

G.I.-30 SEPT. 1976

GEOCRES No. 30M4-74DIST. C.R. REGION W.P. No. 335-89-00CONT. No. W. O. No. STR. SITE No. HWY. No. Q.E.W.LOCATION Q.E.W. ~ Design/Build
Casa Blanca Blvd. to Victoria AveNo of PAGES - =====OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

**PRELIMINARY GEOTECHNICAL INVESTIGATION
CULVERT AND BRIDGE STRUCTURES
QUEEN ELIZABETH WAY
ROBERTS RD. TO ONTARIO ST.
GRIMSBY, ONTARIO
MTO W.P. 80-76-00**

WP 335-89-00

Ref. No. G-94.0107
March 1994

Prepared for:

Ministry of Transportation
Foundation Design Section
Room 315, Central Building
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Downsview, Ontario
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Distribution

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30M4-74
GEOCRES No.

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M.T.O. W.P. 80-76-00

PRELIMINARY GEOTECHNICAL INVESTIGATION
CULVERT AND BRIDGE STRUCTURES
QUEEN ELIZABETH WAY
ROBERTS ROAD TO ONTARIO STREET
GRIMSBY, ONTARIO

1.0 INTRODUCTION

The investigation described in this report was carried out at the request of the Ministry of Transportation, Central Region, Foundation Design Section. The terms of reference for the investigation were provided by the Ministry. The purpose of the investigation was to provide factual geotechnical data for the preliminary design and the costing of twenty three (23) culvert and two (2) bridge structures. These structures are located along an approximately 8 km long section of the Queen Elizabeth Way in Grimsby, Ontario.

The scope of the investigation was agreed on with MTO to consist of drilling two (2) boreholes at each culvert location to a depth of 6 m below the invert level of the culverts, and two (2) boreholes at each of the bridge structure sites. These were to be extended to auger refusal.

.../...

2.0 FIELD INVESTIGATION

The boreholes were put down between February 1 and March 2, 1994, using a track mounted power auger drill rig. A senior technician from Geo-Canada Ltd. supervised the field work. He laid out the boreholes in the field, recorded their locations and elevations, kept a record of the boreholes, and directed the sampling and field testing.

In the boreholes, samples were taken by the standard penetration test (SPT) method. The frequency of sampling in the boreholes for the culverts was at 0.76 m intervals of depth from invert level to 3 m below invert, and at 1.5 m intervals elsewhere. In the boreholes put down at the bridge sites, soil samples were taken at 0.76 m intervals in the upper 3 m, and at 1.5 m intervals at greater depth. Where soft to firm cohesive soils were encountered, in situ vane shear tests were performed in the boreholes to evaluate the undrained shear strength of the soil.

Next to each borehole, a dynamic cone penetration test was performed from the ground surface or below the upper frozen zone of the ground to refusal. Refusal was defined as 100 blows or more per 0.3 m of penetration.

Plate Nos. C3-11 to C3-16 attached to this report show the borehole locations. The borehole locations in terms of coordinates and ground surface elevations at each culvert/bridge site are summarized in Table 1.

.../...

TABLE 1
BOREHOLE SCHEDULE

<u>Structure</u>	<u>Borehole</u>	<u>Co-ordinates</u>		<u>Elevation (m)</u>
		<u>North</u>	<u>East</u>	
WC 136-16	101	4,786,652	298,071	84.2
	102	4,784,695	298,087	83.9
WC 136-17	103	4,784,619	298,173	84.8
	104	4,784,663	298,181	84.3
WC 136-18	105	4,784,473	298,611	87.3
	106	4,784,509	298,636	87.1
WC 136-19	107	4,784,421	298,767	88.7
	108	4,784,467	298,764	88.1
WC 136-20	109	4,784,277	299,165	89.6
	110	4,784,331	299,183	88.4
WC 136-21	111	4,784,042	299,922	82.0
(14 Mile Creek Bridge)	112	4,784,077	299,925	79.5
WC 136-22	113	4,783,887	300,363	81.5
	114	4,783,930	300,386	80.1
WC 136-23	115	4,783,713	300,867	86.4
	116	4,783,769	300,884	86.6
WC 136-24	117	4,783,636	301,114	86.2
	118	4,783,680	301,127	86.1
WC 136-25	119	4,783,546	301,395	85.0
	120	4,783,590	301,398	84.3
WC 136-26	121	4,783,498	301,534	84.6
	122	4,783,541	301,544	84.2
WC 136-27	123	4,783,453	301,668	85.2
	124	4,783,508	301,645	85.4
WC 136-28	125	4,783,380	301,890	87.3
	126	4,783,421	301,903	86.9
WC 136-29	127	4,783,320	302,076	87.5
	128	4,783,361	302,083	87.8
WC 136-30	129	4,783,251	302,269	88.3
	130	4,783,300	302,294	89.6
Bartlett Ave. Bridge	131	4,783,133	302,815	91.8
	132	4,783,119	302,877	92.1
WC 136-31	133	4,783,027	303,102	89.4
	134	4,783,106	303,097	91.6
WC 136-32	135	4,783,020	303,662	89.9
	136	4,783,067	303,660	89.1

.../...

TABLE 1 (Cont'd)
BOREHOLE SCHEDULE

<u>Structure</u>	<u>Borehole</u>	<u>Co-ordinates</u>		<u>Elevation (m)</u>
		<u>North</u>	<u>East</u>	
WC 137-01	137	4,783,025	304,074	88.2
	138	4,783,072	304,090	87.6
WC 137-02	139	4,783,027	304,319	87.4
	140	4,783,069	304,352	87.1
WC 137-03	141	4,783,029	304,578	85.6
	142	4,783,072	304,572	85.6
WC 137-04	143	4,783,031	304,988	84.1
	144	4,783,075	305,018	84.2
WC 137-05	145	4,783,036	305,407	84.5
	146	4,783,079	305,407	84.6
WC 137-06	147	4,783,026	305,982	82.1
	148	4,783,077	306,008	81.6
WC 137-07	149	4,783,008	306,197	83.2
	150	4,783,073	306,168	82.4

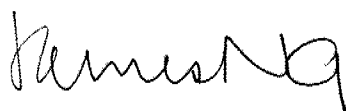
.../...

The borehole elevations were obtained by levelling, using the centre line elevations shown on the profile drawings of the highway provided to us by MTO. The elevations are, therefore, approximate with an estimated accuracy of 0.2 m.

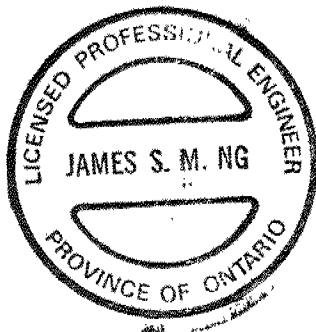
3.0 LABORATORY TESTS

The soil samples were transported to our laboratory, where they were re-examined by a senior engineer. Representative samples at each structure location were selected for laboratory testing. The testing program included natural moisture contents, particle size analyses, and consistency (Atterberg) limit tests. The results of the tests are shown on the borehole logs attached to this report.

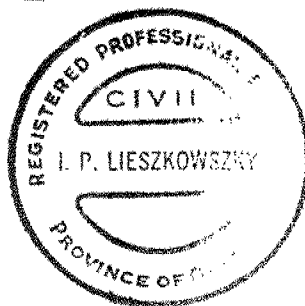
GEO-CANADA LTD.



James Ng, P. Eng.




Ivan P. Lieszkowszky, P. Eng.

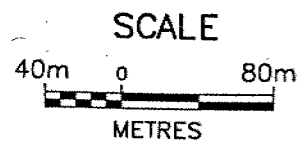
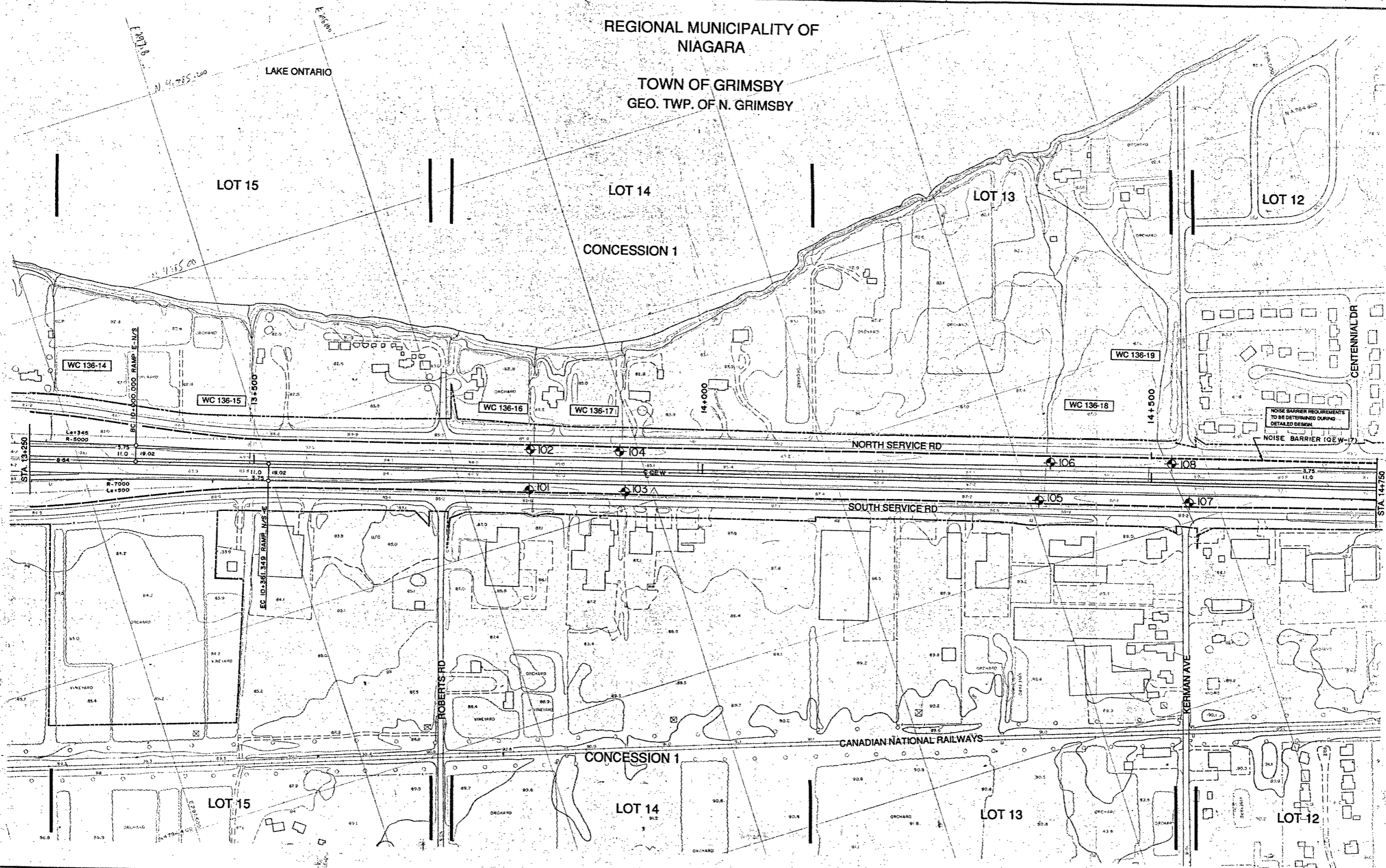


JN/IPL:sf

ENCLOSURES

REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF GRIMSBY
GEO. TWP. OF N. GRIMSBY



LEGEND

- FLOODPLAIN LINE
- FILL LINE
- EXISTING PROPERTY
- PROPOSED CAH
- PROPERTY ACQUISITION

QUEEN ELIZABETH WAY
PRELIMINARY DESIGN STUDY
W.P. 80-76-00

INITIAL PHASE
STA. 13+250 TO STA. 14+750

PLATE
C3-11

REGIONAL MUNICIPALITY OF
NIAGARA
TOWN OF GRIMSBY
GEO. TWP. OF N. GRIMSBY

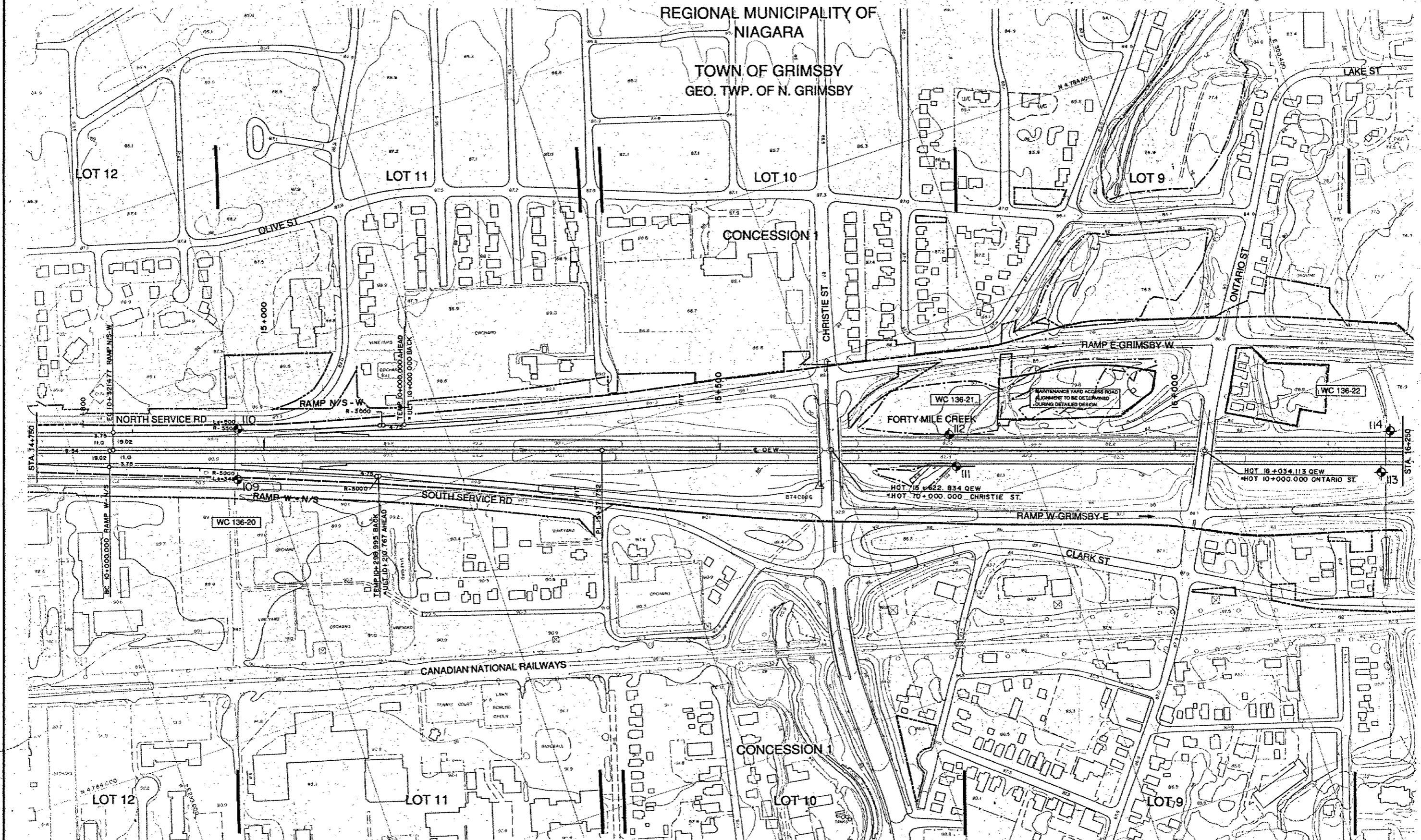


PLATE
C3-12

INITIAL PHASE
STA. 14+750 TO STA. 16+250

QUEEN ELIZABETH WAY
PRELIMINARY DESIGN STUDY
W.P. 80-76-00

LEGEND

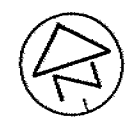
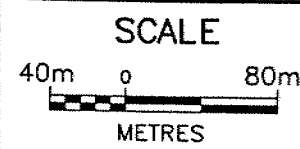
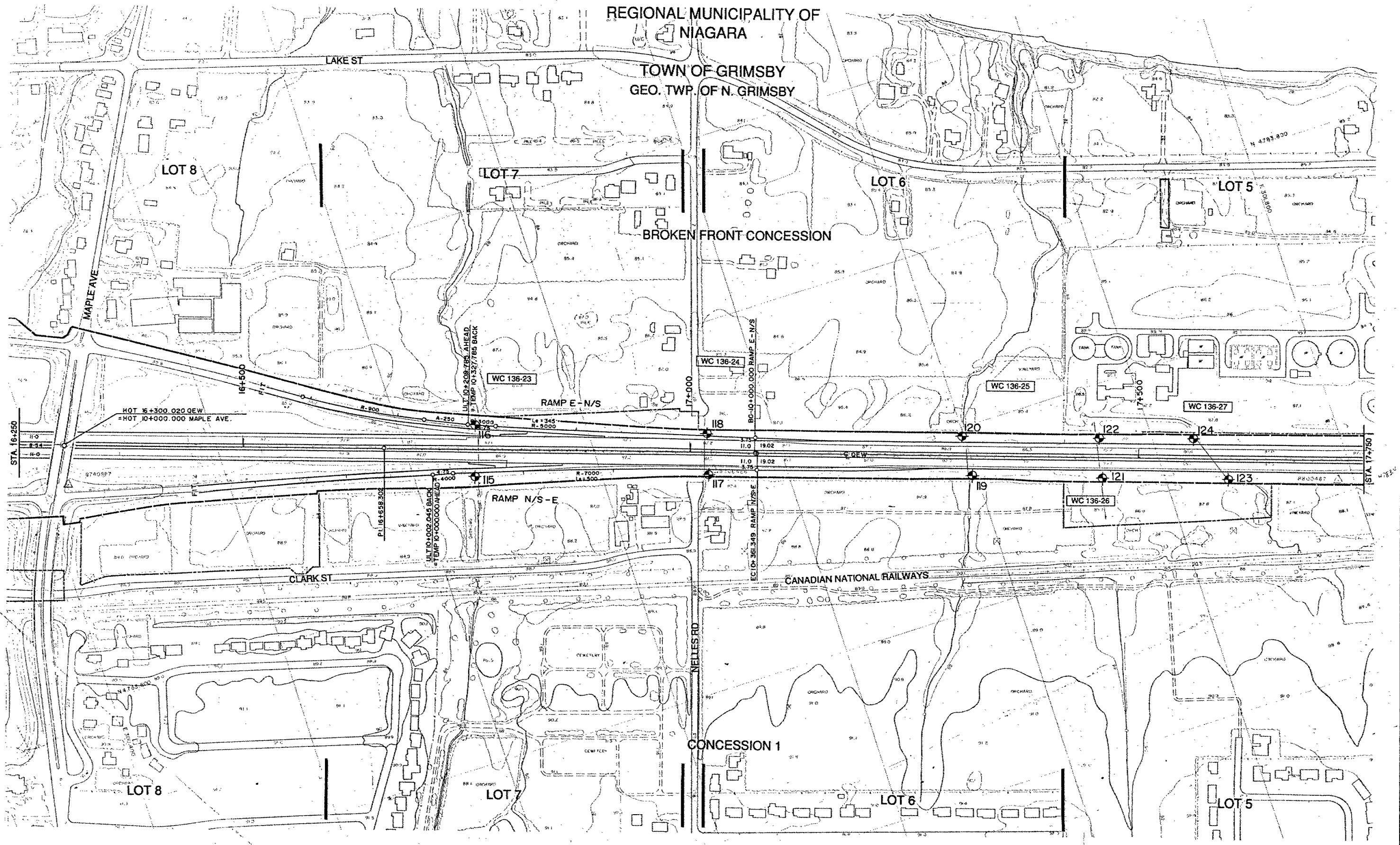
- FLOODPLAIN LINE
- FILL LINE
- EXISTING PROPERTY
- PROPOSED CAH
- PROPERTY ACQUISITION



SCALE
40m 0 80m
METRES

REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF GRIMSBY
GEO. TWP. OF N. GRIMSBY



- LEGEND
- FLOODPLAIN LINE
 - FILL LINE
 - EXISTING PROPERTY
 - PROPOSED CAH
 - PROPERTY ACQUISITION

QUEEN ELIZABETH WAY
PRELIMINARY DESIGN STUDY
W.P. 80-76-00

INITIAL PHASE
STA. 16+250 TO STA. 17+750

PLATE
C3-13

REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF GRIMSBY
GEO. TWP. OF N. GRIMSBY

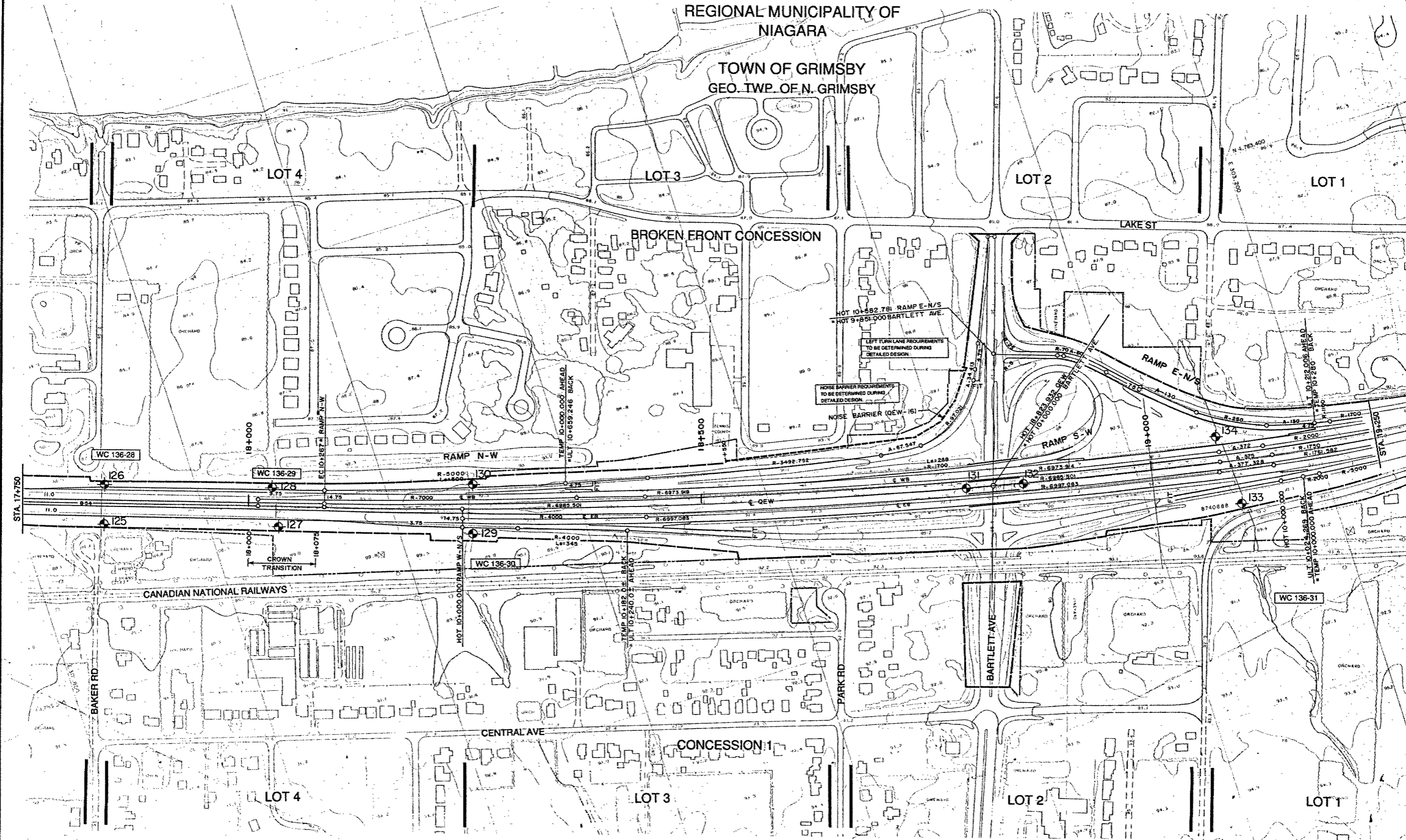


PLATE
C3-14

INITIAL PHASE
STA. 17+750 TO STA. 19+250

QUEEN ELIZABETH WAY
PRELIMINARY DESIGN STUDY
W.P. 80-76-00

LEGEND

- FLOODPLAIN LINE
- FILL LINE
- EXISTING PROPERTY
- PROPOSED CAH
- PROPERTY ACQUISITION



SCALE
40m 0 80m
METRES

REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF GRIMSBY
GEO. TWP. OF N. GRIMSBY

REGIONAL MUNICIPALITY OF
NIAGARA

TOWN OF LINCOLN
GEO. TWP. OF CLINTON

LOT 1

LOT A

LOT 23

LOT 22

LOT 21

BROKEN FRONT CONCESSION

HOT 19-716.965 NEAR TWP. OF N. GRIMSBY
E 107-1000.000 AHEAD - TWP. OF CLINTON

WC 137-03

WC 137-02

SOUTH SERVICE RD

CANADIAN NATIONAL RAILWAYS

WC 136-32

WC 137-01

CONCESSION 1

LOT 23

LOT 22

LOT 21

LOT A
EAST GORE

SCALE

40m 0 80m
METRES



LEGEND

- FLOODPLAIN LINE
- FILL LINE
- EXISTING PROPERTY
- PROPOSED CAH
- PROPERTY ACQUISITION

QUEEN ELIZABETH WAY
PRELIMINARY DESIGN STUDY
W.P. 80-76-00

INITIAL PHASE
STA. 19+250 TO STA. 11+000

PLATE
C3-15



RECORD OF BOREHOLE No 101

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,652 N; 298,071 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.01 CHECKED BY TPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L		
84.2	Ground Level												GR SA SI CL
0.0	FILL - mixture of silt, sand trace to some gravel some wood moist to wet red/black very loose		1	SS	3		84						Frozen to 38 cm
80.5	some organics		2	SS	4		82						7 49 38 6
3.7	CLAYEY SILT, so. sand		3	SS	75/	23 cm	80						
79.8	poss. weathered shale		4	SS	100/	8 cm							
4.4	SHALE completely to highly weathered slightly plastic red very weak		5	SS	100/	6 cm	78						0 13 62 25
	wet		6	SS	100/	8 cm							0 13 62 25
			7	SS	100/	5 cm	76						
75.1			8	SS	100/	0 cm							
9.1	END OF BOREHOLE												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 102

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,695 N; 298,087 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.03.02 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
83.9	Ground Level										
0.0	20 cm topsoil					*					Frozen to 20 cm.
	SILTY CLAY TILL some sand trace of gravel fissured brown/grey very stiff		1	SS	22						0 18 44 38
			2	SS	23						2 19 42 37
			3	SS	22						
79.8			4	SS	50/	15 cm					
4.1	SHALE highly to completely weathered red very weak		5	SS	100/	5 cm					
			6	SS	100/	5 cm					
76.2											No recovery for Sample 7
			7	SS	100/	5 cm					
7.7	END OF BOREHOLE. *Borehole dry on completion but caved to 7.2 m.										

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 103

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,619 N; 298,173 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.01 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT			PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)				
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa							WATER CONTENT (%)			
								○ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE										
84.8	Ground Level														GR SA SI CL				
0.0	25 mm topsoil CLAYEY SILT some sand, gravel red, hard poss. weathered shale						84	2 m north of borehole							11 24 49 16 0 20 54 26				
82.7			1	SS	40														
2.1	SHALE completely to highly weathered		2	SS	63/	15 cm		82											
			3	SS	76/	15 cm													
	slightly plastic red very weak		4	SS	100/	6 cm													
			5	SS	100/	6 cm		80	1 m south of borehole (encountered obstruction at 2.6 m depth)										
			6	SS	100/	9 cm		78											
77.1			7	SS	100/	8 cm													
7.7	END OF BOREHOLE																		

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 104

METRIC

W P 80-76-00 LOCATION Co-ods. 4,784,663 N; 298,181 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.03.02 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC NATURAL LIQUID LIMIT MOISTURE CONTENT LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100		W _p	W	W _L		
84.3	Ground Level													
0.0	15 cm topsoil						84							
83.0	10 cm sand & gravel FILL mixture of silty clay, firm		1	SS	7									Frozen to 15 cm.
1.3	SILTY CLAY		2	SS	31									0 17 45 38
	trace of gravel		3	SS	64		82							
	dissicated boulder		4	SS	61									
	grey/brown													
80.6	very stiff to hard		5	SS	68/	19 cm								5 30 44 21
80.1	CLAYEY SILT, red, hard poss. weathered shale		6	SS	100	15 cm	80							
4.2	SHALE		7	SS	100	14 cm	78							
	completely to highly weathered													
	red													
	very weak		8	SS	100	14 cm								
76.7														
7.6	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION

+3, x⁵: Numbers refer to
Sensitivity

20
15 ϕ 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 105

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,473 N; 298,611 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.02 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		WATER CONTENT (%)					
									10 20 30					
87.3	Ground Level													
0.0	CLAYEY SILT some gravel trace of sand red/grey very stiff to hard possibly weathered shale		1A	SS	26		86							Frozen to 20 cm
84.4			1B											19 8 46 27
			2	SS	68									
2.9	SHALE completely to highly weathered red very weak		3	SS	86/	23 cm	84							0 6 74 20
			4	SS	96/	8 cm								0 4 69 27
			5	SS	100/	10 cm	82							
			6	SS	100/	0 cm								
79.7			7	SS	100/	1 cm	80							0 19 55 26
7.6	END OF BOREHOLE													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 106

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,509 N; 298,636 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.03.01 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
87.1	Ground Level													
0.0	18 cm topsoil													
85.3	FILL - mixture of silty clay, some gravel, boulders, fr. topsoil, stiff		1A	SS	14									
1.8	SHALE completely to highly weathered red very weak		2	SS	89/15	5 cm								
			3	SS	56/15	5 cm								
			4	SS	83/28	8 cm								
			5	SS	100/8	8 cm								
			6	SS	100/5	5 cm								
79.4			7	SS	100/4	4 cm								
7.7	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 107

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,421 N; 298,767 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY IN
DATUM Geodetic DATE 94.02.02 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT 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								
88.7	Ground Level												
0.0	FILL - mixture of clayey silt some sand trace of gravel red stiff		1	SS	8		88						Frozen to 20 cm
86.2							86						12 26 45 17
2.5	CLAYEY SILT, red, hard		2	SS	75/	15 cm							8 35 42 15
85.2	poss. weathered shale												
3.5	SHALE completely to highly weathered slightly plastic red very weak		3	SS	100/	3 cm							
			4	SS	100/	8 cm	84						
			5	SS	100/	0 cm							
			6	SS	100/	8 cm	82						
			7	SS	100/	1 cm							
79.6			8	SS	100/	1 cm	80						No recovery for Samples 4, 5, 7 & 8
9.1	END OF BOREHOLE												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 108

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,467 N; 298,764 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.03.01 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPo ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
88.1	Ground Level												
0.0	15 cm topsoil CLAYEY SILT trace of sand red hard		1	SS	34		88						Frozen to 20 cm.
			2	SS	67	15 cm	86						
85.4	possibly weathered shale		3	SS	95	15 cm							
2.7	SHALE completely to highly weathered red very weak		4	SS	100	/6 cm	84						
			5	SS	100	/13 cm							
			6	SS	100	/9 cm	82						
			7	SS	100	/6 cm							
79.7			8	SS	100	/4 cm	80						
8.4	END OF BOREHOLE.												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 109

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,277 N; 299,165 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.03.02 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
89.6	Ground Level																
0.0	Granular shoulder FILL - mixture of silty clay, tr. gravel red/black, moist stiff		1	SS	8		88										
87.1																	
2.5	CLAYEY SILT red, very stiff		2	SS	21												
85.9	pos. weathered shale																
3.7	SHALE completely to highly weathered red very weak		3	SS	60/15 cm		86										
			4	SS	100/14 cm												
			5	SS	95/15 cm		84										
			6	SS	100/15 cm												
			7	SS	100/8 cm		82										
80.3			8	SS	100/11 cm												
9.3	END OF BOREHOLE.																

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 110

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,331 N; 299,183 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.03.01 CHECKED BY IPL

SOIL PROFILE			SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE 50 100	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE								
88.4	Ground Level											
0.0	15 cm topsoil					88						Frozen to 18 cm.
	36 cm sand and gravel FILL, mixture of silty sand, tr. grave loose		1 ^A	SS	8							
86.5			2	SS	59	86						
1.9	CLAYEY SILT		3	SS	50/100							
	trace of sand		4	SS	100/14							
84.8	red, hard, possibly weathered shale		5	SS	100/6	84						
3.6	SHALE		6	SS	100/5	82						
	completely to highly weathered red very weak		7	SS	100/13							No recovery for Samples 5 and 6.
80.7												
7.7	END OF BOREHOLE.											

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No III

METRIC

W P 80-76-00 LOCATION Co-ords. 4,784,042 N; 299,922 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.03 CHECKED BY IPL

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					
82.0	Ground Level													
0.0	FILL - mixture of clayey silt some sand trace of gravel red stiff		1	SS	9		82							Frozen to 20 cm
78.6			2	SS	64/22	cm	80	100/13						1 26 51 22
3.4	CLAYEY SILT some sand, gravel red, hard possibly weathered shale		3	SS	100/6	cm	78							0 16 63 21
76.2			4	SS	85/15	cm	76							0 17 66 17
5.8	SHALES completely to highly weathered		5	SS	100/6	cm	74							No recovery for Samples 7 to 11
	slightly plastic red very weak		6	SS	100/8	cm	72							
			7	SS	100/6	cm	70							
			8	SS	100/0	cm	68							
			9	SS	100/0	cm								
			10	SS	100/0	cm								
66.8			11	SS	100/0	cm								
15.2	END OF BOREHOLE													



RECORD OF BOREHOLE No 112

METRIC

W P 80-76-00 LOCATION CO-ords. 4,784,077 N; 299,925 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.28 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
79.5	Ground Level												
0.0	10 cm topsoil												
78.1	FILL - mixture of sand and gravel, some clay, red, compact		1	SS	13								
1.4	SHALE completely to highly weathered slightly plastic red very weak		2	SS	100/15 cm								
			3	SS	100/8 cm								
			4	SS	100/6 cm								
			5	SS	100/6 cm								
			6	SS	100/5 cm								
			7	SS	100/4 cm								
			8	SS	100/9 cm								
			9	SS	100/4 cm								
			10	SS	100/4 cm								
			11	SS	100/4 cm								
65.7			12	SS	100/5 cm								
13.8	END OF BOREHOLE.												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 113

METRIC

W P 87-76-00 LOCATION Co-ords. 4,783,887 N; 300,363 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.03 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
81.5	Ground Level										
0.0	FILL - mixture of sand and gravel grey compact		1	SS	13		80				Frozen to 15 cm
79.0											
2.5	CLAYEY SILT TILL some sand trace of gravel grey hard		2	SS	60		78				3 30 45 22
			3	SS	43						
			4	SS	52			100/ 25 cm			7 27 42 24
			5	SS	44		76				3 24 44 29
75.3			6A	SS	81/28	cm					3 28 46 23
6.2	SHALE completely to highly weathered red very weak		7	SS	100/0	cm	74				No recovery for samples 7 and 8
72.4			8	SS	100/0	cm					
9.1	END OF BOREHOLE										

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 114

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,930 N; 300,386 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.25 CHECKED BY IPL

SOIL PROFILE		STRAT PLOT	SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
80.1	Ground Level												
0.0	10 cm topsoil FILL - mixture of clayey silt some sand, tr. gravel brown, firm		1	SS	7								Frozen to 15 cm.
78.0			2	SS	31								
2.1	CLAYEY SILT TILL some sand trace of gravel brown hard to stiff grey		3	SS	29								
			4	SS	15								
75.4			5 ^A	SS	49								
4.7	SILTY SAND/GRAVELLY SAND some clay, red dense to very dense		6	SS	50/10 cm								
73.9													
6.2	CLAYEY SILT some shale red hard possibly weathered shale		7	SS	100/5 cm								
71.7													
8.4	END OF BOREHOLE.		8	SS	100/4 cm								

100/23 cm

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 115

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,713N; 300,867 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Gendetic DATE 1994.02.07 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L	WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES							
86.4	Ground Level											
0.0	FILL - mixture of clayey silt some topsoil trace of gravel brown/grey stiff to soft		1	SS	8	*	86					Frozen to 20 cm
82.7			2	SS	2		84					5 27 44 24
3.7	CLAYEY SILT TILL some sand tr. gravel very stiff brn/gry grey		3	SS	23		82					3 25 48 24
			4	SS	22							
			5	SS	13							
			6	SS	16		80					8 24 46 22
			7	SS	21							
							78					3 24 50 23
76.8			8	SS	16							
9.6	END OF BOREHOLE. * Borehole dry on completion.											

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 116

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,769 N; 300,884 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.25 CHECKED BY IPL

SOIL PROFILE		STRAT. PLOT	SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
86.6	Ground Level												
0.0	8 cm topsoil FILL - mixture of silty clay and clayey silt damp red/brown/grey firm		1	SS	5								Frozen to 15 cm.
82.9			2	SS	5								
3.7	CLAYEY SILT TILL some sand trace of gravel brown hard to very stiff grey		3	SS	34								
			4	SS	19								
			5	SS	21								
			6	SS	58								
			7	SS	28								
77.0			8	SS	27								
9.6	END OF BOREHOLE.												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 117

METRIC

W P 80-76-00 LOCATION Co-ords, 4,783.636 N; 301.114 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.03 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
86.2	Ground Level										
0.0	30 cm topsoil CLAYEY SILT TILL some sand trace of gravel grey hard to stiff		1	SS	42		86				
			2	SS	25		84				
			3	SS	14						
			4	SS	17						
			5	SS	16		82				
			6	SS	19		80				
78.9			7	SS	16						
7.3	END OF BOREHOLE. * Borehole dry on completion but caved to 6.0 m depth.										

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 118

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,680 N; 301,127 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.25 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
86.1	Ground Level												
0.0	48 cm topsoil												
84.7	CLAYEY SILT, ss. sand		1	SS	15								
	stiff roots, brown/grey		2	SS	29								
1.4	CLAYEY SILT TILL		3	SS	31								
	some sand		4	SS	17								
	trace of gravel brown		5	SS	13								
	fissured to 3 m grey		6	SS	12								
	very stiff to stiff		7	SS	11								
78.8													
7.3	END OF BOREHOLE.												

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 119

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,546 N; 301,395 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.04 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
85.0	Ground Level										
0.0	18 cm topsoil SILTY CLAY TILL to CLAYEY SILT TILL some sand trace of gravel grey hard to very stiff		1	SS	32		84				Frozen to 15 cm
			2	SS	32	*	82		○		4 30 41 25
			3	SS	24						
			4	SS	26				○		4 25 39 32
			5	SS	22						
			6	SS	23		80		○		2 26 40 32
			7	SS	19		78		○		6 25 40 29
76.9	END OF BOREHOLE. * Borehole dry on completion.										
8.1											

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 120

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,590 N: 301,398 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.24 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
84.3	Ground Level												
0.0	51 cm topsoil CLAYEY SILT TILL some sand trace of gravel brn/g stiff grey		1	SS	14	*	84						
			2	SS	15		82						
			3	SS	15		80						
			4	SS	11		78						
			5	SS	12								
			6	SS	14								
			7	SS	15								
77.0													
7.3	END OF BOREHOLE. * Borehole dry on completion.												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 121

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,498 N: 301,534 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.04 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
84.6	Ground Level										
0.0	CLAYEY SILT TILL some sand trace of gravel grey hard to very stiff		1	SS	52		84				Frozen to 5 cm
			2	SS	27		82				3 29 45 23
			3	SS	40						6 23 43 28
			4	SS	50		80				3 21 39 37
			5	SS	22			100/28 cm			1 19 41 39
78.0			6	SS	21		78				
6.6	END OF BOREHOLE										

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 122

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,541 N: 301,544 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.24 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE 50 100	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
84.2	Ground Level										
0.0	10 cm topsoil possibly fill to 0.7m CLAYEY SILT TILL some sand trace of gravel very stiff to stiff brn/gry grey		1	SS	8		84				
			2	SS	31						
			3	SS	19						
			4	SS	16						
			5	SS	14						
			6	SS	16						
			7	SS	15						
76.9			8	SS	16						
7.3	END OF BOREHOLE. * Borehole dry on completion.										

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 123

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,453 N; 301,668 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.04 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
85.2	Ground Level										
0.0	10 cm topsoil CLAYEY SILT TILL some sand trace of gravel grey stiff to hard		1	SS	20						Frozen to 15 cm
			2	SS	11						3 34 40 23
			3	SS	10						2 23 50 25
			4	SS	14						
			5	SS	20						
	more silty		6A	SS	42						1 18 42 39
			6B								
77.1			7	SS	68						8 29 41 22
8.1	END OF BOREHOLE										

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 124

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,508 N; 301,645 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.24 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
85.4	Ground Level													
0.0	20 cm topsoil CLAYEY SILT trace of gravel brown/grey firm possibly fill		1	SS	7									
82.8			2 ^A	SS	17									
2.6	CLAYEY SILT TILL some sand trace of gravel grey very stiff to stiff		3	SS	13									
			4	SS	11									
			5	SS	11									
			6	SS	14									
77.3			7	SS	17									
8.1	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 125

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,380 N; 301,890 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.07 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
87.3	Ground Level													
0.0	50 cm topsoil		1	SS	16		86							Frozen to 18 cm
85.5	SILT, trace of clay seams, some sand, wet, brown/grey, compact		2 _A	SS	15									0 12 77 11
1.8	CLAYEY SILT TILL some sand brn/gry grey		3	SS	12		84							3 24 49 24
	trace of gravel		4	SS	9									
	stiff		5	SS	10									7 25 44 24
81.7			6	SS	11		82							
5.6	CLAYEY SILT TILL some sand and gravel fissured grey, hard		7	SS	44									10 23 45 22
79.2	trace of shale		8	SS	57		80							
8.1	END OF BOREHOLE													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 126

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,421 N; 301,903 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.22 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
86.9	Ground Level													
0.0	43 cm topsoil													
85.8	SAND, tr. gravel		1A	SS	14									
1.1	SILT - trace brown		2	SS	74									
84.6	gravel, moist grey very dense													
2.3	CLAYEY SILT TILL		3	SS	20									
	some sand		4	SS	8									
	trace of gravel		5	SS	12									
	grey		6	SS	13									
	stiff to hard		7	SS	67									
79.6														
7.3	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 127

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,320 N; 302,076 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.07 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES								
87.5	Ground Level												
0.0	SILTY SAND												
86.4	Brown trace of gravel												
1.1	SHALE completely to highly weathered slightly plastic red very weak		1	SS	100	/5 cm	86						
			2	SS	75	/15 cm							
			3	SS	100	/1 cm	84						
			4	SS	100	/0 cm							
			5	SS	100	/1 cm							
			6	SS	100	/8 cm	82						
							80						
79.7			7	SS	100	/15 cm							
7.8	END OF BOREHOLE												

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 128

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,361 N; 302,083 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.22 CHECKED BY IPL

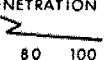

SOIL PROFILE		STRAT PLOT	SAMPLES		GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
87.8	Ground Level												
0.0	71 cm topsoil CLAYEY SILT TILL some sand trace of gravel grey very stiff		1	SS	25								
			2	SS	21								
			3	SS	17								
			4	SS	24								
82.8			5 ^A	SS	80/2	5 cm							
5.0	SHALE completely to highly weathered red very weak		6	SS	50/1	0 cm							
80.1			7	SS	100/	11 cm							
7.7	END OF BOREHOLE												

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 129

METRIC

W P 80-76-00 LOCATION Co-ords. 4.783,251 N; 302.269 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.10 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)						
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES									SHEAR STRENGTH kPo ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	WATER CONTENT (%) 10 20 30	GR	SA	SI	CL
88.3	Ground Level																		
0.0	10 cm topsoil		1	SS	48		88						Frozen to 20 cm						
	CLAYEY SILT, some sand		2	SS	56	*							1 17 56 26						
86.2	trace of gravel, red, hard		3	SS	100	/10 cm		86					0 4 71 25						
	poss. weathered shale		4	SS	100	/5 cm							0 12 61 27						
2.1	SHALE		5	SS	100	/3 cm		84											
	completely to highly weathered		6	SS	100	/10 cm													
	slightly plastic																		
	red																		
	very weak																		
82.1																			
6.2	END OF BOREHOLE																		
	* Borehole dry on completion but caved to 5.5 m depth.																		

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 130

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,300 N; 302,294 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.22 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
89.6	Ground Level													
0.0	23 cm topsoil													
87.8	FILL - mixture of clayey silt, some gravel, red/brown, firm		1A	SS	8									
1.8	CLAYEY SILT-red, stiff		2A	SS	55/1	5 cm								
87.2	pos. weathered shale		2B	SS	50/1	0 cm								
2.4	SHALES completely to highly weathered red, some grey very weak		3	SS	50/1	0 cm								
			4	SS	88/1	5 cm								
			5	SS	100/	11 cm								
			6	SS	100/	9 cm								
81.9			7	SS	100/	6 cm								
7.7	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 131

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,133 N; 302,815 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.15 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
91.8	Ground Level													GR SA SI CL
0.0	8 cm topsoil FILL mixture of silty clay and silty sand trace of gravel red/brown/black firm		1	SS	7	*	90							Frozen to 23 cm.
			2	SS	7		88							
87.4	pieces of concrete		3	SS	78/	25 cm		100/10 cm						
4.4	CLAYEY SILT red, hard, possibly weathered shale		4	SS	100	/1 cm	86							
86.3	SHAPE completely to highly weathered red very weak		5	SS	100	/1 cm								
5.5			6	SS	100	/8 cm	84							
			7	SS	100	/3 cm								
			8	SS	100	/1 cm	82							
			9	SS	100	/5 cm								
			10	SS	100	/3 cm	80							
			11	SS	100	/6 cm	78							No recovery for Samples 4, 5, 7, 8, 9, 10 and 13
			12	SS	100	/6 cm	76							
75.0			13	SS	100	/5 cm								
16.8	END OF BOREHOLE. *Borehole dry on completion but caved to 14.8 m													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 132

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,119 N; 302,877 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02. CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
92.1	Ground Level										
0.0	18 cm topsoil FILL mixture of clayey silt trace of gravel red/grey very stiff to stiff		1	SS	25		92				
			2	SS	8		90				
88.1											
4.0	CLAYEY SILT red, hard, possibly weathered shale		3	SS	58		88				
86.5											
5.6	SHALE completely to highly weathered red very weak		4	SS	100/	1 cm	86				
			5	SS	100/	4 cm					
			6	SS	100/	6 cm	84				
			7	SS	100/	5 cm					
			8	SS	100/	10 cm	82				
			9	AS	100/	5 cm	80				
			10	SS	100/	4 cm	78				
			11	SS	100/	4 cm					
							76				
75.3			12	SS	100/	3 cm					
16.8	END OF BOREHOLE.										

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 133

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,027 N; 303,102 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.10 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100						
89.4	Ground Level													
0.0	13 cm Topsoil													
87.3	FILL - mixture of clayey silt, trace gravel, tr. organics brown/black, stiff		1	SS	13									
2.1	CLAYEY SILT, so. sand tr. gravel, red, hard		2	SS	117									0 11 70 19
85.8	poss. weathered shale		3	SS	73/	15 cm								0 13 69 18
3.6	SHAPE completely to highly weathered red very weak		4	SS	100/	8 cm								0 10 56 34
			5	SS	100/	3 cm								
			6	SS	100/	1 cm								
81.8			7	SS	100/	1 cm								No recovery for Samples 5 and 7
7.6	END OF BOREHOLE													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 134

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,106 N; 303,097 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.21 CHECKED BY IPL

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	W _p W W _L	WATER CONTENT (%)				
91.6	Ground Level													
0.0	15 cm topsoil FILL - mixture of clayey silt trace of sand, gravel moist red very stiff to stiff tr. wood		1	SS	24		90							
			2	SS	16		88							
87.0			3	SS	10									
4.6	SHALE completely to highly weathered red very weak		4 ^A	SS	100/14 cm									
			5	SS	100/5 cm									
			6	SS	50/10 cm									
			7	SS	100/14 cm									
			8	SS	100/8 cm									
81.6			9	SS	100/5 cm		82							
10.0	END OF BOREHOLE.													

RECORD OF BOREHOLE No 135

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,020 N; 303,662 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.10 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100		
89.9	Ground Level							SHEAR STRENGTH kPa						
								○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
0.0	18 cm topsoil							PLASTIC LIMIT NATURAL MOISTURE CONTENT LIQUID LIMIT						
	CLAYEY SILT							W _p W W _L						
	some sand, tr. gravel							WATER CONTENT (%)						
	red, hard							10 20 30						
87.8	poss. weathered shale		1	SS	37		88							Frozen to 13 cm
2.1	SHALE		2	SS	100/	4 cm								0 11 72 17
	completely to highly		3	SS	100/	4 cm								
	weathered		4	SS	100/	4 cm								
	red		5	SS	90/15	5 cm								0 6 74 20
	very weak		6	SS	100/	6 cm								
82.2	wet		7	SS	90/	15 cm	82							0 14 68 18
7.7	END OF BOREHOLE													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 136

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,067 N; 303,660 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.21 CHECKED BY IPL

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20 40 60 80 100					
89.1	Ground Level												
0.0	25 cm topsoil 35 cm sandy silt SHALE highly to completely weathered red very weak		1	SS	100	8 cm							
			2	SS	100	10 cm							
			3	SS	100	8 cm							
			4	SS	100	6 cm							
			5	SS	100	8 cm							
			6	SS	100	6 cm							
81.5	END OF BOREHOLE.		7	SS	100	4 cm							
7.6	* Borehole dry on completion but caved to 6.7 m.												

100/28 cm

No recovery
for Samples
4, 6 and 7

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 137

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,025 N; 304,074 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.11 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
88.2	Ground Level												
0.0	23 cm topsoil						88						Frozen to 18 cm
	SHALE completely to highly weathered red very weak		1	SS	100	/5 cm	86						0 12 66 22
			2	SS	100	/14 cm			○				0 11 69 20
			3	SS	100	/10 cm			○				
			4	SS	100	/6 cm	84			○			
			5	SS	100	/1 cm							
			6	AS	100	/3 cm	82						
80.4			7	SS	108	/15 cm			○				0 27 60 13
7.8	END OF BOREHOLE. * Borehole dry on completion.												

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 138

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,072 N; 304,090 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.21 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
87.6	Ground Level													
0.0	11 cm topsoil CLAYEY SILT trace of gravel red, hard possibly weathered shale		1	SS	48	23 cm	86							Frozen to 15 cm.
			2	SS	77/									
84.8			3	SS	50/	11 cm								
2.8	SHALE highly to completely weathered red very weak		4	SS	100	8 cm	84							
			5	SS	75/	15 cm								
			6	SS	50/	6 cm	82							
80.7			7	SS	100	6 cm								
6.9	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 139

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,027 N; 304,319 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.11 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
87.4	Ground Level										
0.0	20 cm topsoil SHAPE completely to highly weathered		1	SS	71		86				Frozen to 20 cm
			2	SS	100	14 cm					0 7 73 20
			3	SS	81		84				0 14 68 18
	red very weak		4	SS	75/	6 cm					0 10 74 16
			5	SS	52		82				0 16 65 19
			6	SS	50/	4 cm					
79.8			7	SS	100/	0 cm	80				
7.6	END OF BOREHOLE. * Borehole dry on completion.										

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 140

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,069 N; 304,352 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.18 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
87.1	Ground Level										
0.0	10 cm topsoil										
85.4	FILL - mixture of silty clay, tr. gravel red/green, stiff		1A	SS	17						
1.7	CLAYEY SILT some sand trace of gravel red hard possibly weathered shale		2	SS	42						
			3	SS	40						
			4	SS	76/15	5 cm					
			5	SS	80/15	5 cm					
81.7	SHALE completely to highly weathered red very weak		6	SS	100/5	5 cm					
5.4			7	SS	100/6	6 cm					
79.4											
7.7	END OF BOREHOLE.										

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 141

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,029 N; 304,578 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.11 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES								
85.6	Ground Level												
0.0	28 cm topsoil FILL - mixture of sandy silt to silty clay, tr. of organics brown/black loose or firm		1	SS	5		84						Frozen to 15 cm
82.9			2	SS	5								
2.7	CLAYEY SILT, red, hard poss. weathered shale		3	SS	41		82						
81.9			4	SS	100	/13 cm							0 19 65 16
3.7	SHALE completely to highly weathered		5	SS	77	15 cm							0 11 70 19
			6	SS	100	/11 cm	80						
	red very weak		7	SS	100	5 cm	78						No recovery for Samples 7 and 8
77.2			8	SS	100	/1 cm							
8.4	END OF BOREHOLE.												

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 142

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,072 N; 304,572 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.18 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
85.6	Ground Level													
0.0	8 cm topsoil Fill - mixture of silty clay, trace of gravel moist brown/grey stiff		1	SS	9		84							Frozen to 15 cm.
			2	SS	8									
			3	SS	8									
81.9			4	SS	100/	13 cm	82							
3.7	SHALE completely to highly weathered slightly plastic red very weak		5	SS	100/	13 cm								
			6	SS	100/	8 cm	80							Encountered concrete at 3.7 m depth moved hole 1 m west.
			7	AS	100/	4 cm	78							
77.2			8	AS	100/	4 cm								
8.4	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 143

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,031 N; 304,988 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.14 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
84.1	Ground Level										
0.0	10 cm topsoil FILL - mixture of sandy silt trace of gravel, brick brown/black loose		1	SS	9						Frozen to 20 cm
			2	SS	5						
78.9			3	SS	5						
5.2	SANDY SILT TILL tr. gravel, compact to SILTY SAND TILL some gravel, tr. clay some shale fragments grey, very dense		4	SS	27	11 cm					7 29 50 14
			5	SS	75/	15 cm		100/25 cm			23 52 20 5
			6	SS	86/	10 cm					
75.7			7	SS	100						23 34 38 5
8.4	SHALE completely to highly weathered red very weak		8	SS	100	8 cm					0 22 53 25
73.4			9	SS	100	3 cm					
10.7	END OF BOREHOLE.										

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 144

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,075 N; 305,018 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
DATUM Geodetic DATE 1994.02.18 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	PLASTIC LIMIT W _p NATURAL MOISTURE CONTENT W LIQUID LIMIT W _L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL	
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES							
84.2	Ground Level											
0.0	13 cm topsoil FILL - mixture of sand, silt trace of roots brown/black compact to very loose		1	SS	16							Frozen to 15 cm.
80.2	wet		2	SS	3							
4.0	CLAYEY SILT TILL some sand trace of gravel grey, stiff to hard		3	SS	13							
78.3			4	SS	35							
5.9	SANDY SILT TILL some gravel, cobble brown/grey very dense		5	SS	100/	8 cm						
			6	SS	100/	13 cm						
			7	SS	100/	13 cm						
74.9			8 ^A	SS	100/	13 cm						
9.3	SHALE completely to highly weathered, red very weak		8 ^B									
73.5			9	SS	100/	5 cm						
10.7	END OF BOREHOLE.											

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 145

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,036 N; 305,407 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.14 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100						
84.5	Ground Level													GR SA SI CL
0.0	13 cm topsoil FILL sandy silt tr. of gravel, asphalt moist brown/black compact		1	SS	11		84							Frozen to 15 cm
80.8			2	SS	25		82							
3.7	SANDY SILT wet, dilatant, grey dense to compact		3	SS	34		80							0 40 55 5
79.3			4	SS	16									
5.2	SILT AND CLAY layered, grey, stiff		5	SS	11		78							0 4 74 22
78.6			6	SS	18									9 26 47 18
5.9	CLAYEY SILT TILL some sand trace of gravel grey/brown very stiff to hard		7	SS	95/	15 cm								3 30 49 18
75.2			8	SS	100	14 cm	76							
9.3	SANDY SILT TILL tr. clay, brown/red very dense		9	SS	70/	15 cm								3 37 54 6
74.4														
10.1	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 146

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,079 N; 305,407 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.17 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
84.6	Ground Level													
0.0	10 cm topsoil SANDY SILT with topsoil trace of gravel brown/black, compact possibly fill		1	SS	13		84							Frozen to 28 cm.
82.1	2.5		2	SS	4		82							
80.9	ORGANIC SILT some wood, roots black/grey, firm		3	SS	19		80							0 8 79 13
3.7	SILT AND CLAY stratified moist grey very stiff to soft		4	SS	7									
			5	SS	8									
			6	SS	3									0 4 76 20
77.6	7.0		7	SS	50/	10 cm	76							
	SANDY SILT TILL some gravel grey very dense		8	SS	110/	15 cm								
75.3														
9.3	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION



RECORD OF BOREHOLE No 147

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,026 N; 305,982 E ORIGINATED BY PD
DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY IN
DATUM Geodetic DATE 1994.02.14 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40					
82.1	Ground Level													GR SA SI CL
0.0	10 cm topsoil FILL - mixture of clayey silt tr. of roots, organics grey, stiff		1	SS	11									Frozen to 5 cm
79.6	2.5 CLAYEY SILT TILL some sand, tr. gravel grey, very stiff		2	SS	24									3 26 45 26
78.4	3.7 SANDY SILT TILL wet trace of gravel red/brown very dense shale fragments		3	SS	79									5 42 48 5
			4	SS	81/	15 cm								13 35 45 7
76.2			5	SS	92/	24 cm								9 42 41 8
5.9	SHALE completely to highly weathered red very weak		6	SS	100	/5 cm								
			7	SS	100	/6 cm								
73.0			8	SS	100	/3 cm								No recovery for Samples 7 and 8
9.1	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 148

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,077 N: 306,008 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.17 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	SHEAR STRENGTH kPa					
81.6	Ground Level							○ UNCONFINED + FIELD VANE						GR SA SI CL
0.0	8 cm topsoil FILL - mixture of silty clay and clayey silt some sand, tr. wood grey, stiff		1	SS	9		80	● QUICK TRIAXIAL x LAB VANE						Frozen to 10 cm.
2.5	SANDY SILT TILL trace of gravel red/grey very dense		2	SS	66		78							
77.2			3	SS	102	25 cm								
4.4	SHALE completely to highly weathered red/green very weak		4	SS	92	15 cm	76							
			5	SS	100	8 cm								
			6	SS	100	6 cm								
			7	SS	100	6 cm	74							
72.4			8	SS	100	4 cm								
9.2	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 149

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,008 N; 306,197 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.15 CHECKED BY IPL

OFFICE REPORT ON SOIL EXPLORATION

SOIL PROFILE		SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		NATURAL MOISTURE CONTENT			UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE			'N' VALUES	20 40 60 80 100	W _p	W	W _L		
83.2	Ground Level												
0.0	20 cm topsoil FILL mixture of sandy silt and some sand and gravel, tr. roots, wet, brown/grey		1	SS	8								Frozen to 18 cm.
80.3	loose to very loose		2	SS	4								
2.9	SILTY SAND TO SANDY SILT TILL some clay, gravel grey boulder dense to very dense boulder		3	SS	34								15 41 29 15
			4	SS	43								
			5	SS	100	10 cm							
77.7			6	SS	105	15 cm							
5.7	CLAYEY SILT TILL some sand, tr. gravel red/grey, hard		7A	SS	84	25 cm							13 33 38 16
76.1			7B	SS									8 35 35 22
													2 10 63 25
7.1	SHALE completely to highly weathered red very weak		8	SS	100	6 cm							
74.1			9	SS	100	1 cm							
9.1	END OF BOREHOLE.												

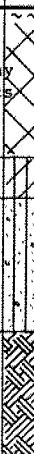
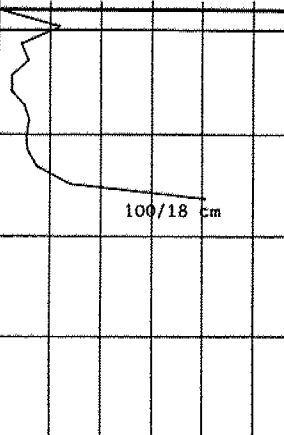

+3, x5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

RECORD OF BOREHOLE No 150

METRIC

W P 80-76-00 LOCATION Co-ords. 4,783,073 N; 306,168 E ORIGINATED BY PD
 DIST 4 HWY QEW BOREHOLE TYPE Augering & Cone Test COMPILED BY JN
 DATUM Geodetic DATE 1994.02.17 CHECKED BY IPL

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100						
								SHEAR STRENGTH kPo ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE						
82.4	Ground Level													
0.0	8 cm topsoil FILL - mixture of clayey silt, silty clay some sand, tr. organics brown/black stiff to firm						82						Frozen to 28 cm.	
79.5			1	SS	7		80							
2.9	CLAYEY SILT TILL		2	SS	4									
78.7	grey, very stiff		3	SS	27									
3.7	SANDY SILT TILL some sand trace of gravel grey moist to wet very dense		4	SS	50/	8 cm	78							
			5	SS	60/	15 cm								
		6	SS	79										
76.1						76								
6.3	SHALE completely to highly weathered red very weak		7	SS	100	/5 cm								
73.9				8	SS	100	/8 cm	74						
8.5	END OF BOREHOLE.													

OFFICE REPORT ON SOIL EXPLORATION