{e_{max} - e}{e_{max} - e_{min}}$   
 $n$  POROSITY  
 $w$  WATER CONTENT  
 $w_L$  LIQUID LIMIT  
 $w_p$  PLASTIC LIMIT  
 $w_s$  SHRINKAGE LIMIT  
 $I_p$  PLASTICITY INDEX =  $w_L - w_p$   
 $I_L$  LIQUIDITY INDEX =  $\frac{w - w_p}{p}$   
 $I_c$  CONSISTENCY INDEX =  $\frac{w_L - w}{p}$   
 $A_c$  ACTIVITY =  $\frac{I_p \text{ of soil}}{I_p \text{ of } 2\mu m \text{ Soil Fraction}}$   
 $Om$  ORGANIC MATTER CONTENT

### STRENGTH PARAMETERS

$\phi$  ANGLE OF SHEARING RESISTANCE  
 $\tau_f$  PEAK SHEAR STRENGTH  
 $\tau_R$  RESIDUAL SHEAR STRENGTH  
 $c$  COHESION INTERCEPT  
 $\sigma_1, \sigma_2, \sigma_3$  NORMAL PRINCIPAL STRESSES  
 $u$  PORE WATER PRESSURE  
 $u_e$  EXCESS  $u$   
 $r_u$  PORE PRESSURE RATIO  
 $q_u$  UNCONFINED COMPRESSIVE STRENGTH  
 $s_u$  UNDRAINED SHEAR STRENGTH  
 $\epsilon$  LINEAR STRAIN  
 $\gamma$  SHEAR STRAIN  
 $\nu$  POISSON'S RATIO  
 $E$  MODULUS OF ELASTICITY  
 $G$  MODULUS OF SHEAR DEFORMATION  
 $k_s$  MODULUS OF SUBGRADE REACTION  
 $m, n$  STABILITY COEFFICIENTS  
 $A, B$  PORE PRESSURE COEFFICIENTS

### HYDRAULIC TERMS

$h$  HYDRAULIC HEAD OR POTENTIAL  
 $q$  RATE OF DISCHARGE  
 $v$  VELOCITY OF FLOW  
 $i$  HYDRAULIC GRADIENT  
 $j$  SEEPAGE FORCE PER UNIT VOLUME  
 $\eta$  COEFFICIENT OF VISCOSITY  
 $\nu$  COEFFICIENT OF HYDRAULIC CONDUCTIVITY  
 $k_h$   $k$  IN HORIZONTAL DIRECTION  
 $k_v$   $k$  IN VERTICAL DIRECTION  
 $\alpha_v$  COEFFICIENT OF VOLUME CHANGE  
 $\alpha_c$  COEFFICIENT OF COMPRESSION  
 $C_c$  COMPRESSION INDEX  
 $C_r$  RECOMPRESSION INDEX  
 $d$  DRAINAGE PATH DISTANCE  
 $T_v$  TIME FACTOR  
 $U$  DEGREE OF CONSOLIDATION  
 $\alpha$  TERZAGHI'S RATIO (OCR)

NOTE: EFFECTIVE STRESS PARAMETERS ARE DENOTED BY USE OF APOSTROPHE ABOVE THE SYMBOL, THUS:  $\sigma'$  = EFFECTIVE ANGLE OF SHEARING RESISTANCE





RECORD OF BOREHOLE No 1

W P 88-78-00 LOCATION Hwy. 407 & Mimico Creek  
Coords. N 15 890 590; E 955 960 ORIGINATED BY M.M.  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers (0-25'), Hollow Stem Augers (24-40) COMPILED BY M.M.  
DATUM Geodetic DATE October 13, 1978 CHECKED BY J.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
564.8	Ground Surface																
0.0	Clayey Silt		1	SS	9		560										
	Stiff		2	SS	16												
556.8	Very Stiff		3	SS	42												
8.0	Silt, Some Sand Dense		4	SS	44		550										
550.8			5	SS	18												
14.0	Sand, Some Silt		6	SS	34		540										
	Compact		7	SS	39												
534.8			8	SS	50/	3"	530										
300.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Occasional Cobbles Hard		9	SS	100/	3"											
523.3	Glacial Till																
41.5	End of Borehole																

+3, x5: Numbers refer to  
Sensitivity

20  
15-5 (%) STRAIN AT FAILURE  
10



# RECORD OF BOREHOLE No 2

W P 88-78-00 LOCATION Hwy. 427 & Finch Avenue ORIGINATED BY MM  
DIST 6 HWY 427 BOREHOLE TYPE Hollow Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 16, 1978 CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL			
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100									WATER CONTENT (%)		
								SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									20 40 60		
555.0	Ground Surface																		
0.0	Clayey Silt Trace Sand Hard		1	SS	32		550								23 27 40 10				
547.9			2	SS	22														
8.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Glacial Till  Hard		3	SS	73		540								7 22 58 13				
			4	SS	111														
			5	SS	68														
			6	SS	50/	5"													
			7	SS	112														
529.4							530												
26.5	End of Borehole  Note: Groundwater Not Encountered																		

+3, x5: Numbers refer to  
Sensitivity

20  
15  $\phi$  5 (%) STRAIN AT FAILURE  
10



# RECORD OF BOREHOLE No 3

W P 88-78-00 LOCATION Finch Ave. & West Humber ORIGINATED BY MM  
DIST 6 HWY Finch Ave. BOREHOLE TYPE Hollow Stem Augers & BXL Rock Coring COMPILED BY MM  
DATUM Geodetic DATE October 16, 1978 CHECKED BY al.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
519.7	Ground Surface												
0.0	Sandy Gravel												
515.7	Loose		1	SS	5								
4.0	Glacial Till												
512.7	Hard		2	SS	48								
7.0	Bedrock, Layers of Limestone and Weathered Shale		3	BXL RC	Rec= 60% RQD= 0%		510						
			4	BXL RC	Rec= 60% RQD= 0%								
505.7													
14.0	End of Borehole												
	Note: Groundwater Not Established. Borehole Was Relatively Dry Upon Completion of Augering						490						

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No 4

W P 88-78-00 LOCATION Hwy. 407 & Airport Road ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 16, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
596.3	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel		1	SS	32		590										2 12 46 40
	Very Stiff to Hard		2	SS	35												
	Brown		3	SS	49												
	Grey		4	SS	26												
	Very Stiff to Hard		5	SS	27		580										
			6	SS	40												
571.3			7	SS	68/	6"	570										
25.0	Silt, Some Sand																
	Very Dense																
564.8			8	SS	125												
31.5	End of Borehole																
	Note: Groundwater Not Encountered																



# RECORD OF BOREHOLE No 5

W P 88-78-00 LOCATION Hwy. 407 & West Humber ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers (0-30'), Hollow Stem Auger & Washing (30-35') COMPILED BY MM  
DATUM Geodetic DATE October 17, 1978 CHECKED BY a.s.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
540.4	Ground Surface													
0.0	Clayey Silt						540							
535.4	Stiff		1	SS	7					+8				
5.0	Heterogeneous Mixture Clayey Silt, Sand & Gravel		2	SS	24							+2000		
	(Glacial Till)		3	SS	12		530			+6				
	Stiff to Hard		4	SS	54									
522.4			5	SS	49									
18.0	Silt, Some Sand		6	SS	26		520							
517.4	Compact													
23.0	Sand, Some Silt Some Gravel Very Dense		7	SS	59									15 62 21 2
510.4							510							
30.0	Heterogeneous Mixture Silt, Sand and Gravel, Very Dense, Glacial Till		8	SS	120/	6"								
503.9			9	SS	60/	2"								
36.5	End of Borehole													

+3, x5: Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10

# RECORD OF BOREHOLE No 6

W P 88-78-00 LOCATION Hwy. 407 & Humber Main Coords. N 15 903 680; E 977 910 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Auger COMPILED BY MM  
DATUM Geodetic DATE October 17, 1978 CHECKED BY *MS*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
443.5	Ground Surface																GR SA SI CL
0.0	Fine Sand		1	SS	5		440										OM 1%
	Loose		2	SS	5												
	Compact Gravelly Sand		3	SS	16												
432.5	Trace Organics		4	SS	26		430										129
11.0	Very Stiff		5	SS	8												
	Stiff Clayey Silt to Silty Clay		6	TW	PH												
419.5			7	SS	4		420										130
24.0	Clayey Silt to Silt of Slight Plasticity Very Stiff		8	TW	PH												
409.5			9	SS	49												
34.0	Heterogeneous Mixture, Clayey Silt Sand and Gravel Hard (Glacial Till)		10	SS	134		410										13 17 57 13
			11	SS	100/	5"											
			12	SS	100/	5"	400										
392.0																	
51.5	End of Borehole																

OFFICE REPORT ON SOIL EXPLORATION



# RECORD OF BOREHOLE No 7

W P 88-78-00 LOCATION Hwy. 407 & Kipling Avenue ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers and Cone Test COMPILED BY MM  
DATUM Geodetic DATE                      CHECKED BY MM

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub> NATURAL MOISTURE CONTENT W LIQUID LIMIT W <sub>L</sub> WATER CONTENT (%) 20 40 60	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
456.5	Ground Surface										
0.0	Sand, Some Silt Some Gravel Loose to Compact		1	SS	6						
447.5			2	SS	21						
9.0	Heterogeneous Mixture Silt, Sand & Gravel (Glacial Till) V. Dense		3	SS	131						
442.5			4	SS	95						
14.0	Sand, Some Silt Some Gravel Compact to Dense		5	SS	45						
			6	SS	11						
			7	SS	50/2"						
	Sand, Some Silt Very Dense		8	SS	108						
420.0			9	SS	94						
36.5	End of Borehole										

# RECORD OF BOREHOLE No 8

W P 88-78-00 LOCATION Hwy. 407 @ Hwy. 427  
Coords. N 15 898 530; E 965 070 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 19, 1978 CHECKED BY *al*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
585.8	Ground Surface												
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Very Stiff to Hard (Glacial Till) Red Brown		1	SS	18								
577.8			2	SS	48								
8.0	Sandy Silt		3	SS	9								
	Very Dense		4	SS	62								
			5	SS	109								
			6	SS	84								
558.8			7	SS	50								
27.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Hard (Glacial Till) Red Brown		8	SS	138								
			9	SS	122								
544.3			10	SS	106								4 26 45 26
41.5	End of Borehole Note: Water Level Not Established												

OFFICE REPORT ON SOIL EXPLORATION





# RECORD OF BOREHOLE No 9

W P 88-78-00 LOCATION Hwy. 427 & Steeles Ave. ORIGINATED BY MM  
DIST 6 HWY 427 BOREHOLE TYPE Solid Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 19, 1978 CHECKED BY al.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100	W <sub>p</sub>	W	W <sub>L</sub>		
578.0	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel		1	SS	39												
			2	SS	45												
			3	SS	87												
			4	SS	117												
			5	SS	119												
560.0	Hard (Glacial Till)																
18.0	Sandy Silt Very Dense		6	SS	67												
551.5			7	SS	57												
26.5	End of Borehole																



# RECORD OF BOREHOLE No 10

W P 88-78-00 LOCATION Hwy. 407 & 427 Ramps E of Hwy. 427 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 20, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
569.1	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel Hard, Brown Glacial Till		1	SS	30												
			2	SS	45												
558.1			3	SS	124												
11.0	Sandy Silt Some Gravel Very Dense		4	SS	100/6"												
			5	SS	100/6"												
			6	SS	50/3"												
529.1																	
40.0	Heterogeneous Mixture Clayey Silt, Sand & Gravel, Hard, Glacial Till																
44.0	End of Borehole																



# RECORD OF BOREHOLE No 11

W P 88-78-00 LOCATION Hwy. 407 & Hwy. 50 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 20, 1978 CHECKED BY J. J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100										SHEAR STRENGTH			WATER CONTENT (%)		
																		○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			20 40 60		
578.8	Ground Surface																						
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel (Glacial Till) v. Stiff Brown Hard		1	SS	22																		
			2	SS	33																		
			3	SS	65																		
			4	SS	120																		
			5	SS	120																		
	Very Dense		6	SS	125																		
555.8																							
23.0	Sandy Silt Very Dense		7	SS	72																		
544.8																							
34.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Hard (Glacial Till)		8	SS	69																		
537.3			9	SS	70/2"																		
41.5	End of Borehole																						



RECORD OF BOREHOLE No 12

W P 88-78-00 LOCATION Hwy. 407 & Hwy. 27 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 23, 1978 CHECKED BY ref.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT:					UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH						
								UNCONFINED		FIELD VANE		QUICK TRIAXIAL		
562.5	Ground Surface													
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel (Glacial Till) Hard		1	SS	58		560							
			2	SS	55									
			3	SS	46									
			4	SS	56		550							
			5	SS	58									
			6	SS	80		540							
			7	SS	78									
536.1	End of Borehole													
26.5	Note: Groundwater Not Encountered													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 13

W P 88-78-00 LOCATION Hwy. 407 & Martingrove Road  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers COORDS. N 15 900 900; E 972 020  
DATUM Geodetic DATE October 23, 1978 ORIGINATED BY MM  
COMPILED BY MM  
CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
559.1	Ground Surface																
0.0			1	SS	12												
			2	SS	27												
	Brown		3	SS	39												
	Grey		4	SS	49												
	Heterogeneous Mixture		5	SS	26												
	Clayey Silt		6	SS	26												
	Sand and Gravel		7	SS	49												
	(Glacial Till)		8	SS	40												
	Hard		9	SS	50												
			10	SS	37												
			11	SS	86												
			12	SS	81												
			13	SS	100/ 5"												
			14	SS	100/ 2"												
487.6																	
71.5	End of Borehole																



# RECORD OF BOREHOLE No 14

W P 88-78-00 LOCATION Hwy. 407 & Pine Valley Drive Coords. N 15 905 450; E 981 320 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 24, 1978 CHECKED BY 2. J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	400 800 1200 1600 2000					
								SHEAR STRENGTH						
							○ UNCONFINED + FIELD VANE							
							● QUICK TRIAXIAL × LAB VANE							
531.9	Ground Surface													
0.0	Silty Sand Compact		1	SS	24		530							
526.9			2	SS	31									
5.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Very Stiff (Glacial Till)		3	SS	21									
520.9			4	SS	10		520							
11.0	Clayey Silt Very Stiff		5	TW	PH									
512.9			6	SS	26									
19.0	Silty Sand to Sandy Silt Some Gravel Compact to Loose		7	SS	18		510							
			8	SS	0									
			9	SS	7		500							
493.9			10	SS	86									
38.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel Hard (Glacial Till)		11	SS	45		490							
			12	SS	29									
476.9			13	SS	74		480							
55.0	Silty Sand to Sand, Trace Gravel Dense to Very Dense		14	SS	28		470							
457.9			15	SS	131/ 6"		460							
74.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel Hard (Glacial Till)		16	SS	60/ 3"		450							
440.4														
91.5	End of Borehole													
	Note: Low 'N' value of 0 blows/foot resulted from excess hydrostatic pressure during sampling procedures.					Casing Boiling								



RECORD OF BOREHOLE No 15

Hwy. 407 & Weston Road

W P 88-78-00 LOCATION Coords. N 15 908 250; E 987 850 ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Solid Stem Augers COMPILED BY MM  
DATUM Geodetic DATE October 25, 1978 CHECKED BY C.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR, SA, SI, CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
625.0	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Hard		1	SS	13		520										
	Brown		2	SS	40												
	Grey		3	SS	64												
	(Glacial Till)		4	SS	102												
			5	SS	113		510										
	Sand		6	SS	136												
			7	SS	75/	5"	500										
			8	SS	75/	5"											
			9	SS	60/	5"	490										
583.5			10	SS	60/	4"											
41.5	End of Borehole																

# RECORD OF BOREHOLE No 16

W P 88-78-00 LOCATION Hwy. 407 & Jane St. ORIGINATED BY MM  
 Coords. N 15 910 080 E 993 940  
 DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MM  
 DATUM Geodetic DATE October 25-30, 1978 CHECKED BY e.g.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT $\gamma$	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
652.7	Ground Surface													
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Very Stiff (Glacial Till) Red Brown Grey		1	SS	17		650							
			2	SS	19									
			3	SS	39									
			4	SS	62		640							
			5	SS	72									
634.7			6	SS	34									
18.0			7	SS	20		630							
	Clayey Silt Trace Sand Stratified Grey		8	SS	21									
	Very Stiff to Hard		9	SS	36		620							
			10	SS	25									
			11	SS	39		610							
			12	SS	73		600							
			13	SS	54		590							
			14	SS	38		580							
			15	SS	94		570							
			16	SS	62		560							
552.7														
100.0	Cont.													

+3, x5: Numbers refer to  
Sensitivity

20  
15  $\phi$  5 (%) STRAIN AT FAILURE  
10

OFFICE REPORT ON SOIL EXPLORATION





RECORD OF BOREHOLE No 16 cont

W P 88-78-00 LOCATION Hwy. 407 & Jane St. ORIGINATED BY MM  
DIST 6 HWY 407 BOREHOLE TYPE Hollow Stem Augers COPILED BY MM  
DATUM Geodetic DATE October 25-30, 1978 CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
552.7																	
100.0	Clayey Silt Trace Sand Stratified Grey Very Stiff to Hard		17	SS	32		550										
			18	SS	39		540										
			19	SS	38		530										
520.7																	
132.0	Silty Sand, Trace						520										
517.7	Gravel, Very Dense		20	SS	150/	6"											
135.0	End of Borehole																

+3, x5: Numbers refer to  
Sensitivity

20  
15  $\phi$  5 (%) STRAIN AT FAILURE  
10



RECORD OF BOREHOLE No 17

W P 88-78-00 LOCATION Hwy. 400 & Langstaff Rd.  
Coords. N 15 918 013; E 988 502 ORIGINATED BY MM  
DIST 6 HWY 400 BOREHOLE TYPE Hollow Stem Augers and Washboring COMPILED BY MM  
DATUM Geodetic DATE October 31, 1978 CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
673.1	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel, Red Brown Very Stiff (Glacial Till) Hard Grey		1	SS	19		670							OH			2 22 55 21
			2	SS	19												
			3	SS	37												
			4	SS	51		660							OH			
			5	SS	38												
			6	SS	60												
			7	SS	30		650										
			8	SS	31												
			9	SS	131		640										
							630										
628.1																	2 22 55 21
45.0	Clayey Silt Grey Hard Varved		10	SS	41		620										
618.1																	
55.0	Sand, Trace Silt Trace Gravel Compact to Very Dense		11	SS	36		610										
							600										
594.1																	
79.0																	
	Clayey Silt *						580										
672.1	Grey Hard Varved																
101.0	Glacial Till *						570										
568.1	Hard																
105.0	End of Borehole * Note: Description based on wash return, nature of washboring operation and other borings in vicinity.																



# RECORD OF BOREHOLE No 18

W P 88-78-00 LOCATION Hwy. 400 & Hwy. 427 ORIGINATED BY MM  
DIST 6 HWY 400 BOREHOLE TYPE Hollow Stem Augers COMPILED BY MM  
DATUM Geodetic DATE November 1, 1978 CHECKED BY W.J.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			SHEAR STRENGTH									
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE								
630.0	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt Sand and Gravel, Red (Glacial Till) Brown Very Stiff Hard		1	SS	24		620										
			2	SS	43												
			3	SS	60/												
			4	SS	105												
			5	SS	147												
			6	SS	130												
603.5			7	SS	100/	5"	610										
26.5	End of Borehole																

# RECORD OF BOREHOLE No 19

Borehole Data Obtained From C.N.R.

W P 88-78-00 LOCATION CNR S-E Corner & Indian Line ORIGINATED BY C.N.R.  
 Coords. N 15 894 450; E 964 997  
 DIST 6 HWY 427 BOREHOLE TYPE N/A COMPILED BY MM  
 DATUM Geodetic DATE N/A CHECKED BY ef.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
561.4	Ground Surface													
0.0	Silty Clay Very Stiff		1	SS	22		560							
555.0			2	SS	22									
6.4	Sandy Silt Some Gravel		3	SS	83									
550.0	Very Dense		4	SS	69									
11.4	Sandy Silt Some Gravel Very Dense		5	SS	62		550							
			6	SS	29									
			7	SS	82									
			8	SS	100		540							
531.7			9	SS	100									
29.7	Probably Grey Silt Sand and Gravel Very Dense						530							
522.0														
39.4	End of Borehole													
	Note: No groundwater observed													

OFFICE REPORT ON SOIL EXPLORATION



## Borehole Data Obtained From C.N.R.

W P 88-78-00 LOCATION CNK & Humber Main East Bank ORIGINATED BY CNR  
 Coords. N 15 903 050; E 978 100  
 DIST 6 HWY 407 BOREHOLE TYPE N/A COMPILED BY MM  
 DATUM Geodetic DATE N/A CHECKED BY v.l.

[illegible]

120 End of Borehole

+3, x5; Numbers refer to 15-20 15-25 15-30 15-35 15-40 15-45 15-50 15-55 15-60 15-65 15-70 15-75 15-80 15-85 15-90 15-95 15-100 15-105 15-110 15-115 15-120 15-125 15-130 15-135 15-140 15-145 15-150 15-155 15-160 15-165 15-170 15-175 15-180 15-185 15-190 15-195 15-200 15-205 15-210 15-215 15-220 15-225 15-230 15-235 15-240 15-245 15-250 15-255 15-260 15-265 15-270 15-275 15-280 15-285 15-290 15-295 15-300 15-305 15-310 15-315 15-320 15-325 15-330 15-335 15-340 15-345 15-350 15-355 15-360 15-365 15-370 15-375 15-380 15-385 15-390 15-395 15-400 15-405 15-410 15-415 15-420 15-425 15-430 15-435 15-440 15-445 15-450 15-455 15-460 15-465 15-470 15-475 15-480 15-485 15-490 15-495 15-500 15-505 15-510 15-515 15-520 15-525 15-530 15-535 15-540 15-545 15-550 15-555 15-560 15-565 15-570 15-575 15-580 15-585 15-590 15-595 15-600 15-605 15-610 15-615 15-620 15-625 15-630 15-635 15-640 15-645 15-650 15-655 15-660 15-665 15-670 15-675 15-680 15-685 15-690 15-695 15-700 15-705 15-710 15-715 15-720 15-725 15-730 15-735 15-740 15-745 15-750 15-755 15-760 15-765 15-770 15-775 15-780 15-785 15-790 15-795 15-800 15-805 15-810 15-815 15-820 15-825 15-830 15-835 15-840 15-845 15-850 15-855 15-860 15-865 15-870 15-875 15-880 15-885 15-890 15-895 15-900 15-905 15-910 15-915 15-920 15-925 15-930 15-935 15-940 15-945 15-950 15-955 15-960 15-965 15-970 15-975 15-980 15-985 15-990 15-995 15-1000 15-1005 15-1010 15-1015 15-1020 15-1025 15-1030 15-1035 15-1040 15-1045 15-1050 15-1055 15-1060 15-1065 15-1070 15-1075 15-1080 15-1085 15-1090 15-1095 15-1100 15-1105 15-1110 15-1115 15-1120 15-1125 15-1130 15-1135 15-1140 15-1145 15-1150 15-1155 15-1160 15-1165 15-1170 15-1175 15-1180 15-1185 15-1190 15-1195 15-1200 15-1205 15-1210 15-1215 15-1220 15-1225 15-1230 15-1235 15-1240 15-1245 15-1250 15-1255 15-1260 15-1265 15-1270 15-1275 15-1280 15-1285 15-1290 15-1295 15-1300 15-1305 15-1310 15-1315 15-1320 15-1325 15-1330 15-1335 15-1340 15-1345 15-1350 15-1355 15-1360 15-1365 15-1370 15-1375 15-1380 15-1385 15-1390 15-1395 15-1400 15-1405 15-1410 15-1415 15-1420 15-1425 15-1430 15-1435 15-1440 15-1445 15-1450 15-1455 15-1460 15-1465 15-1470 15-1475 15-1480 15-1485 15-1490 15-1495 15-1500 15-1505 15-1510 15-1515 15-1520 15-1525 15-1530 15-1535 15-1540 15-1545 15-1550 15-1555 15-1560 15-1565 15-1570 15-1575 15-1580 15-1585 15-1590 15-1595 15-1600 15-1605 15-1610 15-1615 15-1620 15-1625 15-1630 15-1635 15-1640 15-1645 15-1650 15-1655 15-1660 15-1665 15-1670 15-1675 15-1680 15-1685 15-1690 15-1695 15-1700 15-1705 15-1710 15-1715 15-1720 15-1725 15-1730 15-1735 15-1740 15-1745 15-1750 15-1755 15-1760 15-1765 15-1770 15-1775 15-1780 15-1785 15-1790 15-1795 15-1800 15-1805 15-1810 15-1815 15-1820 15-1825 15-1830 15-1835 15-1840 15-1845 15-1850 15-1855 15-1860 15-1865 15-1870 15-1875 15-1880 15-1885 15-1890 15-1895 15-1900 15-1905 15-1910 15-1915 15-1920 15-1925 15-1930 15-1935 15-1940 15-1945 15-1950 15-1955 15-1960 15-1965 15-1970 15-1975 15-1980 15-1985 15-1990 15-1995 15-2000 15-2005 15-2010 15-2015 15-2020 15-2025 15-2030 15-2035 15-2040 15-2045 15-2050 15-2055 15-2060 15-2065 15-2070 15-2075 15-2080 15-2085 15-2090 15-2095 15-2100 15-2105 15-2110 15-2115 15-2120 15-2125 15-2130 15-2135 15-2140 15-2145 15-2150 15-2155 15-2160 15-2165 15-2170 15-2175 15-2180 15-2185 15-2190 15-2195 15-2200 15-2205 15-2210 15-2215 15-2220 15-2225 15-2230 15-2235 15-2240 15-2245 15-2250 15-2255 15-2260 15-2265 15-2270 15-2275 15-2280 15-2285 15-2290 15-2295 15-2300 15-2305 15-2310 15-2315 15-2320 15-2325 15-2330 15-2335 15-2340 15-2345 15-2350 15-2355 15-2360 15-2365 15-2370 15-2375 15-2380 15-2385 15-2390 15-2395 15-2400 15-2405 15-2410 15-2415 15-2420 15-2425 15-2430 15-2435 15-2440 15-2445 15-2450 15-2455 15-2460 15-2465 15-2470 15-2475 15-2480 15-2485 15-2490 15-2495 15-2500 15-2505 15-2510 15-2515 15-2520 15-2525 15-2530 15-2535 15-2540 15-2545 15-2550 15-2555 15-2560 15-2565 15-2570 15-2575 15-2580 15-2585 15-2590 15-2595 15-2600 15-2605 15-2610 15-2615 15-2620 15-2625 15-2630 15-2635 15-2640 15-2645 15-2650 15-2655 15-2660 15-2665 15-2670 15-2675 15-2680 15-2685 15-2690 15-2695 15-2700 1

OFFICE REPORT ON SOIL EXPLORATION

# RECORD OF BOREHOLE No 21 Borehole Data Obtained From C.N.R.

W P 88-78-00 LOCATION CNR West Side & Islington Ave. ORIGINATED BY CNR  
 Coords. N 15 903 450; E 979 500  
 DIST 6 HWY 407 BOREHOLE TYPE N/A COMPILED BY CNR  
 DATUM Geodetic DATE N/A CHECKED BY l.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
523.5																	
0.0	Sand, Medium to Coarse With Gravel						520										
513.5				SS	26												
10.0	Sandy Silt						510										
507.5	Compact			SS	17												
16.0	Silty Clay  Very Soft to Stiff						500										
							490										
							480										
472.5							470										
51.0	Heterogeneous Mixture Clayey Silt Sand and Gravel Stiff to Very Stiff  (Glacial Till)			SS	26												
				SS	39												
				SS	27		460										
				SS	27												
				SS	18		450										
				SS	41												
442.0				SS	20												
81.5	End of Borehole  * Note: This borehole data obtained from CNR																



RECORD OF BOREHOLE No 22 Borehole Data Obtained From C.N.R.

W P 88-78-00 LOCATION CNR & Hwy. 400 Coords. N 15 906 450; E 990 470 ORIGINATED BY CNR  
DIST 6 HWY 400 BOREHOLE TYPE N/A COMPILED BY MM  
DATUM Geodetic DATE N/A CHECKED BY e.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100									
								SHEAR STRENGTH									
619.0	Ground Surface																
0.0	Heterogeneous Mixture Clayey Silt, Sand and Gravel Dense to Very Dense (Glacial Till)																
604.0																	
15.0	Sandy Silt																
598.0	Very Dense																
21.0	Sand, Fine to Medium Dense to Very Dense																
584.0																	
35.0	Heterogeneous Mixture Silt Sand and Gravel Very Dense																
569.0																	
50.0	End of Borehole																

+3, x5: Numbers refer to  
Sensitivity

20  
15 5 (%) STRAIN AT FAILURE  
10



RECORD OF BOREHOLE No 23

(This data obtained from  
Metropolitan Toronto and Region  
Conservation Authority)

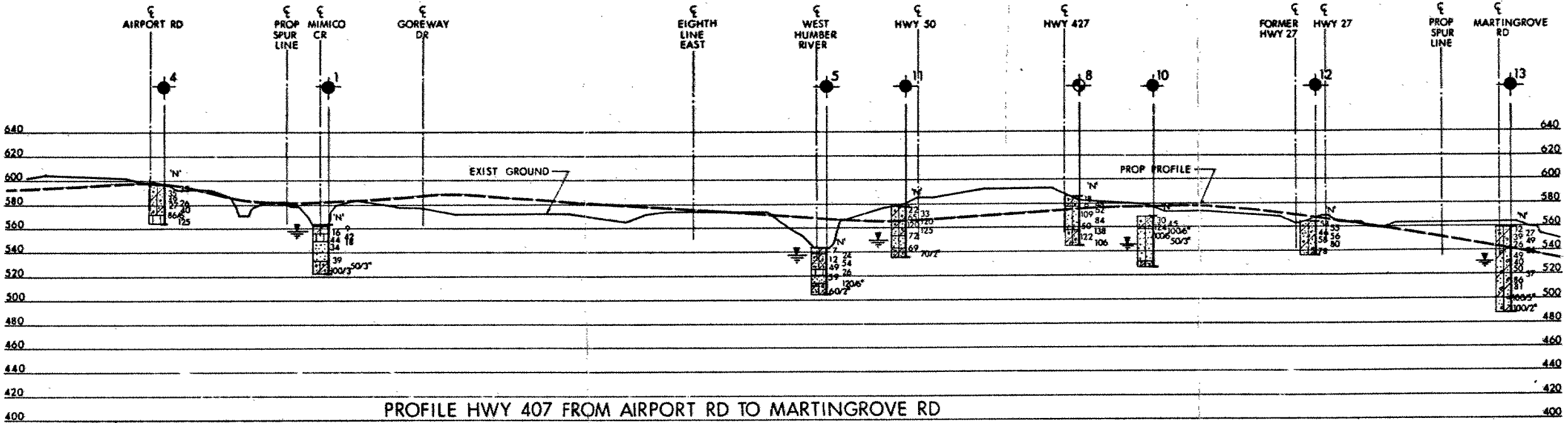
W P 88-78-00 LOCATION East Side of Clairville Dam Coords. N 15 890 220; E 965 600 ORIGINATED BY Geocon  
DIST 6 HWY 427 BOREHOLE TYPE N/A COMPILED BY MM  
DATUM Geodetic DATE N/A CHECKED BY w.f.

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
542.0	Ground Surface																
0.0	Topsoil																
1.0	Heterogeneous Mixture Silt, Sand and Gravel Grey to Brown  (Glacial Till) Compact to Very Dense						540										
							530										
							520										
							510										
504.0																	
38.0	Soft Grey Interbedded Shale and Limestone																
500.0	Bedrock						500										
42.0	End of Borehole																

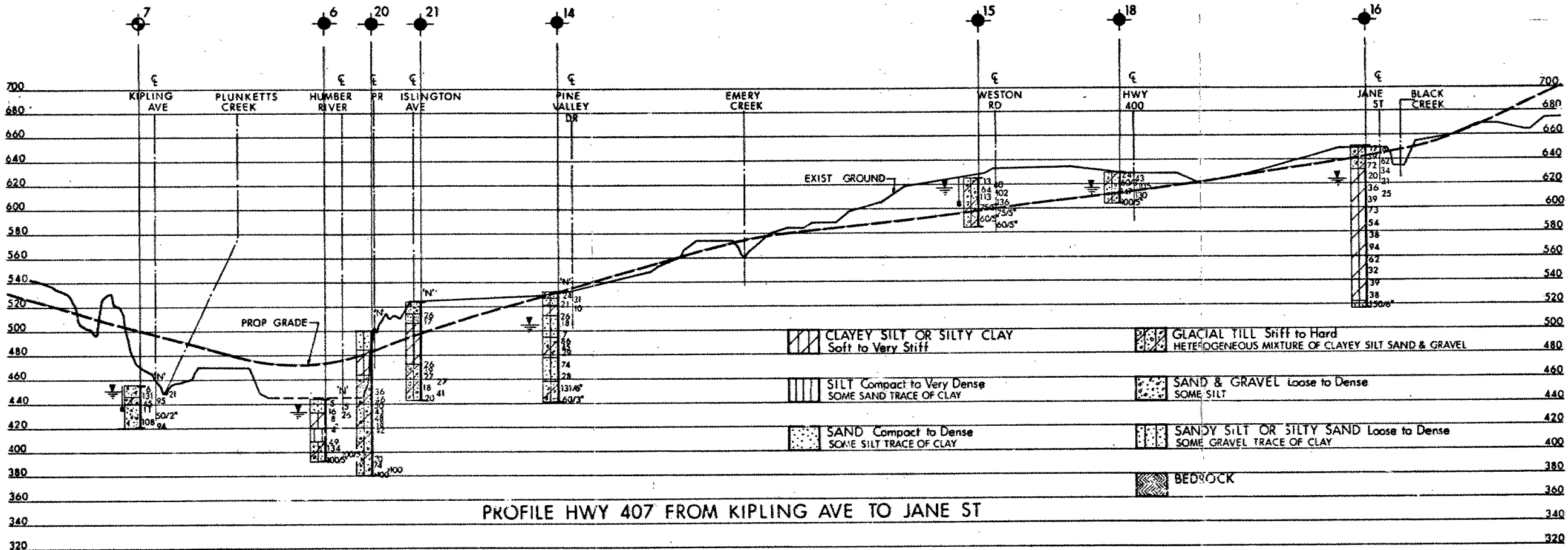


## APPENDIX

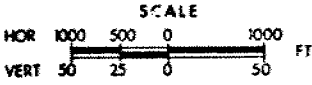
# OVERSIZE DRAWING



PROFILE HWY 407 FROM AIRPORT RD TO MARTINGROVE RD



PROFILE HWY 407 FROM KIPLING AVE TO JANE ST



**LEGEND**

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350 ft lbs energy)
- CONE Blows/ft (60° Cone, 350 ft lbs energy)
- WL at time of investigation
- NO WL Established in BH No 2 3 4 8 12 19 20 21 & 23

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	564.8	15 890 590	955 960
2	555.9	15 891 020	966 305
3	519.7	15 891 330	967 445
4	596.3	15 888 480	954 140
5	540.4	15 896 130	961 270
6	443.5	15 903 680	977 910
7	456.5	15 902 520	975 330
8	585.8	15 898 530	965 070
9	578.0	15 897 460	965 250
10	569.1	15 899 190	966 570
11	578.8	15 897 380	963 020
12	562.6	15 899 840	969 280
13	559.1	15 900 900	972 020
14	531.9	15 905 450	981 320
15	625.0	15 908 250	987 850
16	652.7	15 910 080	993 940
17	673.1	15 918 013	988 502
18	630.0	15 908 830	989 950
19	561.4	15 894 450	964 997
20	500.0	15 903 050	978 100
21	523.5	15 903 450	979 500
22	619.0	15 906 450	990 470
23	542.0	15 890 220	965 600

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

REVISIONS	DATE	BY	DESCRIPTION



**Giffels Associates Limited**

Divisions  
Giffels Associates  
Giffels, Davis & Jorgensen  
Strategic Planning Services

30 International Blvd.  
Toronto (Rexdale), Ontario  
Canada M9W 5P3

Telex 06-989215  
Telephone  
(416) 675-5950

**Giffels**

May 9, 1979

Mr. P. Penev  
Geotechnical Section  
Engineering and Right of Way Office  
Central Region  
Ministry of Transportation  
and Communications  
Downsview, Ontario  
M3K 1N6

Re: WP 88-78-00, Hwy. 407  
Preliminary Design fr.  
Airport Road Easterly  
to Jane Street  
Our Job Number W7834

Dear Sir :

As you are aware, we are currently assessing alternate Highway 407/400 interchange directional ramp profiles. The major factors yet to be fully assessed are subsoil conditions and stability, and groundwater impacts for the deep cuts proposed west of Highway 400. Based on available information, we are unable to fully determine the impacts of the "directionals under" scheme and the associated deep cuts.

We have reviewed the information generated to date by the Soils Mechanics Section and the Geotechnical Section and feel that additional work is required with your assessment and recommendations to resolve the following:

1. Viability of proposed deep cuts. Assessment of any special problems associated with the "directionals under" alternative and preliminary recommendations for construction. Factors to be assessed include:
  - a) Location and implications of the water bearing sand seam.
  - b) Subexcavation requirements.
  - c) Suitability of cut for embankment construction. Percentage of cut to assume as waste.
  - d) Water table impacts of deep cuts, notably local wells.
  - e) Other factors that come to light in the course of further investigations and assessment.
2. Review of previous recommendations for the "directionals over", deep fill alternative with supplementary recommendations where required.

.....2



↓ MM  
↓ Files

Giffels Associates Lim

Ministry of Transportation & Communications  
Att: Mr. P. Penev

Page Two  
May 9/79

The above is required as soon as possible to resolve a profile recommendation for the 407/400 interchange. Programmed detailed design (Hwy. 400/7 interchange) elements depend on this decision.

If more information or discussion is required, please contact the writer.

Yours very truly,



Paul MacLeod, P.Eng.  
Project Manager  
Giffels, Davis & Jorgensen Division

pm-kas

cc: L. Dutchak  
K. Pilgrim  
M. MacLean —

.les

Mr. L. Dutchak  
Planning and Design Section  
Central Region  
3501 Dufferin St., Downsview

Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building

79 04 10

Re: Hwy. 407 From Airport Road to Jane Street  
W.P. 88-78-00, District 6, Toronto

---

On your referral, Mr. W. Lachmaniuk of Giffels Associates Limited, contacted our office for comments/recommendations concerning proposed grade revisions for Hwy. 407. We have reviewed the recommendations made in our earlier report for this project in view of the proposed grade revisions and are submitting the necessary additional/revised recommendations in the sheets attached.

It is important to note that the scope of our original foundation investigation fieldwork did not include the assessment of deep cuts in the area of Martingrove to Hwy. 400. As such, the necessary data, both for subsurface and groundwater conditions, to make firm recommendations in these areas is lacking. However, the preliminary recommendations attached will enable you to proceed with your evaluations. For property and final design requirements, further fieldwork will be required.

If you have any further queries please call.

M. MacLean  
Project Engineer

For: M. Devata  
Supervising Engineer

MM/MD/gs

Attach.

cc: G.C.E. Burkhardt, Attn: K. Pilgrim  
R.D. Gunter  
W. Lachmaniuk (Giffels Assoc.)  
Files ✓

Location	Subsurface Conditions	Earth Cuts		Earth Fill	
		Depth of Cut	Slope/Berm Requirements	Ht.of Fill	Slope Berm Requirement
Airport Road Vicinity Sta. 645+00 to Sta. 675+00	0-25' glacial till very stiff to hard Groundwater not encountered	0-18 ft.	2:1 cut slopes	11 ft.	2:1 fill slopes
Watercourse and Vicinity Sta. 749+50	0-25' very stiff glacial till Groundwater not encountered			20 ft.	2:1 fill slopes
Hwy. 50 to Hwy. 427 Sta. 105+00 to Sta. 130+00	0-13' very stiff to hard glacial till 13-23' very dense glacial till 23-34' very dense sandy silt 34-42' hard glacial till Groundwater: 28' below ground	0-25 ft.	2:1 cut slopes		
Martingrove and Vicinity Sta. 183+00 to Sta. 222+00	0-57' hard glacial till ① Groundwater 28' below ground surface	0-30 ft.	2:1 cut slopes		
West of Plunketts Crk. Sta. 225+00 to Sta. 234+00	0-57' hard glacial till ①② possible sand layers	0-30 ft.	2:1 cut slopes		
Kipling Avenue - North of Hwy. 407 Kipling Ave. Sta. 89+00 to Sta. 98+00	glacial till with possible sand layers ①②	0-30 ft.	2:1 cut slopes		
		30-50 ft.	2:1 cut slopes, mid- height 15' wide berms		



Location	Subsurface Conditions	Earth Cuts		Earth Fill	
		Depth of Cut	Slope/Berm Requirements	Ht.of Fill	Slope Berm Requirement
Weston Road and Vicinity Sta. 355+00 to Sta. 405+00	0-42' hard glacial till with sand layers Groundwater 8' below ground surface ①②③	0-35 ft.	2:1 cut slopes		
Hwy. 400/407 Interchange Option A - Ramps Under 407	0-42' glacial till with sand layers Groundwater 8' below ground surface ①②③	0-30'	2:1 cut slopes	0-30 ft	2:1 fill slopes
		30-50'	2:1 cut slopes mid-height 15' wide berms		
Hwy. 400/407 Interchange Option B Ramps Over 400	0-42' glacial till with sand layers Groundwater 8' below ground surface ①②③	0-20'	2:1 cut slopes	0-35 ft	2:1 fill slopes
				35-50 ft	2:1 fill slopes with mid-height 15' wide berms
<div>① Subsurface and groundwater information in this area is not sufficiently adequate to access deep cuts. Further fieldwork in this area would be required for final design.</div> <div>② In view of the presence of water bearing sand seams in these areas, cuts intersecting these will require subdrains and nominal interceptor ditching at sand seams.</div> <div>③ The sand seams in these areas are a source of water for local wells. With highway cuts intersecting these water bearing sand seams, the possibility of compensating well owners for either road salt contamination or loss of water source because of drawdown should be considered within a one mile radius of the proposed cut locations.</div>					



## Memorandum

To: Mr. M. Devata,  
Supervising Engineer,  
Soil Mechanics Section,  
Central Building, Downsview.

Attention:

Our File Ref.

From: G.C.E. Burkhardt,  
Structural Section,  
Central Region.

Date: 1978-11-20

In Reply to

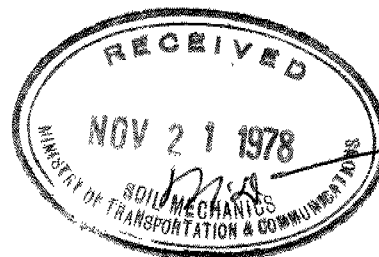
Subject: RE: Feasibility Study,  
Hwy. 407 Airport Rd. to Jane St. (incl. Hwy. 400),  
W.P. 88-78-00, Hwy. 427 - Finch Ave. to Hwy. 27,  
W.P. 49-71-00, District 6, Toronto

Further to our memo of 1978-09-11 and our recent telephone conversation, attached please find a copy of plan and profile of Highway 427 showing new sites A30 and A31. At this time, all factors are being assessed with respect to putting Highway 407 over Highway 7 and vice-versa, as shown on the profile drawing.

It is realized that no boreholes were put down at these locations, but it will nevertheless be appreciated if recommendations could be included for these sites in your report. Please let us also have your comments or preference regarding the grade separation at site A30.

KP:gj  
Attach.

K. Pilgrim,  
Senior Structural Engineer,  
for:  
G.C.E. Burkhardt,  
Head, Structural Section.



7 m.m.  
k  
Zim



## Memorandum

To: Mr. G.C.E. Burkhardt  
Head, Structural Section  
Central Region  
3501 Dufferin St., Downsview

From: Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building

Attention:  
Mr. K. Pilgrim

Date: 78 11 06

Our File Ref.

In Reply to

Subject: Re: Feasibility Study, Hwy. 407 From Airport Road  
to Jane Street, W.P. 88-78-00 ✓  
Hwy. 427 from Finch Avenue to Hwy. 406, W.P. 49-71-00

### Introduction

Further to your request of September 11, 1978 we have completed the foundation investigation fieldwork for the above mentioned project. As per your verbal request of September 8, 1978 we are hereby providing you with our preliminary assessment of the subsoil conditions, general recommendations on structure foundations and the stability of embankments and a preliminary assessment of problem areas.

### Fieldwork

The fieldwork was carried out during the period from October 3 to November 1, 1978 and consisted of a total of 18 sampled boreholes advanced by means of either solid stem augers or hollow stem augers to depths of 14 to 135 feet below ground surface. Bedrock was encountered in one boring (within the floodplain of the West Humber River at the proposed Finch Ave. crossing) at a depth of 7 feet and was proven by obtaining 7 feet of BXL size rock core.

In addition to our fieldwork we have assembled a number of boring records located within the study area that have been previously carried out by ourselves and other agencies. This data enabled us to reduce significantly the necessary fieldwork and we will incorporate portions of the data in our report.

### Subsurface Conditions

The study area for this portion of Hwy. 407-Hwy. 427-Hwy. 400 is wholly located within the physiographic region known as the "Peel Plain". This area is found to be at elevation 500 to 750 feet above sea level and has a gradual slope toward Lake Ontario. Across the plain, rivers and streams have cut deep valleys and there is, therefore, no large undrained depressions, swamp or bogs in the whole area. The plain is furthermore characterized by an underlying till or boulder clay. In much of the Peel Plain this has been modified by a veneer of clay which when deep enough is clearly seen to be varved.

The fieldwork revealed that across the study area generally favourable conditions exist for structure and embankment foundations. Generally, the dominant subsurface deposit extending from the ground surface to a depth of up to 105 feet is a heterogeneous mixture of clayey silt, sand and gravel, a glacial till. The consistency is very stiff ('N' values 18 to 58 blows per foot) in the upper 10 feet and becoming very hard ('N' values greater than 100 blows per foot) at depths ranging from 15 to 100 feet being generally in the order of 40 feet below the ground surface. In some locations a 14 to 25 foot thick deposit of very dense silty sand was encountered within the glacial till deposit. Exceptions to the above occur adjacent to the major water courses in the study area. At Mimico Creek, Plunketts Creek, the west side of Humber River (Main Branch) and at the West Humber River, subsurface conditions consist of generally a surficial deposit of stiff to very stiff clayey silt up to 20 feet thick overlying loose to dense deposits of silt, silty sand and sand overlying a very hard glacial till ('N' values greater than 100 blows per foot). The glacial till was encountered at depths ranging from 25 to 35 feet below the ground surface. Adjacent to Blacks Creek subsurface conditions consist of a surficial deposit 18 feet thick of very stiff glacial till overlying up to 115 feet of very stiff to hard varved silty clay overlying hard glacial till. Because of property problems it was not possible to place a boring on the east side of the Humber River (Main Branch) at Islington Avenue. However, other borings carried out in this area indicate subsurface conditions consist of 20 feet of compact to dense sand and silt deposits overlying 60 feet of soft to stiff silty clay overlying a very hard glacial till.

Groundwater was encountered at depths of about 10 to 30 feet below the ground surface, except adjacent to waterways where the groundwater was at the approximate river water level.

#### Discussion and Recommendations

It is proposed to construct a new east-west highway, Hwy. 407, constructed to freeway design standards, to be located immediately south of existing Hwy. 7. This report is concerned with that section of Hwy. 407 between Airport Road and Jane Street including the section of Hwy. 400 from Langstaff southerly to Steeles Avenue and also the section of Hwy. 427 from Hwy. 407 to Finch Avenue. This portion of the project will require the crossing of 5 major waterways, some 10 interchanges including 2 major interchanges, and some 16 crossings of railways and minor roads; in all requiring some 50 odd structures. The recommended grade for Hwy. 407 will involve roadway cuts up to 35 feet deep and roadway fills up to 45 feet high.

cont'd.....

Subsurface conditions across the site are generally favourable for structure and embankment foundations.

In Table 1 attached we have listed the areas where it is proposed to construct structures. Beside each is indicated the suitability for various structure foundation possibilities as follows.

Compacted Granular 'A' Pad - For abutments only, where the maximum allowable bearing pressure is in the order of 3.5 tsf.

Spread Footings - For abutments or piers where the maximum allowable loading will be in excess of 2.5 to 3.0 tsf.

Short End-Bearing Piles - For abutments or piers where the estimate pile tip elevation is 30 to 50 feet below the existing ground surface and the piles can be loaded to the maximum allowable load.

Long End-Bearing Piles - For abutments or piers where the estimated pile tip elevations is 80 to 140 feet below the existing ground surface and the piles can be loaded to the maximum allowable load.

Friction Piles - For abutments or piers where a competent end-bearing stratum is in the order of 80 feet deep and 45 foot #14 timber piles can be used at a loading of 30 tons/pile.

Embankments can be constructed using 2:1 cut slopes in the majority of areas. Where berms in the fill or cut slope may be required for stability purposes this is noted beside the appropriate area.

There are two areas where additional comment is thought necessary at this time. One area is the Hwy. 407-Islington Avenue location and vicinity. Here subsoil conditions consist of up to 20 feet of compact to dense sand and silt deposits overlying up to 60 feet of soft to stiff silty clay overlying hard glacial till. The proposed grade at this location will require a 35 foot cut. It is anticipated that berms will be required for stability purposes at this location. The second area is the Hwy. 407-Weston Road area and vicinity. Here the profile grade also requires a 35 foot cut. Subsoil conditions here consist of up to 42 feet of hard glacial till with a water bearing silty sand deposit 15 to 20 feet below ground surface. Slope protection measures will be required at this location to control seepage from the water bearing stratum.

cont'd.....

It is to be noted that the recommendations contained herein are very general and for the purposes of the Structural Planning Office to proceed with their discussions. In the final feasibility report we will provide more detailed recommendations for the structure and embankment foundation.

If you have any questions please do not hesitate to contact this office.

*M MacLean*

M. MacLean  
Project Engineer

MM/gs

Attach.

cc: Files ✓

TABLE 1

Area	Description	Structure Foundations				Berm Required
		Compacted Granular Fill	Spread Footings	End Bearing Piles Short	Piles Long	
A1	Hwy. 407 @ Airport Rd.	X	X			
A2	Hwy. 407 @ Brampton Terminal Spurline		X	X		
A3	Hwy. 407 @ Mimico Creek			X		
A4	Hwy. 407 @ Goreway Dr.	X		X		
A5	Hwy. 407 @ West Humber			X		
A6	Hwy. 407 @ Hwy. 50	X	X			
A7	Hwy. 407 @ Hwy. 427	X	X			
A8	Hwy. 427 @ Steeles Ave.	X	X			
A9	Hwy. 427 @ Albion Rd.	X	X			
A10	Hwy. 427 @ C.N.R.			X		
A11	Hwy. 407-Hwy. 427 Ramps East of Hwy. 427	X	X			
A12	Hwy. 407 @ Hwy. 27	X	X			
A13	Hwy. 407 @ Martingrove		X	X		
A14	Hwy. 407 @ Kipling			X		POSSIBLE
A15	Kipling @ C.N.R.			X		POSSIBLE
A16	Hwy. 407 @ Humber			X		
A17	Hwy. 407 @ C.P.R.				X	
A18	Hwy. 407 @ Islington				X	YES
A19	Hwy. 407 @ Pine Valley Dr.				X	

TABLE 1

Area    Description		Structure Foundations				Berm Required	
		Compacted Granular Fill	Spread Footings	End Bearing Piles Short	Long		Friction Piles
A20	Hwy. 407 @ Weston		X				POSSIBLE
A21	Hwy. 407 @ Hwy. 400	X	X				
A22	Hwy. 400-Hwy. 407 Ramps N. of Hwy. 407	X	X				
A23	Hwy. 400 @ Hwy. 7	X	X				
A24	Hwy. 407 @ Jane St.	X			X	X	
A25	Hwy. 400 @ C.N.R.	X	X				
A26	Hwy. 400 @ Langstaff				X	X	
A27	Hwy. 427 @ West Humber			X			
A28	Hwy. 427 @ Finch	X	X				
A29	Finch @ West Humber	X	X	X			

Legend

X denotes suitability for structure foundations according to the following.

Compacted Granular 'A' Pad: Abutments Only, Max. Allowable Load 3.5 tsf.

Spread Footings: Pier of Abutments Max. Allowable Load in Excess of 2.5 to 3.0 tsf.

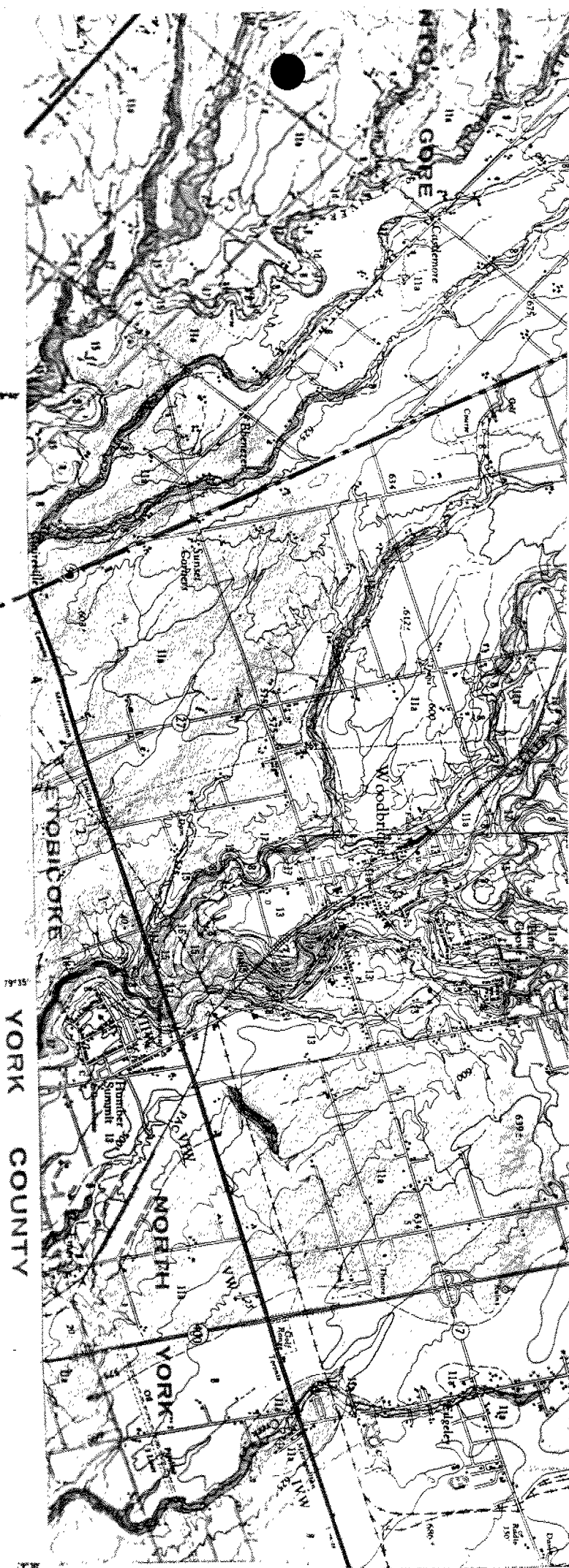
Short End-Bearing Piles: Piers or Abutments Estimated Pile Tip Elev. 30-50' Below Ground Level  
Max. Allowable Load Per Pile

Long End-Bearing Piles: Piers of Abutments Estimated Pile Tip Elev. 80-140' Below Ground Level  
Max. Allowable Load Per Pile

Friction Piles: Piers or Abutments 45' Long #14 Timber Piles @ Load 30 tons/pile



# OVERSIZE DRAWING



- 10 WILDFIELD TILL: dark grey silty clay loam, clay loam, silty clay or clay till. Silt balls and stratified material may be included. Occasionally conglomeratic.
- 9 Northern upper till: light grey silty clay loam to clay till.
- 8 HALTON TILL: brown loam to silt loam till.
- 7 Gravel: outwash gravel usually covered by several feet of sand.
- 6 Sand: deposited in meltwater channels—often underlain by gravels.
- 5 Ice contact stratified drift: sand, gravel and (locally) silt. Structure often disturbed. Of kame, outwash and collapse origin. Is frequently exposed along river valleys.
- 4a Northern lower till: light brown and red sandy loam to loam till.
- 4b Northern lower till: light brown very gravelly sandy loam till.
- 4c Northern lower till: light brown-grey gravelly loam to sandy loam till.

**LEGEND**

**CENOZOIC  
QUATERNARY  
RECENT**

- 17 Modern alluvium: silt, sand, gravel.
- 16 Peat, muck, marl.

**PLEISTOCENE  
WISCONSINAN**

- 15 Older alluvium: sands, silts and gravels on elevated terrace remnants.
- 14 Alluvial gravels: usually covered with several feet of sand.
- 13 Deltaic and lacustrine sands, some silt and gravels.
- 12 Lacustrine silt and clay, some sand: usually stratified or varved (deposits of glacial Lake Schomberg in the north).
- 11a LACUSTRINE-WILDFIELD TILL COMPLEX: stratified or non-stratified silt loam, silty clay loam or clay deposits. May contain grits, silt balls or pebbles and may be interbedded with layers of till-like material. Carbonate concretions common. Occurs as thin discontinuous veneer over Wildfield Till. (deposits of glacial Lake Peel)
- 11b Conglomeratic, lacustrine deposits: thin, fine-grained, conglomeratic deposits near Eversley, King Twp. (deposits of glacial Lake Eversley)

**SOURCES OF INFORMATION**

Geology by O. L. White and assistants, 1963 1:24,000  
by P. F. Karrow and assistants, 1967 1:24,000

APPENDIX A

GEOCON LTD.

REPORT

TO

JAMES F. MACLAREN ASSOCIATES

ON

SOIL CONDITIONS

PROPOSED CLAIRVILLE DAM AND RESERVOIR

CLAIRVILLE

ONTARIO

I N D E X

	<u>Page</u>
Introduction	3
Site and Geology	3
Summarized Soil Conditions	3
Discussion	4
General	4
Site Suitability	4
Available Borrow Material	4
Dam Cross-Section	5
Foundations - Control Structures	6
Phase II Investigation	6
Site Investigation	6
Borrow Investigation	6
Engineering Analyses	7
Conclusions and Recommendations	7
Personnel	7
Appendix I	
Procedure	II
Soil Conditions	II
Water Conditions	III

## INTRODUCTION

Geocon Ltd has been retained by James F. MacLaren and Associates Limited under the terms of our proposal dated October 19th, 1959 and accepted October 22nd, 1959 to provide soil engineering services necessary for the design of the proposed Clairville Dam and Reservoir on the West Branch of the Humber River. The purpose of Phase I of the site investigation, the results of which are presented in this preliminary report, was to assess, in preliminary form, the relative suitability of the subsoil pattern at two proposed sites for the dam and to present the basis for preliminary design of the dam section.

## SITE AND GEOLOGY

Both of the sites under consideration in this report are located approximately 3/4 miles southeast of the Village of Clairville, Ontario. One site, designated as Site I, is located on the line of the proposed Canadian National Railways Bypass. The alternative site, designated as Site II, is located about 2,000 feet downstream from Site I, and about 400 feet east of where Indian Line crosses the West Branch of the Humber River. The slopes forming the stream valley in this area rise to a height of approximately 40 to 50 feet above the elevation of the stream bed and at a generally moderate angle. A plan of the two sites is shown on Drawing S6998-1 in the pocket at the rear of this report.

From available geological information and previous work in the area, it is known that the ground surface in the area of the proposed dam is generally formed of glacial moraine of the Wisconsin period. The uppermost material of this ground moraine is basal till. In local areas the till is overlain by a thin veneer of loose silts and sands deposited by geologically recent stream action. Underlying the upper till, interglacial sands, gravels, and stratified silts are occasionally encountered. These interglacial deposits and earlier stages of Illinoian till extend to Ordovician shale and limestone bedrock at a depth of the order of 100 to 150 feet below general ground surface.

## SUMMARIZED SOIL CONDITIONS

The floor of the valley at Site I is covered by about 5 to 10 feet of compact to dense brown silt and sand followed by very dense grey silty glacial till. The slopes of the valley are also composed of very dense glacial till. Underlying the till at a depth of about 60 feet below stream level is soft, interbedded shale and limestone bedrock.

At Site II the floor of the valley is underlain by about 8 feet of compact silty sand and gravel followed by soft interbedded shale and limestone bedrock. The slopes of the river valley are composed of very dense grey silty till, followed by bedrock.

Groundwater level at the time of the investigation varied from river level to about elevation 530 near the head of the valley slopes.

Detailed descriptions of the various strata encountered are given in Appendix I, and stratigraphies at the two sites are shown on Drawing S6998-1 in the pocket at the rear of the report.

## DISCUSSION

### General

It is understood that the principal function of the proposed earth fill dam is for flood control in the Humber Valley with a secondary function of providing a reservoir for recreational facilities. In the case of a dam at Site I, it has been proposed that the dam also serve as a river crossing for the proposed Canadian National Railways Bypass. It is further understood that the crest of the dam, about 50 to 60 feet width, would be at about elevation 559, to provide a minimum freeboard of about 4 feet above maximum pond level and that a mass concrete spillway structure about 200 feet in length would be located in the central section of the dam.

### Site Suitability

Based on the results of the investigation, it is considered that either of the sites under consideration would be suitable for the construction of an earth fill dam of the type proposed. Either the very dense silty till underlying Site I or the shale and limestone bedrock underlying Site II would provide stable foundation strata for the central portion of the dam and associated control structures. Detailed consideration of the seepage losses through the foundations is beyond the scope of this report, but it is considered that, at either site, such losses would probably be minor. The possibility of piping failure through the foundations at either site would necessitate further study, but it is considered at this time that this danger is remote and that no extensive special foundation treatment, such as concrete outflow walls or grouting would be required.

### Available Borrow Material

The only borrow material readily available in the area which would be suitable for the construction of an earth fill dam is the glacial till which forms the slopes of the valley.

Provided that strict engineering control is maintained over the construction, as discussed below, it is considered that the silty till would provide a satisfactory fill material for the construction of an earth fill dam.

A detailed borrow examination was not within the scope of Phase I of the investigation, but based on a general reconnaissance of exposed slopes in the area, it is considered that sufficient material for the construction of the dam could be obtained within 500 yards upstream of either site.

From the results of the reconnaissance survey, it is considered that the character of the available borrow would be similar to the very dense silty till encountered in boreholes 1 and 4. The grain size distribution would therefore be approximately that shown on Figure I of Appendix II, indicating that the median grain size of the material would be about 0.25 millimeters. The liquid limit of the borrow would be of the order of 15 percent and the plasticity index would be less than 6.

The compaction characteristics for the borrow would be similar to those shown on Figure I of Appendix III; this compaction curve was obtained from a composite sample of the till and is shown merely as an indication of the probable nature of the material. From this figure it may be inferred that in order to attain suitable compaction in the field, it would be necessary to exercise strict control over water content during construction. Furthermore, based on previous experience with the use of similar materials in dam construction, it would be necessary to place the fill at or slightly below the optimum water content it lifts of about 6 to 8 inches.

#### Dam Cross-Section

Based on the availability of the borrow material adjacent to the site, it is recommended that a homogeneous earth section consisting of silt till be utilized for the dam. For the preliminary design, it is suggested that an embankment slope of 3 horizontal to 1 vertical be employed for the upstream face and those portions of the downstream face subject to possible submergence during flood conditions. Portions of the downstream slope not subject to submergence may be carried up at slopes of  $2\frac{1}{2}$  to 1. A suggested typical dam section for the purpose of preliminary design is shown on Drawing S6998-2 in Appendix IV; the details of this sketch are discussed below.

In order to keep the line of seepage through the dam well within the downstream slope of the dam, it would probably be necessary to provide an under drain extending from the toe to approximately  $\frac{1}{3}$  of the base width. This under drain would be about 4 feet thick, constructed of clean granular material designed to provide free drainage and to prevent entrance of fines from the main dam section. Possible erosion of the toe could be prevented by a rock fill toe drain about 5 feet high.

The upstream slope may be protected by a 1 to 2 feet thick gravel blanket and about 2 feet of rip rap. The rip rap and gravel blanket should probably extend about 50 feet upstream from the junction of the embankment section with the valley slope. It is also suggested that the rip rap and gravel blanket be included on downstream slopes subject to submergence. Downstream slopes above the level of possible submergence could be protected by sodding.

At Site I the earth-fill dam section may be founded on the very dense till. This would require stripping of the overlying silty sand, the average thickness of which may be taken as 5 feet over the site for preliminary estimating.

In the case of a dam at Site II, it is recommended that the embankment section be founded directly on sound bedrock, which appears to be at a reasonable depth across the stream valley. For preliminary purposes, the average thickness of material to be stripped may be taken as 5 feet across the site; however, further definition of the soil stratigraphy would be required for final design. Where the dam embankment rests directly on bedrock, it is recommended that a core trench approximately 5 feet deep and 10 feet wide at the base be constructed in the rock. No serious difficulties in stripping are anticipated at either site, and it is considered that groundwater would be controlled easily by sumps.

At the extremities of a dam at either site where the dam meets the till valley slopes, it is recommended that the till slopes be stripped of weathered material across the width of the dam. This would probably require stripping for a horizontal distance of 10 to 20 feet at each end.

#### Foundations - Control Structures

The mass concrete spillway section may be founded on a concrete mat resting directly on either the till or in sound bedrock, depending on the site. At Site I, it is recommended that the base of the mat be located about 5 feet below the general base level of the earth-fill dam section which would be at about elevation 515. It is further considered that bearing pressures of up to 3.0 tons per square foot may be used for the preliminary design of the spillway structure. Under sustained contact pressure of 3 tons per square foot, it is anticipated that no significant settlement would occur.

With regard to outlet conduits, it is recommended that these be located within the abutments or piers of the spillway structure in order to eliminate the possibility of differential compaction and hence possible cracking of the earth fill sections.

#### PHASE II INVESTIGATION

When the final site has been selected and a preliminary design of the dam has been adopted, a detailed site and borrow investigation should be carried out to obtain the detailed information required for the final design of the dam and to ensure that no unusual site conditions exist in local areas. Based on the results discussed in this report, it is considered that the scope of the detailed investigation should include the following:

##### Site Investigation

- (1) Approximately 5 detailed exploratory borings in BX size would be required along the centre line spaced in order to supplement and extend the information obtained in the boreholes of the preliminary phase. These boreholes would be taken to bedrock, and soil samples would be taken at vertical intervals not exceeding 5 feet. Falling head permeability tests would also be carried out at frequent intervals in each borehole, and where rock is encountered near ground surface pressure pumping tests would be carried out in the rock.
- (2) Approximately 8 short power auger holes would be required within the area of the dam site and spaced to supplement the detailed boreholes in order to define in detail the amount of stripping of previous recent deposits.
- (3) Laboratory tests would be carried out on samples obtained in the boreholes, as required, in order to define the strength, compressibility, and permeability of the foundation strata.

##### Borrow Investigation

- (1) Approximately 12 power auger holes would be required to define a suitable borrow area. It is considered that these would be generally less than 30 feet in depth, and representative samples would be taken at frequent intervals for identification and laboratory determination of engineering properties.



- (2) The power auger holes would be supplemented by 3 to 5 test pits dug with a backhoe to enable detailed examination of any stratification in the borrow area and to obtain bulk samples for laboratory testing.
- (3) Laboratory testing would be carried out to define the characteristics of the borrow material, its compaction properties, and its strength and permeability properties when compacted.

### Engineering Analyses

Analyses would be carried out, as required, to determine the extent of seepage losses through and under the dam, and to determine the most economical, stable dam cross-section possible under the existing conditions and with the available borrow material.

### CONCLUSIONS AND RECOMMENDATIONS

1. The central portion of Site I on the line of the proposed Canadian National Railways Bypass was found to be underlain by about 1 foot of topsoil, followed by an average of about 5 feet of compact to dense silty sand, and then very dense silt till. Shale and limestone bedrock is at a depth of about 60 feet below stream level. The central portion of Site II is underlain by less than 10 feet of silty sand and gravel followed by bedrock. At both locations, the stream valley slopes are composed of very dense silty till.

2. It is concluded that either site would be suitable for the proposed dam, and that major stability or seepage problems would be unlikely.

3. It is considered that the deposits of silty till located within 500 yards of either site would be suitable for the construction of an earth fill dam as discussed in the report.

4. Based on the general properties of the available borrow material, it is recommended that the proposed dam be a homogeneous earth fill section, and pertinent preliminary design considerations for such a section are discussed in the report.

5. Recommendations are also given in the report for the preliminary foundation design of control structures for the proposed dam.

6. Detailed recommendations for the detailed site and borrow investigation which will be required to provide the data for final design of the dam are given in the report.

### PERSONNEL

The field work was carried out by Mr. J. N. Beckett under the supervision of Mr. J. L. Seychuk and Mr. A. A. Gass. The report was written by Mr. A. A. Gass and reviewed by Mr. V. Milligan.

A. A. Gass, P. Eng.

## APPENDIX I

Procedure

Soil Conditions

Water Conditions

Office Reports on Soil Exploration.

## PROCEDURE

The field work was commenced on October 28th, 1959 and completed on November 24th 1959. Four boreholes were put down, numbers 1 and 2 at Site I and numbers 3 and 4 at Site II, to a maximum depth of 67 feet using a standard skid-mounted machine drillrig. In-situ falling head permeability tests were carried out in the cased borings at 5 foot intervals of depth. Bed-rock, where encountered was core drilled in AXT size. The location of the borings is shown on Drawing S6998-1, contained in a pocket at the rear of this report. The soil stratigraphy inferred from these borings and borings put down by others is also shown on this drawing. Detailed logs of the boring put down are given on the Office Reports on Soil Exploration in this Appendix.

The soil testing was carried out in the Toronto Soils Laboratory of Geocon Ltd and the results are plotted on the Figures in Appendices II and III. The results of the in-situ field falling head permeability tests are plotted on the Office Reports on Soil Exploration.

Elevations given in this report were supplied by James F. MacLaren Associates and are referred to the Toronto Township datum.

## SOIL CONDITIONS

The main soil Strata encountered by the borings are as follows:

### Topsoil

Site I and Site II are generally covered by about 1 foot of brown sandy topsoil.

### Silty Sand and Gravel

Underlying the topsoil in the central portion of the river valley at Site I is a stratum of brown silty sand. The thickness of the stratum, which was encountered in borehole 2, is about 4 feet. Based on boring information supplied by others, the stratum has a maximum thickness of 7 feet. At Site II a similar stratum having a thickness of about 8 feet was encountered in borehole 3. In addition to the silt and sand as at Site I, the stratum contains an appreciable proportion of gravel. Geologically, it is considered that these strata are recent flood plain deposits.

From boring resistance and the result of a standard penetration test which gave an "N" value of 17 blows per foot, it is estimated that the stratum is compact to dense at Site I and loose to compact at Site II.

### Silty Till

Underlying the recent flood plain deposits at Site I and the topsoil on the river valley slopes at both sites is a stratum of glacial silty till. The stratum generally consists of well graded gravel to silt sizes as shown in Figures 1 and 2 of Appendix II. In about the upper 20 feet in borehole 2, the stratum consists predominantly of clayey silt as shown by the grain size distribution curve for sample 4 in Figure 2, Appendix II. The individual particles of the till are generally subangular in shape.

The coefficient of permeability computed from the in-situ field falling head permeability tests varied from a value indicating a practically impermeable material to a maximum value of  $5 \times 10^{-9}$  centimeters per second, but generally less than  $1 \times 10^{-9}$  centimeters per second. Based on these results the permeability of the stratum is generally low, with the occasional higher values indicating local pockets of coarser and more pervious material within the till.

Standard penetration or "N" values obtained within the stratum were generally in excess of 100 blows per foot, confirming that the till is of very dense relative density.

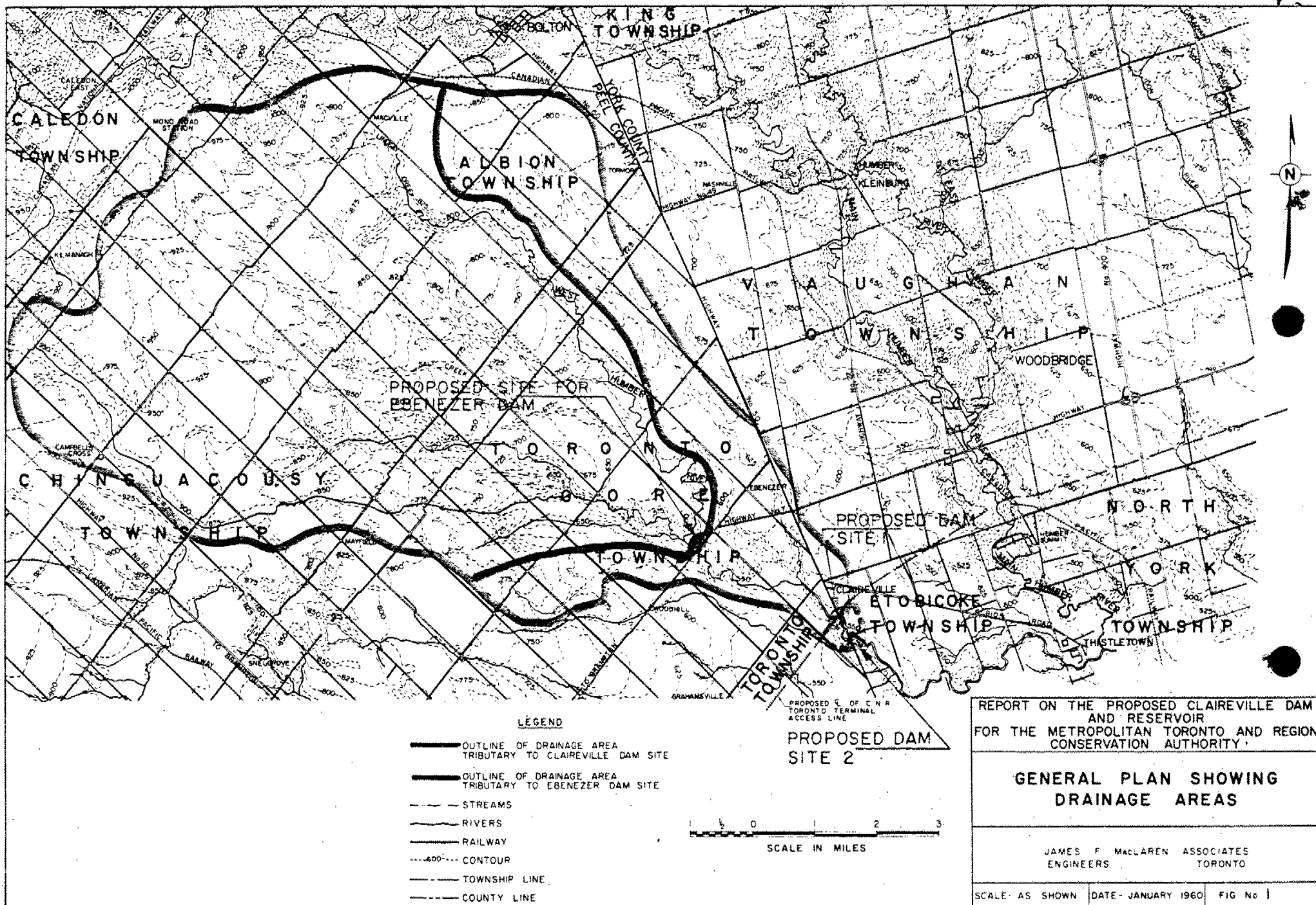
#### Shale and Limestone Bedrock

Bedrock underlies the silty sand and gravel at Site II and the very dense till at both sites. The rock was cored in AXT size for 5 feet in boreholes 1 and 4 and for 10 feet in borehole 3, and was found to consist of soft grey shale with bands of limestone up to about 6 inches in thickness. The shale is generally vertically fissured and the top  $1\frac{1}{2}$  to 2 feet of the bedrock is weathered.

Bedrock was encountered at about elevation 468 in borehole 1, elevation 516 in borehole 3 and elevation 503 in borehole 4.

#### WATER CONDITIONS

Groundwater level at the time of the investigation varied from river level in the valley to about elevation 530 along the slopes of the valley at both sites.





Ontario

To

Action  
Memo

Time

Date

From

Murtu → Malcolm

Cam

<input type="checkbox"/> Phoned	<input type="checkbox"/> Please Call	<input type="checkbox"/> Will Call Back	Telephone No.
<input type="checkbox"/> On Hold	<input type="checkbox"/> Returned Your Call	<input type="checkbox"/> Wishes Appointment	
<input type="checkbox"/> Waiting in Person	<input type="checkbox"/> Was Here	<input type="checkbox"/> Will Return	Message Taken By

<input type="checkbox"/> File	<input type="checkbox"/> Draft Reply For My Signature	<input type="checkbox"/> Provide More Details	<input type="checkbox"/> For Your Information
<input type="checkbox"/> Type Draft	<input type="checkbox"/> For Your Approval and Signature	<input type="checkbox"/> Keep Me Informed	<input type="checkbox"/> Per Discussion
<input type="checkbox"/> Type Final	<input type="checkbox"/> Circulate, Initial and Return	<input checked="" type="checkbox"/> Take Appropriate Action <i>Please</i>	<input type="checkbox"/> Per Your Request
<input type="checkbox"/> Make _____ Copies	<input type="checkbox"/> Return With Comments	<input type="checkbox"/> Note and See Me	<input type="checkbox"/> Returned With Thanks
<input type="checkbox"/> Please Answer	<input type="checkbox"/> Investigate and Report	<input type="checkbox"/> Note and Return	<input type="checkbox"/>

Comments:

Malcolm told me about this, maybe a Property damage report should be filled out.

Copy for the information of

C. MIRZA

Mr. H.A. Aron, Head,  
Property Section,  
Central Region.

Planning and Design Section,  
Central Region.

1978-10-27

Highway 407, Town of Vaughan between  
Kipling Avenue and Islington

As discussed with you on the telephone, I had a call from a property owner by the name of Mr. Ken McKay, who was somewhat upset that the Ministry staff had entered upon his property, cutting a fence and not replacing it. He alleged that it was a party from the Soils Office that came in with equipment to carry out boring work and was under the supervision of Mr. Malcolm Maclean, who works under Mr. Cam Mirza from Head Office. The entry was alleged to be from the old Kipling Road allowance through lands owned by the Metropolitan Conservation Authority and then cut the fence into his property to carry out the work. This property lies between Kipling and the CPR west of the Humber River. He has requested that the fence be repaired immediately.

Would you please look into this matter and arrange to either compensate or have the fence repaired.

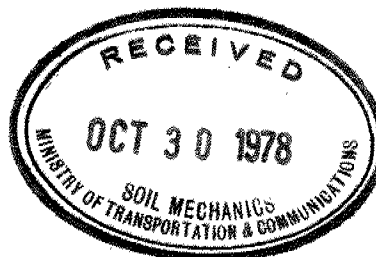
For your information, the Highway 407 work in this area is tentatively programmed for 1981 and lands will be required from Mr. McKay for the construction of Highway 407. It is likely that we will have considerable difficulty in settling with this particular land owner as I have known him for some years. Both the CNR and the Conservation Authority had a really difficult time in settling their takings.

Property damage report  
filled out Oct 26, 78.

Property under concern was  
understood to be under jurisdiction  
of Conservation Authority and hence  
no prior permission was obtained  
for access M M  
RGB/phw

Original Signed by  
R. G. BURNFIELD  
R. G. Burnfield,  
Regional Design Engineer.

cc: W.C. Friedmann  
R.D. Gunter  
C. Mirza ✓  
G.C.E. Burkhardt  
J.G. Celmins





Ontario

## ACTION REQUEST

7540-1037 (2-72)

DATE

79-03-28

TO

Mr. M. MacLean

FROM

K. Higgins

TELEPHONE NO.

☐

— PLEASE CALL

☐— WISHES  
APPOINTMENT☐— RETURNED  
YOUR CALL☐— WILL  
CALL BACK☐— NOTE AND  
FILE☐— PROVIDE  
MORE DETAILS— PLEASE  
ANSWER☐— NOTE AND  
FORWARD☒— FOR YOUR  
INFORMATION— DRAFT REPLY FOR  
MY SIGNATURE☐— NOTE AND  
RETURN☐— FOR YOUR  
APPROVAL— INVESTIGATE AND  
REPORT☐— NOTE AND  
SEE ME☐

— SIGNATURE

— TAKE APPROPRIATE ACTION

☐— RETURN  
WITH COMMENTS☐— PER YOUR  
REQUEST☐

COMMENTS:

Profiles at Hwy 427 at Morningstar Drive enclosed. This is further to our letter of 79-03-28 to Proctor & Redfern.

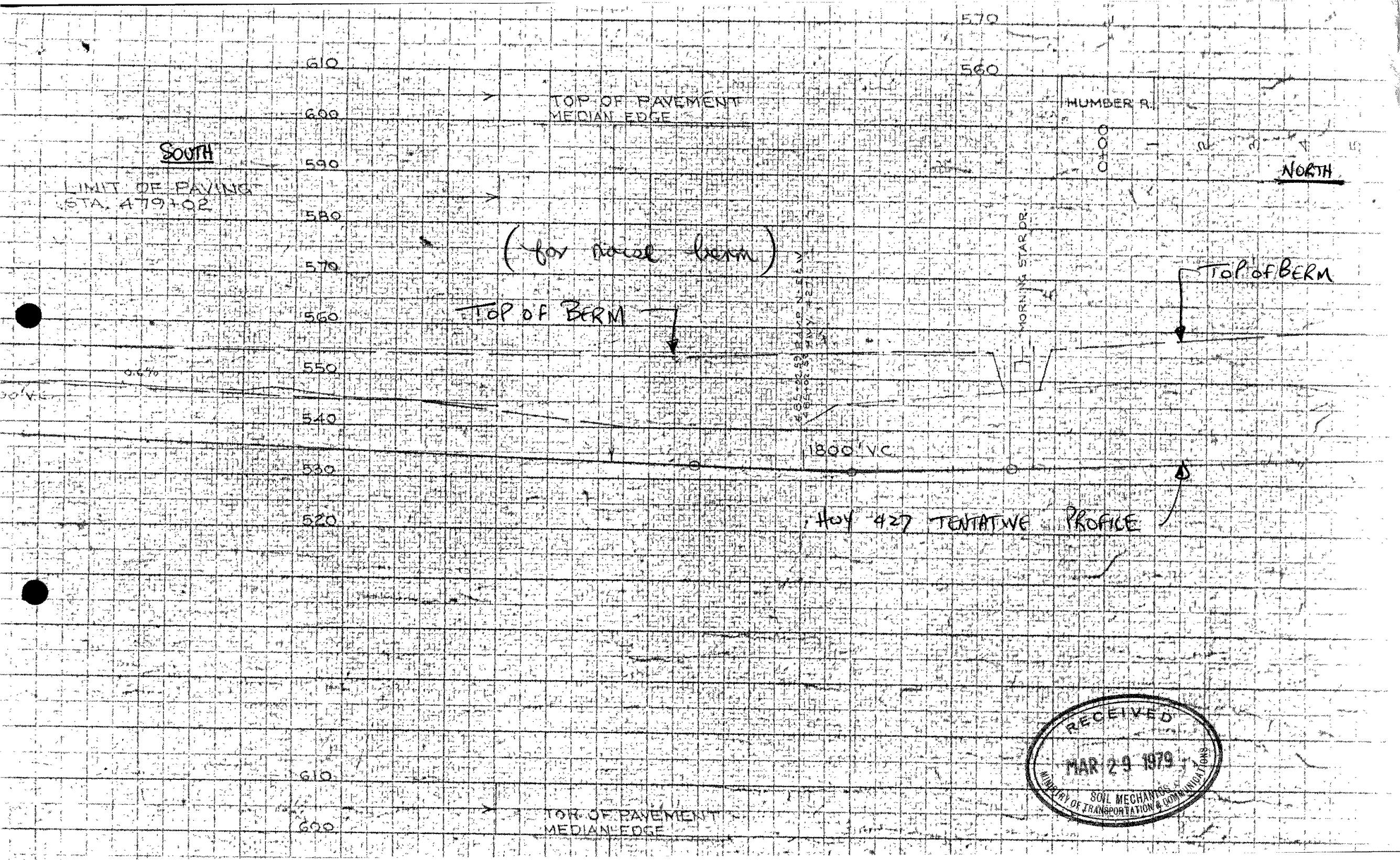
CALL TAKEN BY:

TIME

Please take no further action if you agree with our recommendations.

6-4030





EXISTING PAV'T

HST

TENTATIVE GRADE ONLY

C&ST

400' V.C.

500' V.C.

1.5%

3.8%

HWY 427  
S.B.

HWY 427  
N.B.

MORNING STAR DR.

20' HIGH PRESSURE  
GAS LINE

590  
580  
570  
560

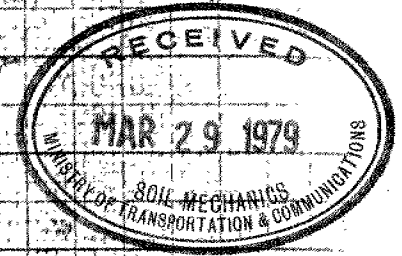
560  
550  
540  
530  
520

EXIST. PAV'T

1800' V.C.

TOP OF PAVEMENT  
MEDIAN EDGE

NUMBER R.



October 5, 1978

Ministry of Transportation  
and Communications  
Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building  
1201 Wilson Avenue  
Downsview, Ontario  
M3M 1J8

Attention: Mr. M. MacLean  
Project Engineer

Re: Proposed Subsurface Investigation  
Highway No. 407 Crossing Regional Roads  
File: 13.04.11

Dear Sir:

We acknowledge receipt of your letter dated October 2, 1978 requesting permission to locate boreholes on the Regional Road allowance at the proposed crossing of Highway No. 407 and Jane Street, Weston Road, Pine Valley Drive and Islington Avenue.


Permission is hereby granted to carry out the work subject to the following conditions.

1. The Ministry agrees to indemnify and save harmless the Regional Municipality of York from any claims arising out of the work as outlined.
2. The Ministry shall obtain all utility stake-outs as required.
3. Any area disturbed within the road allowances will be restored upon the completion of the work.

Yours truly,

WEB/pk



  
W. E. Bando, P. Eng.  
Operations Engineer

WPA#?

Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building  
1201 Wilson Avenue  
Downsview, Ontario  
M3M 1J8

Tel: (416) 248-3282

October 2, 1978

Mr. W. Bando  
Operations Engineer  
Regional Municipality of York  
Box 296  
Newmarket, Ontario  
L3Y 4X1

Dear Sir:

In response to our telephone conversation of October 2, 1978, we are hereby informing you of our intentions and request permission to carry out the required subsurface investigation.

Our work is in connection with the proposed Hwy. 407 crossing Jane Street, Weston Road, Pine Valley Drive and Islington Avenue (please find attached sketch of subject areas). The fieldwork consists of augering and sampling (6" diameter hole) through the overburden to a competent bearing stratum. Upon completion of each boring the borehole will be backfilled. At this stage in the design only one borehole is contemplated at each of the aforementioned locations.

Under our present schedule for fieldwork we intend to commence work in this area sometime within the last week in October.

The Ministry agrees to save the Region harmless from any claims arising out of the work as outlined above.

If you have any questions concerning the above please contact us. Thank you for your cooperation in this matter.

Yours truly,

M. MacLean  
Project Engineer

MM/gs

Attach.

bcc: Files

ABRAMS

Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building  
1201 Wilson Avenue  
Downsview, Ontario  
M3M 1J8

Tel: (416) 248-3282

September 29, 1978

Mr. Abrams  
Department of Roads and Traffic  
Municipality of Metro Toronto  
30th Floor, Simpson Tower  
401 Bay Street  
Toronto, Ontario  
M5H 2Y4

Dear Sirs:

In response to our telephone conversation of September 29, 1978, we are hereby informing you of our intentions and request permission to carry out the required subsurface investigation.

Our work is in connection with the proposed Hwy. 427 crossing Albion Road (attached please find a sketch of subject area). The fieldwork would be performed off the highway so as not to interfere with traffic and would consist of augering and sampling one hole through the overburden to establish a competent bearing stratum for the proposed structures. Under our present schedule for fieldwork we intend to commence work in this area in mid October. The duration of our work in this area is not expected to exceed two days.

The equipment used will be rented from a private soil sampling firm operating within the Toronto area and will be directly supervised by our office. Upon completion of each boring the auger hole will be backfilled.

Your cooperation in this matter is appreciated. Thank you for your trouble.

Yours truly,

M. MacLean  
Project Engineer  
MM/gs

ROSS L. CLARK  
B.A. SC., P. ENG.  
COMMISSIONER OF WORKS



ADDRESS ALL  
CORRESPONDENCE  
TO THE COMMISSIONER

Att'n. Mr. G.A. Kelly  
TELEPHONE: 367-8286  
TELEX: 06 234 72

## THE MUNICIPALITY OF METROPOLITAN TORONTO

DEPARTMENT OF WORKS  
PHOENIX HOUSE  
439 UNIVERSITY AVE., TORONTO  
M5G 1Y8

September 20, 1978

Ministry of Transportation  
and Communications  
Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building  
1201 Wilson Avenue  
Downsview, Ontario  
M3M 1J8

Attention: Mr. M. MacLean  
Project Engineer

THACKERAY LANDFILL SITE  
OUR FILE NO. 1621.00

We acknowledge receipt of your letter dated September 14th,  
and your request to carry out soil borings on the above mentioned  
landfill site.

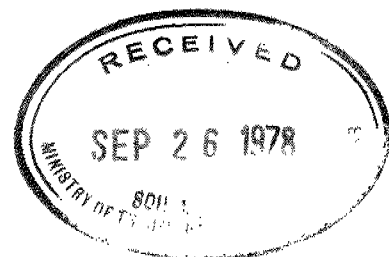
We have no objection to the proposal contained in your letter,  
providing the Ministry saves the Metropolitan Corporation  
harmless from any claims which may arise out of the work being  
done and, further, agrees to restore any damaged areas to  
their former condition.

Before proceeding with the work, please contact our Mr. Don  
Duncliffe (telephone 839-9876) who will arrange for your entry  
onto and through the site.

A handwritten signature in dark ink, appearing to read "I. McKerracher".

I. McKerracher, P.Eng.,  
Director - Refuse Disposal Division

GAK:bs 33982



PLEASE  
QUOTE OUR  
FILE No.  
IN REPLY



Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building  
1201 Wilson Avenue  
Downsview, Ontario  
M3M 1J8

Tel: (416) 248-3282

September 14, 1978

Mr. G.A. Kelly  
Assistant Director  
Refuse Disposal  
Work Department of Metro Toronto  
439 University Avenue  
Toronto, Ontario

Dear Mr. Kelly:

In response to our conversation of September 14, 1978, we are hereby informing you of our intentions and request approval for a subsurface investigation to be carried out in the vicinity of the ThackerayLand Fill Site.

Our work is in connection with the proposed Hwy. 407 located to the north of the ThackerayLand Fill Site (attached please find a sketch of subject area and approximate locations of our work areas). The fieldwork consists of augering and sampling (6" diameter hole) through the overburden to a competent bearing stratum. At this time we are in the feasibility stage of design and hence only one borehole is contemplated at each of the locations marked. Under our present schedule for fieldwork we intend to commence work in this area sometime within the first week in October. The duration of our work here is not expected to be more than three 10 hour days.

The equipment used will be rented from a private soil sampling firm operating within the Toronto area and will be directly supervised by our office. Upon completion of each boring the borehole will be backfilled. However, subsidence may occur in the future and it is suggested the boreholes be rechecked to ensure hazards do not exist.

We would require permission to enter the ThackerayLand Fill Site to put one boring down south of the C.N.R. tracks

cont'd.....

(as shown on attached plan). Further, we would require permission to gain access to the property to the north of the C.N.R. through the Thackeray Land Fill Site.

Your cooperation in this matter is appreciated. Thank you for your trouble.

M. MacLean  
Project Engineer

MM/gs

Attach.

cc: Files



Soil Mechanics Section  
Engineering Materials Office  
Room 315, Central Building  
1201 Wilson Avenue  
Downsview, Ontario  
M3M 1J8

Tel: (416) 248-3282

September 14, 1978

Metropolitan Toronto and Region  
Conservation Authority  
5 Shoreham Drive  
Downsview, Ontario  
M3N 1S4

Attn: Mr. J. Agnew

Dear Sir:

Further to our telephone conversation of September 14, 1978, please find attached two plans showing the proposed boreholes located within the Claireville Conservation Area and within the Conservation Authority's property to the north of the Thackeray Land Fill site.

At this time we are in the feasibility stage of design and hence only one borehole is contemplated at each of the locations marked.

Under our present schedule for fieldwork we will be performing the work sometime within the first week in October. As requested we will contact your field personnel at the Claireville Conservation Area giving a 24 hour notice of our intention to work there.

The equipment used will be rented from a private soil sampling firm operating within the Toronto area and will be directly supervised by our office. Upon completion of each boring the borehole will be back-filled. However, subsidence may occur in the future and it is suggested that the boreholes be rechecked to ensure hazards do not exist.

cont'd.....

If you require any further information or have any further requests please contact our office.

Thank you for your trouble.

Yours very truly,

M. MacLean  
Project Engineer

MM/gs

cc: Files ✓

Attach.



## Memorandum

To: Mr. M. Devata,  
Supervising Engineer,  
Soils Mechanics Section,  
Central Building, Downsview.

From: G.C.E. Burkhardt,  
Structural Section,  
Central Region.

Attention: Mr. M. MacLean

Date: 1978-09-11

Our File Ref.

In Reply to

Subject: RE: Feasibility Study,  
Hwy. 407 - Airport Rd. to Jane St. (incl. Hwy. 400),  
W.P. 88-78-00, Hwy. 427 - Finch Ave. to Hwy. 407 -  
W.P. 49-71-00, District 6, Toronto

Further to our meeting of 1978-09-08, two sets of plans and profiles for the proposed section of Highway 407 from Airport Road to Jane Street, and the section of Highway 427 north of Finch Avenue were submitted to Mr. MacLean of your office today.

The following is a description of some of the areas shown on the plans. It is not known whether any soils information is available for the existing structures at areas A5 and A23:

- A5 - This area is circled for two separate structures, plus probable widening of the existing structure. The site number of the existing municipal bridge on Steeles Avenue (built 1963) is 24-160.
- A15 - The Thackeray Land fill site is located in the southeast quadrant of this area. The C.N.R. tracks would be detoured during construction, and it would be helpful if some recommendations could be provided on the detour location.
- A23 - The existing structure (Site 37-125) was built in 1950, and will be replaced.
- A25 - The existing structure (Site 37-269) was built in 1961. Soils information is available in report BA 1000, and new structures will be built for the ramps.
- A26 - No plan or profile is available for the proposed structure at Langstaff Road (approximately 1¼ miles north of Highway 7). Langstaff Road will go over Highway 400, and information on a preliminary profile will be available shortly.

A foundation investigation report W.O. 70-11099 is available for a proposed sewer in the northwest quadrant of the proposed Highway 400/407 interchange.



As agreed, please provide your preliminary recommendations for the proposed structures, indicating the feasibility of the proposed schemes. Preliminary recommendations are expected by 1979-11-01, and the final report by 1979-12-01.

Please contact this office if any further information is required.



K. Pilgrim,  
Senior Structural Engineer,  
for:  
G.C.E. Burkhardt,  
Head, Structural Section.

KP:gj

c.c. L. Dutchak  
G. Norman  
R.D. Gunter  
P. MacLeod - Giffels

CONT No  
WP No 88-78-00



HWY 407 AIRPORT RD TO JANE ST.  
HWY 427 FINCH AVE TO PLUMMER ST. CR  
HWY 400 CNR HALTON TO LANESIDE RD.  
BORHOLE LOCATIONS & SOIL STRATA

- OLDER ALLUVIUM SANDS SILTS & GRAVELS ON ELEVATED TERRACE REMNANTS
- MODERN ALLUVIUM SILT SAND & GRAVEL
- DELTAIC & LACUSTRINE SAND SOME SILT & GRAVEL
- HALTON TILL BROWN LOAM TO SILT LOAM TILL
- LACUSTRINE WILD FIELD TILL COMPLEX STRATIFIED OR NON-STRATIFIED SILT LOAM SILTY CLAY LOAM OR CLAY DEPOSITS

HWY 407 427 400  
SURVEYED BY M. J. H. CHECKED BY M. J. H. DATE 11/11/88 SITE 88780-00  
DRAWN BY M. J. H. CHECKED BY M. J. H. DATE 11/11/88

CONT No  
W P No. 88-78-00



HWY 407 AIRPORT RD TO JANE ST  
HWY 427 FINCH AVE TO PLUNKETT CR  
HWY 400 CNR HALTON TO LANDSCAPE RD  
BORING LOCATIONS & SOIL STRATA

- OLDER ALLUVIUM SANDS SILTS & GRAVELS ON ELEVATED TERRACE REMNANTS
- MODERN ALLUVIUM SILT SAND & GRAVEL
- DELTAIC & LACUSTRINE SAND SOME SILT & GRAVEL
- HALTON TILL BROWN LOAM TO SILT LOAM TILL
- LACUSTRINE WILD FIELD TILL COMPLEX; STRATIFIED OR NON-STRATIFIED SILT LOAM SILTY CLAY LOAM OR CLAY DEPOSITS

HWY 407 AIRPORT RD TO JANE ST  
BORING IN CHECKED BY DATE 78 12 18  
DRAWING CHECKED BY DATE 78 12 18  
DWS 427800-3

