DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 3165-155

DIST. 9 REGION

W.P. No. 125-87-00

CONT. No.

W. O. No.

STR. SITE No.

HWY. No. 416

LOCATION HWY 416 & CEDAR VIEW RD.
BRUCE PIT LANDFILL

No of PAGES - ~

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

G.I.-30 SEPT. 1976

TONY

Ministry
of
Transportation
Ontario

FOUNDATION DESIGN SECTION

foundation investigation and design report

ENGINEERING MATERIALS OFFICE
FOUNDATION DESIGN SECTION

WP 125-87-00 DIST 9

HWY 416 STR SITE

Proposed Cedarview Road Realignment
Over Abandoned Bruce Pit Landfill Site

DISTRIBUTION

E.C. Lane (2)
T.W. Murphy
D.J. Kimmett
E. Zavitski (2)
K.G. Bassi
D. Aspinwall
T. Yakutchuk
G. Szekreny
L. Saulnier (Cover Only)
M. MacLean (Cover Only)
File

GEOCRES 31G5-155 DATE FEB 13 1989

FOUNDATION INVESTIGATION REPORT
For
Proposed Cedarview Road Realignment
Over Abandoned Bruce Pit Landfill Site
Hwy. 416, WP 125-87-00
District 9, Ottawa

INTRODUCTION

This report summarizes the results of a geotechnical site investigation implemented for stability and settlement analysis of the proposed Cedarview Road realignment over the abandoned Bruce Pit Landfill site. The existing Cedarview Road is to be relocated approximately 150 metres east of its present alignment or equivalently, 60 metres east of the proposed Hwy. 416 at the location of the investigation.

The investigation was carried out between 88 11 28-29 and consisted of four sampled boreholes and four dynamic cone penetration tests. The boreholes ranged in depth from 6.6 m to 8.1 m and were advanced using hollow stem augering techniques.

SITE DESCRIPTION AND GEOLOGY

The site is located within an abandoned landfill site in an area known as the Bruce Pit in the City of Nepean, Ottawa-Carleton Municipality. It is located approximately 150 metres east of the existing Cedarview Road adjacent to an existing unpaved parking lot. A neighbourhood high school and recreational arena are situated on the opposite (west) side of Cedarview Road. The CNR railtracks intersects Cedarview Road approximately 2 kilometres north of the site.

The Bruce Pit property is owned and managed by the National Capital Commission and is used primarily as a recreational area. The hilly terrain and gently undulating surface topography provides ideal routes for bicycle paths and tobogganning on the site. The land consists of grassland and localized shrubs and woodlands. Two large ponds are also present in the area.

Physiographically, the site lies in the area known as the Ottawa Valley Clay Plains founded in the Lowlands of the St. Lawrence. The deposit consists of clay plains interrupted by ridges of rock or sand. Overburden deposited by successive progression and retreat of shallow seas is underlain by bedrock of the Oxford formation.

The Bruce Pit was used as a sand pit during the 1940's, 1950's and 1960's as suppliers excavated the resource of sand predominant at the site. In addition, a small municipal landfill had operated at the site from approximately 1948 to the early 1960's.

SUBSURFACE CONDITIONS

General

Subsoil conditions are generally uniform across the site of investigation. A surficial layer of brown sand fill up to 1.5 metres in thickness overlies refuse fill material consisting of incinerated domestic garbage, in the form of cinder and ash, and varying in thickness from 1.1 metres to 2.6 metres. The native cohesionless sand deposit underlies the refuse fill material and this deposit was proven to a maximum thickness of 5.1 metres. The extent of the refuse material along the proposed Cedarview Road was determined and it appears that the refuse fill tapers off at the northern and southern extremes of the area of investigation and the surficial brown sand fill directly overlies the native sand deposit at these locations.

The boundaries between the various soil types, in situ and laboratory test results as well as stabilized ground water levels, are shown on the attached Record of Borehole Sheets in the Appendix. A plan of the site illustrating the locations and elevations of the boreholes and a stratigraphical profile are also provided on Dwg. 1258700-A.

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

Sand (Fill)

The surficial layer spread across the site consists of a brown, cohesionless fill that has a varying thickness ranging from 1.2 m to 1.5 m. Traces of organics are also present in the fill. The sand fill is poorly graded and based on 'N' values obtained from the Standard Penetration Test, varies from a very loose to a compact state of condition. A distinct methane odour (a direct permeation from the underlying domestic refuse) is present within this layer.

Refuse (Fill Material)

Underlying the relatively clean surficial sand fill exists fill material composed of a heterogeneous mixture of incinerated domestic garbage, in the form of cinder and ash, plastics, cloths and wood chips. The refuse varies in thickness from 1.1 to 2.6 metres. The presence of the black cinder and ash illustrates that a large quantity of the refuse has been burned and consequently, the fill material generally possesses cohesionless characteristics. The state of decomposition also indicates that the refuse had been placed some time ago.

'N' values obtained from the Standard Penetration Test varies from 2 blows/0.3 m to 12 blows/0.3 m indicating that the domestic refuse is in a loose to compact state of condition. A strong methane odour is also present in the fill.

Sand

Underlying the refuse fill material at a depth ranging from 1.5 m to 3.8 m below the ground surface, exists the native deposit of poorly graded sand. The deposit which contains occasional silt seams was proven to a maximum thickness of 5.1 metres. Grain size distribution curves for this deposit is provided in envelope form on Figure 1 in the Appendix.

The relative density of this cohesionless deposit is primarily dense to very dense with 'N' values obtained from the Standard Penetration Test ranging from 31 blows/0.3 m to 100 blows/0.15 m. The deposit appears to be less dense below the water table that is present within this layer approximately 2 m to 3 m below the base of the fill material (El. 86.6 m-87.6 m).

Groundwater Conditions

Observation of the groundwater level was carried out by measuring the water level in the open boreholes and also in standpipes installed in the native sand stratum. Measurements revealed stabilized levels at an elevation ranging from 86.6 m to 87.6 m which corresponds to depths of 4.6 m to 6.1 m below the ground surface or equivalently, 2 m to 3 m below the base of the refuse fill material.

DISCUSSION AND RECOMMENDATIONS

In conjunction with the construction of Hwy. 416, it is proposed to relocate the existing Cedarview Road between Century Road and Hwy. 417 approximately 150 m east of its present alignment. The proposed realigned Cedarview Road is located approximately 60 metres east of the proposed Hwy. 416 and requires fill heights up to 5.0 metres. Both the proposed Hwy. 416 and the proposed realigned Cedarview Road pass through the abandoned Bruce Pit landfill site and consequently stability and settlement of the ramp fills are geotechnical items of concern, particularly in the area of the intersection of Cedarview Road and the proposed Cedarview Road connection. This is the area where domestic refuse fill material had been identified from an earlier environmental investigation and verified by this report. The cost-effectiveness of leaving this fill in situ was clearly pronounced in the environmental assessment report produced by Conestoga Rovers & Associates-1988.

Stability

Stability computations were carried out to evaluate the effect of the road fills in the area of the previously placed sand and refuse fills. In view of the fact that a large portion of the refuse fill had been previously burned, the refuse fill was considered to behave as a cohesionless soil with soil properties as provided in Table 1. The soil parameters for other soils used in the stability analysis including the existing sand fill, the proposed road fill and the existing native sand are also tabulated in Table 1.

Table 1 - Soil Parameters

Soil Type	Unit Weight γ (kN/m^3)	Angle of Internal Friction (ϕ°)
Road Fill	20	30
Sand Fill (Existing)	19	28
Refuse Fill	17	23
Sand	20	30

Bishop's total stress analysis was implemented incorporating a minimum factor of safety of 1.3 and standard 2H:1V slopes. Based on the analysis it can be concluded that no stability problems are anticipated for the proposed fill heights.

Settlement

Settlements will result from further compaction of the refuse fill produced by the placement of the road fill. Although the magnitude of these settlements is difficult to predict because of the composition of the refuse and the inability to apply conventional soil mechanics, it can be assumed that the refuse fill will behave as a cohesionless soil, in view of its primarily incinerated and decomposed state. This interpretation combined with the fact that the maximum thickness of the refuse fill is 2.6 m and the absence of the water table within this refuse fill suggests that the settlements induced will not be of enormous magnitudes and should not exceed 100 mm. The settlements will be immediate in nature and will be realized during or shortly after road fill construction.

It is recommended that in order to minimize settlements and subsequent post construction maintenance, the existing fill be compacted prior to placement of the road fill using standard drum drive vibratory rollers or equivalent. In addition, the fills should be placed as far in advance of surface paving as scheduling and economics permit. Any subsidence can be corrected by regrading with granular subbase material prior to the surface paving.

MISCELLANEOUS

The fieldwork for this investigation was carried out under the supervision of T. Sangiuliano, Foundation Engineer, utilizing equipment owned and operated by Johnston Drilling Co. Ltd. This report was written by T. Sangiuliano and reviewed by M.S. Devata, Chief Foundation Engineer.

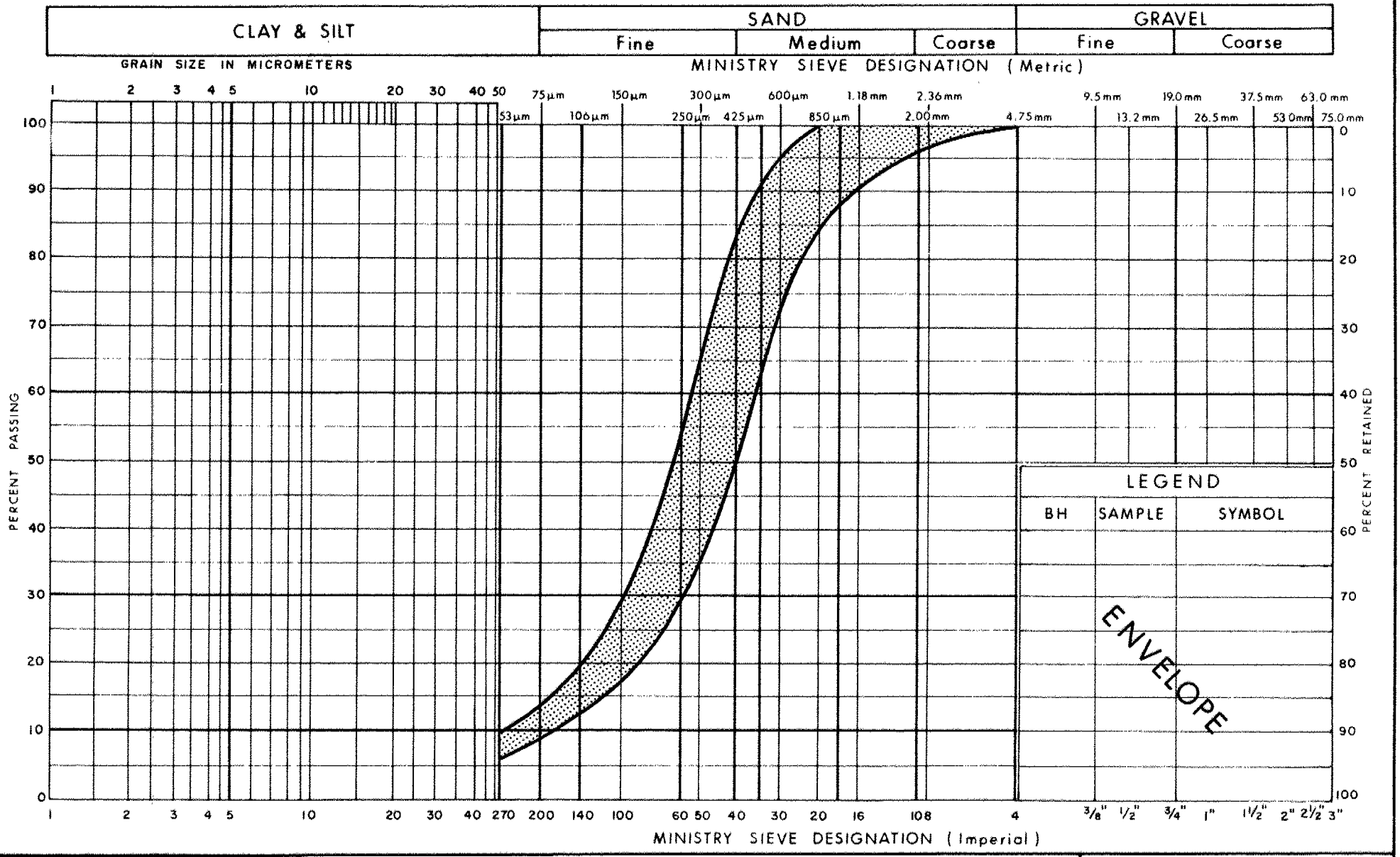
T. Sangiuliano, P.Eng.
Foundation Engineer

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

APPENDIX

78 12 M

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of Transportation
Ontario

GRAIN SIZE DISTRIBUTION

SAND, WITH OCC SILT SEAMS

FIG No 1

WP 125-87-00

EXPLANATION OF TERMS USED IN REPORT

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

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

SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSENESS.

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

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

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

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

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

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

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

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

JOINTING AND BEDDING:

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

ABBREVIATIONS AND SYMBOLS

FIELD SAMPLING

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

STRESS AND STRAIN

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

MECHANICAL PROPERTIES OF SOIL

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

PHYSICAL PROPERTIES OF SOIL

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

e	1, %	VOID RATIO
n	1, %	POROSITY
w	1, %	WATER CONTENT
S_r	%	DEGREE OF SATURATION
w_L	%	LIQUID LIMIT
w_p	%	PLASTIC LIMIT
w_s	%	SHRINKAGE LIMIT
I_p	%	PLASTICITY INDEX = $w_L - w_p$
I_L	1	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_C	1	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	1, %	VOID RATIO IN LOOSEST STATE

e_{min}	1, %	VOID RATIO IN DENSEST STATE
I_D	1	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
D	mm	GRAIN DIAMETER
D_n	mm	n PERCENT - DIAMETER
C_U	1	UNIFORMITY COEFFICIENT
h	m	HYDRAULIC HEAD OR POTENTIAL
q	m^3/s	RATE OF DISCHARGE
v	m/s	DISCHARGE VELOCITY
i	1	HYDRAULIC GRADIENT
k	m/s	HYDRAULIC CONDUCTIVITY
j	kN/m^3	SEEPAGE FORCE

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 1

METRIC

W P 125-87-00 LOCATION Co-ords. N 5 020 683.4; E 359 216.4 ORIGINATED BY TS

DIST 9 HWY 416 BOREHOLE TYPE Cone Test, Hollow Stem Auger COMPILED BY TS

DATUM Geodetic DATE 88 11 28 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
91.2	Ground Surface										
0.0	Sand, Brown Compact (Fill)		1	SS	10		90				
89.7			2	SS	40						
1.5	Sand With Occ. Silt Seams Grey-Brown Dense to Very Dense		3	SS	32		88		○		0 91 (9)
			4	SS	38						
			5	SS	68	▼	86				
84.6			6	SS	31						
6.6	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

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

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 2

METRIC

W P 125-87-00 LOCATION Co-ords. N 5 020 706.6; E 359 205.1 ORIGINATED BY TS

DIST 9 HWY 416 BOREHOLE TYPE Cone Test, Hollow Stem Auger COMPILED BY TS

DATUM Geodetic DATE 88 11 28 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L — WATER CONTENT (%) 10 20 30	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
93.3	Ground Surface										
0.0 / 91.8	Sand, Brown Very Loose (Fill)		1	SS	2		92				
1.5 / 89.9	Refuse Domestic Garbage Black Cinder/Ash (Fill)		2	SS	2						
			3	SS	4						
			4	SS	35		90	100/15 cm			
3.4	Sand With Occasional Silt Seams Grey Dense to Very Dense		5	SS	70						
			6	SS	70		88		○		0 89 (11)
			7	SS	60	Seal					
85.2			8	SS	40	* Seal	86				
8.1	End of Borehole										

* Standpipe Installed
Bottom 300 mm
Slotted

OFFICE REPORT ON SOIL EXPLORATION

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

15 20/10 5 (%) STRAIN AT FAILURE

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 3

METRIC

W P 125-87-00 LOCATION Co-ords. N 5 020 698.7; E 359 213.2 ORIGINATED BY TS

DIST 9 HWY 416 BOREHOLE TYPE Cone Test, Hollow Stem Auger COMPILED BY TS

DATUM Geodetic DATE 88 11 28 CHECKED BY

ELEV / DEPTH	DESCRIPTION	STRAT PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES 'N' VALUES	GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT WL / WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
92.8	Ground Surface										
0.0 / 91.6	Sand, Brown Compact (Fill)		1	SS	12		92				
1.2 / 90.5	Refuse Domestic Garbage Black Cinder/Ash (Fill)		2	SS	8						
2.3	Sand With Occasional Silt Seams Grey Dense to Very Dense		3	SS	100/15 cm		90		○		0 89 (11)
			4	SS	60						
			5	SS	65	Seal	88				
86.2			6	SS	30	Seal					
6.6	End of Borehole										

* Standpipe Installed Bottom 300 mm Slotted

OFFICE REPORT ON SOIL EXPLORATION

+3, ×5 : Numbers refer to Sensitivity

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

Ministry of Transportation Ontario

RECORD OF BOREHOLE No 4 METRIC

W P 125-87-00 LOCATION Co-ords. N 5 020 717.0; E 359 211.7 ORIGINATED BY TS

DIST 9 HWY 416 BOREHOLE TYPE Hollow Stem Auger COMPILED BY TS

DATUM Geodetic DATE 88 11 29 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT (20 40 60 80 100) / SHEAR STRENGTH kPa (○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE)	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT Wl — WATER CONTENT (%) (10 20 30)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						GR SA SI CL
93.7	Ground Surface										
0.0 / 92.5	Sand, Brown Loose (Fill)		1	SS	8						
1.2 / 89.9	Refuse Domestic Garbage Black Cinder/Ash (Fill)		2	SS	8		92				
			3	SS	7						
			4	SS	75/23 cm		90				
3.8	Sand With Occasional Silt Seams Grey Very Dense		5	SS	50						
			6	SS	50		88				
			7	SS	70	▼			o		0 91 (9)
85.6	Compact		8	SS	20		86				
8.1	End of Borehole										

OFFICE REPORT ON SOIL EXPLORATION

*3, ×5 : Numbers refer to Sensitivity

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

Ministry of Transportation
Ontario

RECORD OF BOREHOLE No 5

METRIC

W P 125-87-00 LOCATION Co-ords. N 5 020 726.2; E 359 199.6 ORIGINATED BY TS

DIST 9 HWY 416 BOREHOLE TYPE Cone Penetration Test COMPILED BY TS

DATUM Geodetic DATE 88 11 29 CHECKED BY

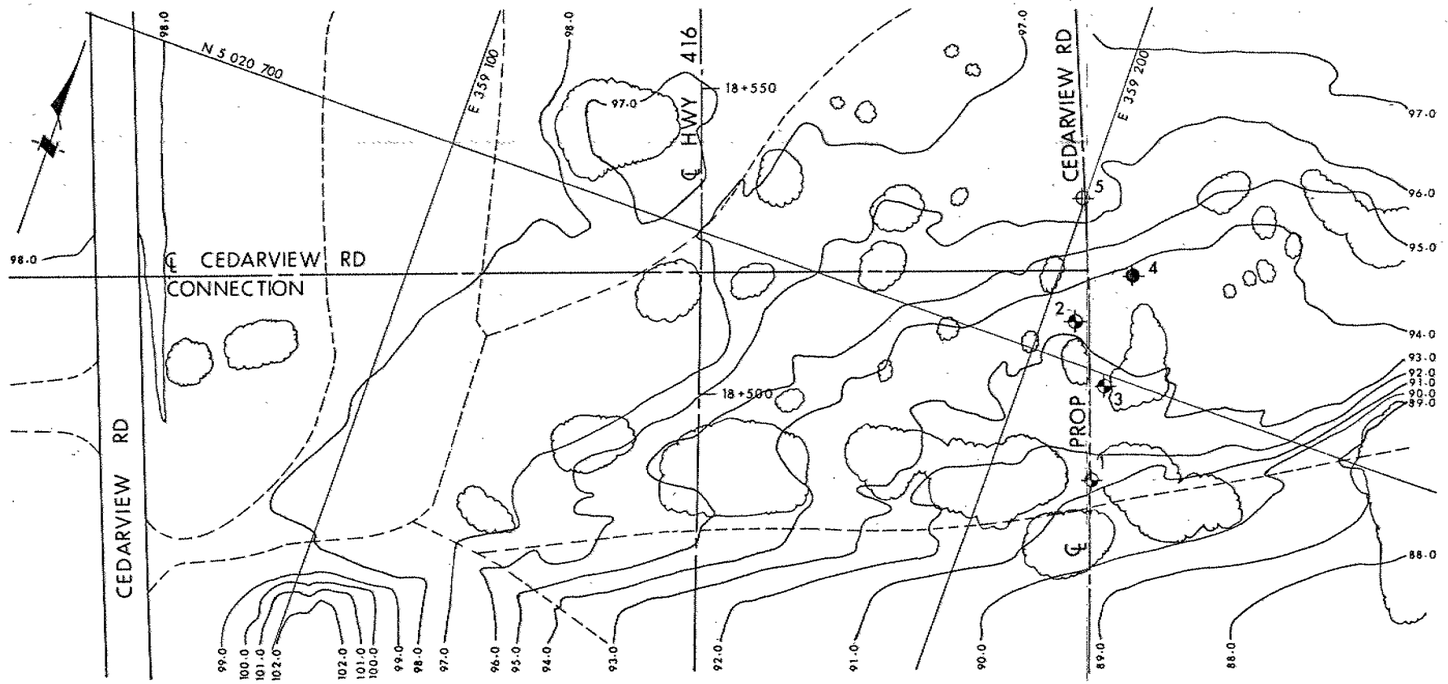
SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH kPa ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	PLASTIC LIMIT Wp / NATURAL MOISTURE CONTENT W / LIQUID LIMIT W_L WATER CONTENT (%)	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV / DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES						
96.4	Ground Surface										
0.0 / 94.9	Probable Sand (Fill)						96				
1.5	Probable Sand						94				
							92				
90.3											
6.1	End of Cone Test										

OFFICE REPORT ON SOIL EXPLORATION

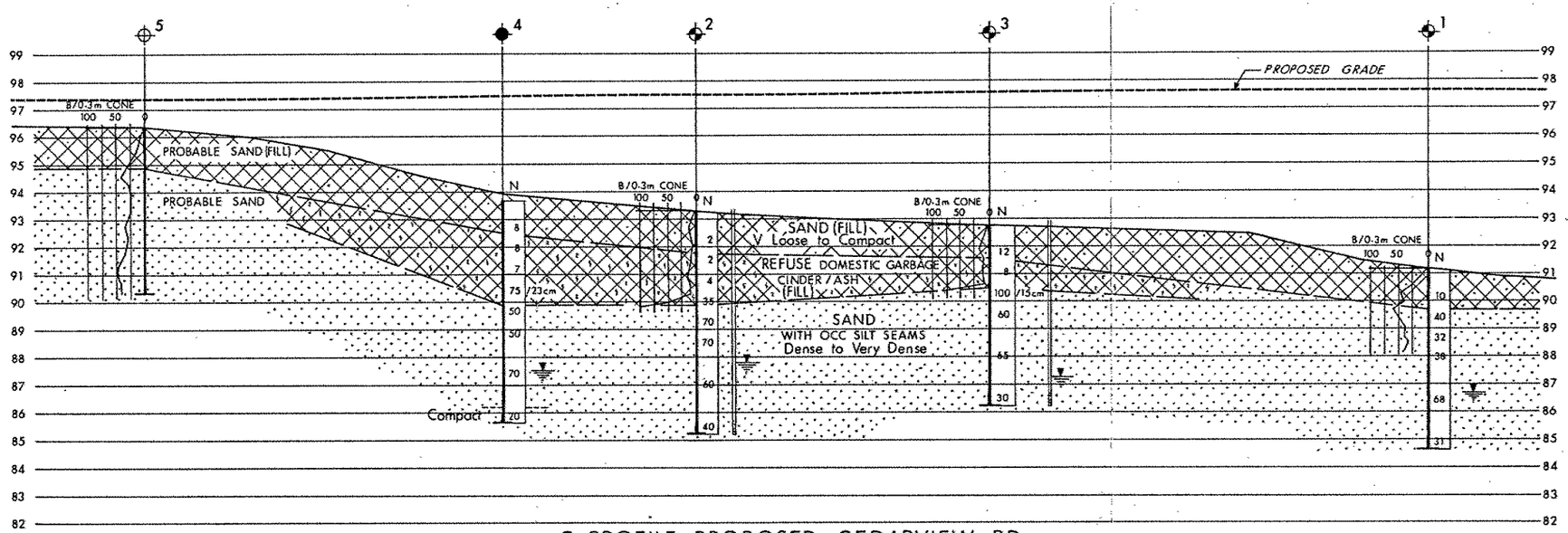
$+^3$, $\times^5$: Numbers refer to Sensitivity

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

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



PLAN
SCALE
10m 5 0 10m



℄ PROFILE PROPOSED CEDARVIEW RD
SCALE
2m 1 0 2m

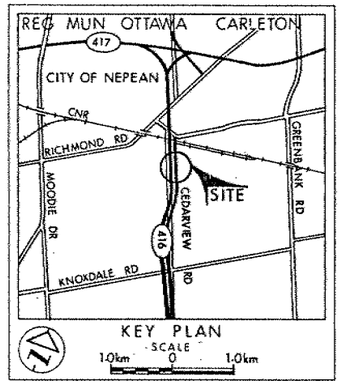
METRIC

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

CONT No
WP No 125-87-00

CEDARVIEW RD
(BRUCE PIT LANDFILL)
BORE HOLE LOCATIONS & SOIL STRATA

SHEET



LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation 88 11
- Standpipe Bottom 300mm Slotted

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	91.2	5 020 683.4	359 216.4
2	93.3	5 020 706.6	359 205.1
3	92.8	5 020 698.7	359 213.2
4	93.7	5 020 717.0	359 211.7
5	96.4	5 020 726.2	359 199.6

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

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

REV	DATE	BY	DESCRIPTION

Geocres No 31G5-155

HWY No 416			DIST 9
SUBM'D TS	CHECKED	DATE 89 02 03	SITE
DRAWN DT	CHECKED	APPROVED	DWG 1258700-A

memorandum

Ontario

To: D. McAvoy
Planning & Design Section
Kingston

Date: 1988 04 07

From: Foundation Design Section
Room 315, Central Building

RE: Bruce Pit
W.P. 146-74-00
Hwy. 416, District 9, Ottawa

As requested we have reviewed the Bruce Pit Landfill Investigation Study Design, prepared by Conestaga Rovers & Associates, and dated March 9, 1988.

Our comments are as follows:

1) Regarding the terms of reference indicated on pages 1 and 2: The consultant plan for items 1 and 2 has been explicitly detailed. However, in our opinion more detailing is required for items 3 and 4. The CRA report will describe the present situation within the landfill. It should also predict and suggest measures to control negative impact of the proposed construction.

2) We assume Ministry staff will determine the landfill subexcavation requirements. In order to design this crossing, details of the proposed road geometry, and the engineering properties of the landfill are required. The CRA report should provide recommendations for the safety precautions that will be necessary for subsequent subsurface investigations in the landfill, or if routine drilling procedures will be acceptable.

3) The report indicates that the proposed monitoring program should extend through the pre-construction phase. Consideration should be given to extending some monitoring through the construction phase.

4) The report does not indicate the frequency of sampling during the monitoring program, or any criteria for reproducable results between sampling groups.

5) The water quality in the ponds should be monitored. The report should detail surface topography and surface drainage.

.....2

6) On page 20, the report indicates that drill cuttings will be spread on the surface. Drill cuttings from within the landfill should be disposed in a landfill site.

If there are any questions, please contact this office.

D.H. Dundas

D.H. Dundas. P. Engineer
Sr. Foundations Engineer

DHD/mj