

W.O.

W.P.

LOCATION

GEOCRES NO.

536-56-05 Hwy 8 Ret W. Dundas

30 M 5-98

● DATA ON FILE IN SOIL MECHANICS SECTION

REFER TO:

W.P. FILE

REMARKS

Project Cancelled

GEOCRES

INDEXING CARD FOR REPORTS NOT MICROFILMED

GI-20

AUG. 74

Oversized Drawings

program status report.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. C. Mirza,
Principal Foundations Engineer,
West Building.

FROM: G.C.E. Burkhardt,
Structural Planning Office,
3501 Dufferin Street.

ATTENTION: Mr. K. Selby

DATE: August 23, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT: Schemes for Proposed Retaining Walls
on Highway 8 in the Town of Dundas,
W.P. 536-56, District 4.

Further to our discussion and review of the schemes for the proposed retaining walls we are forwarding to you the following:

- 2 prints of plans showing 1 wall scheme
- 1 roll of cross-sections for 1 wall scheme

- 2 prints of plans showing 3 wall scheme
- 1 print of profile of top of walls for 3 wall scheme
- 1 roll of cross-sections for 3 wall scheme

- 2 prints of plans showing 4 wall scheme
- 1 print of profile of top of walls for 4 wall scheme
- 1 roll of cross-sections for 4 wall scheme

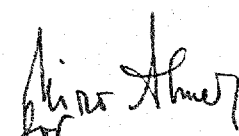
- 1 copy of Public Participation pamphlet

Additional copies of the profiles have been ordered and will be forwarded at a later date.

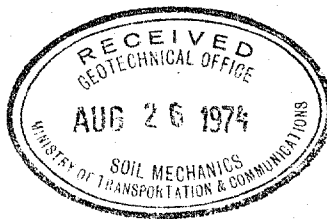
As we discussed, it is necessary to have additional feasibility foundation studies carried out to establish the feasibility of these schemes.

We would appreciate receiving any preliminary findings and recommendations as soon as available to be followed at a later date by the complete report.

WMK/sm


W.M. Killin,
for:
G.C.E. Burkhardt,
REG. STRUCTURAL PLANNING ENG.

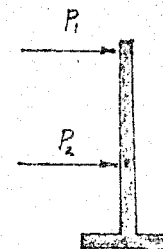
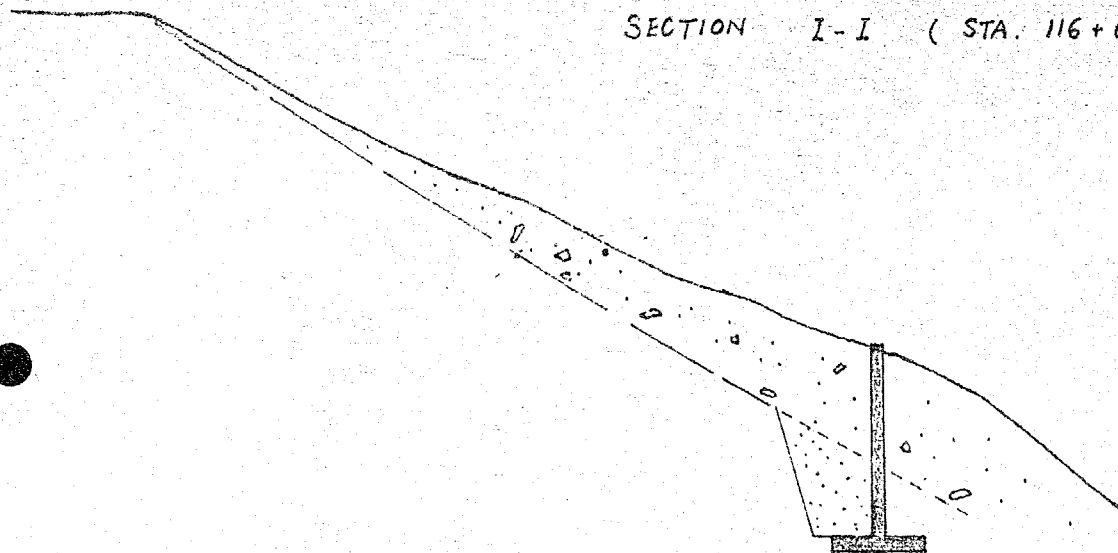
cc: J. Barclay
R. Fitzgibbon
J. Anderson



For Mr. Selby

71-11001

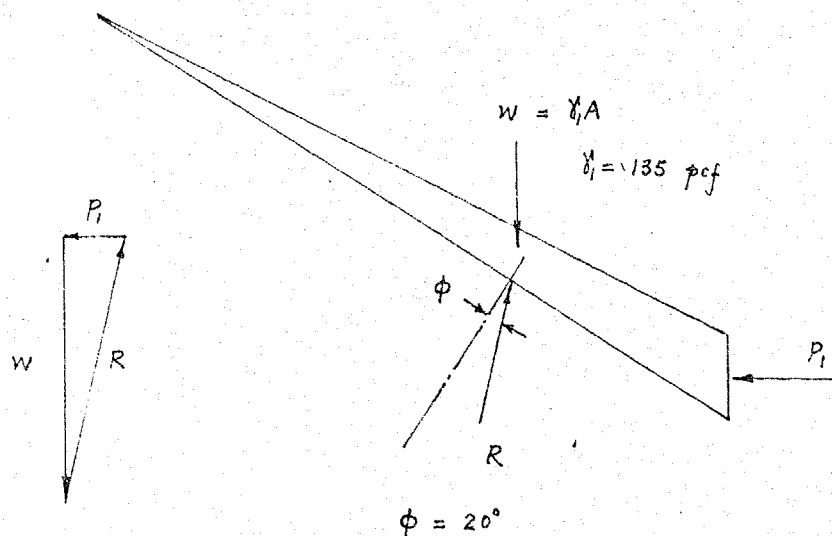
SECTION I-I (STA. 116+00, BL A)



$$P_2 = \frac{K_o}{2} \gamma H^2$$

$$K_o = 0.6$$

$$\gamma = 130 \text{ pcf}$$



For $H = 44 \text{ ft.}$

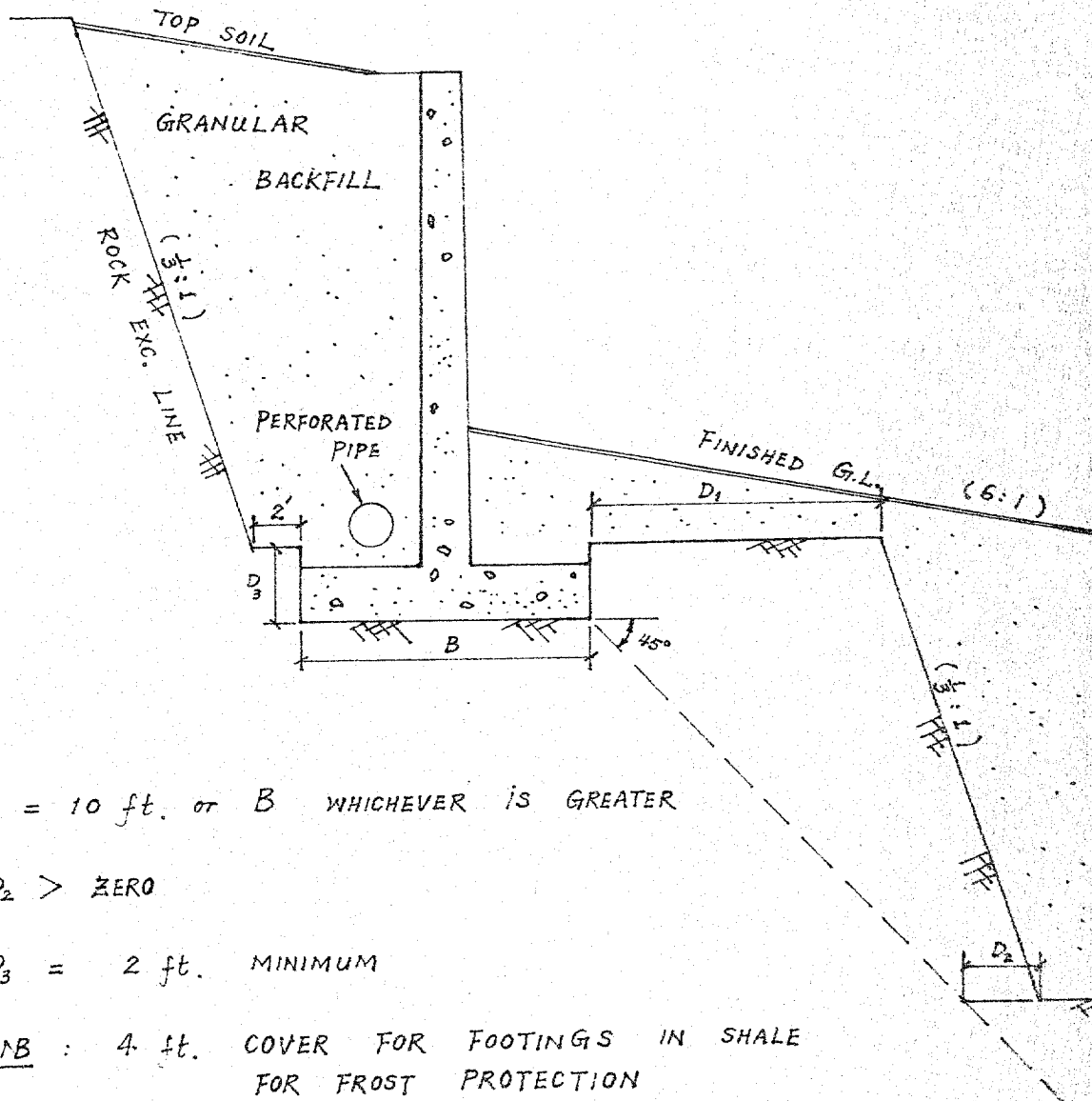
$$P_1 = 49.1 \text{ Kips}, \quad P_2 = 75.5 \text{ Kips}$$

$$\therefore \text{REQ. SHEAR RESISTANCE} = 1.5 (P_1 + P_2) \\ = 186.9 \text{ Kips. per ft.}$$

$$\therefore \text{REQ. MOMENT RESISTANCE} = 2.0 (P_1 d_1 + P_2 \times \frac{H}{3}) \\ = 2.0 (49.1 \times 44 + 75.5 \times \frac{44}{3}) \\ = 6520 \text{ ft-Kips. per ft.}$$

FIG. 3

FIG. 2. GENERAL REQUIREMENTS



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: G. C. E. Burkhardt (3)
Regional Structural Planning Engr.
Central Region
3501 Dufferin Street, Downsview

FROM: Soil Mechanics Section
Geotechnical Office
Downsview

ATTENTION:

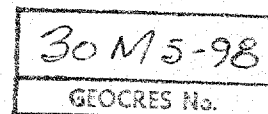
DATE: December 10, 1974

OUR FILE REF.

IN REPLY TO

SUBJECT:

Proposed Improvement of Hwy. #8
Retaining Walls Between Subway
and Escarpment Cres. West of
Dundas West Limits, Base Line 'A'
Sta. 100 + 00 to Sta. 120 + 00
District #4 Hamilton



W.P. 536-56-05

Attached is a copy of the report on our recent foundation investigation for the above-mentioned project. The report is an extension of our Report 71-11001 which was prepared for a feasibility study and compared two proposed routes referred to as the 'Subway Line' and the 'Overhead Line'. The new report deals only with the 'Subway Line' and in particular with the cut sections between the C.N.R. Crossing of Hwy.#8 and the Lookout Platform, a total distance of about 2,000 feet. The feasibility of constructing various retaining walls as an alternative to cut slopes has been studied and sufficient factual information relating to soil and rock conditions, together with design and construction recommendations is contained in the report to enable you to (1) decide on the most suitable location for retaining walls, and (2) to make a reasonable cost estimate of the construction of these. You should note however, that after consultation with the Structural Office, we do not consider it to be economically feasible to retain extensive overburden slopes by means of retaining walls because of the very large forces involved, and that the walls we do consider feasible are simply a means of reducing excavation within the soft rock (i.e. shale) strata and providing level areas for purposes of growing trees and other suitable vegetation.

If any questions arise, or if further information is required, please contact this Office.

K. G. Selby

KGS:mt

K. G. Selby
Supervising Engineer

cc: E. J. Orr
B. R. Davis
R. S. Pillar
B. J. Giroux
D. Gunter
C. A. Wrong
J. Cullen (2)
C. R. Robertson
W. Lyn
P. Lewycky

Foundation Files
Documents

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Proposed Improvement of Hwy. 8
Retaining Walls Between Subway
and Escarpment Crest, West of
Dundas West Limits, Base Line 'A'
Sta. 100 + 00 to Sta. 120 + 00
District #4 Hamilton

W.P. 536-56-05

1. INTRODUCTION:

The section of Hwy. 8 under consideration is located just west of the City of Dundas, covering a distance of approximately 2,000 ft. from the Subway structure in the east to the Look-out platform in the west. Confined between the Niagara Escarpment and the Canadian National Railway, Hwy. 8 in this locale is a two-lane highway with steep gradients, sharp turns, and poor visibility. Hence, an improvement is necessitated in order to accommodate the increasingly heavy traffic and, in addition, to achieve safety in driving.

One of the proposals for the improvement of Hwy. 8 involves the so-called Subway scheme (Foundation Report W.O. 71-11001), which calls for a widening of the pavement from two lanes to four lanes and a reduction of curvatures of the turns near the Subway and the Look-out platform. The overall gradient of the road apparently cannot be decreased because of the constraints by the Subway and the top of the Escarpment.

As the proposal just mentioned will move Hwy. 8 into the Escarpment for the additional lanes, a considerable amount of earth-rock excavation is required. In this connection, stability of the resulting slopes and that of the retaining structures have to be investigated.

To be considered here is the feasibility of various schemes involving retaining walls and rock-cut slopes. The purpose of this report therefore is to present the results of our field investigation and recommendations, so that an assessment of the cost of the various proposals can be achieved.

2. DESCRIPTION OF SITE AND GEOLOGY:

Hwy. 8 along the investigated area is bounded to the north by the Niagara Escarpment, and to the south by the Canadian National Railway (Drawing 53656-05A). It rises from El. 495± at the Subway to El. 630± near the Look-out platform over a distance of some 2,000 ft. The area is mainly residential development of detached houses. A golf course is also located in the valley south of the railway fill. Except where rock faces are exposed, the Escarpment at present is heavily wooded.

The site is located in the physiographic region referred to as the Niagara Escarpment. It stretches from the Niagara Falls to the tip of the Bruce Peninsula, then reappears in the Manitoulin Islands after it is submerged in Lake Huron. The outstanding feature of the Escarpment is the long steep rock faces formed by the abrupt termination of the rock strata. This feature is a result of differential erosion taking place over millions of years. The more resistant layers of dolomitic limestone are undercut by the softer shale below, resulting in the rupture of blocks of dolomite and thus the steep fronts of the Escarpment. The broken fragments of dolomite, shale and sandstone were mixed with till to form a talus deposit which covers a large portion of the slope.

The bedrock comprises essentially horizontally bedded sedimentary rocks of the Palaeozoic age. From an engineering standpoint, the geological succession may be regarded as consisting of two dolomite members (Lockport & Clinton) separated by a shaley member (Rochester) and underlain by a sequence of shales (Cabot Head). A more detailed description of the rock formations is contained in Section 4, and a typical rock stratigraphy is summarized in Figure (1)

3. FIELD WORK:

Field work was carried out to determine the overburden and bedrock characteristics, as well as the groundwater conditions. A total of 22 sampled boreholes (#101 - #122) was put down. In addition, results of 10 boreholes (#1 - #10) reported previously in Foundation Report W.O. 71-11001 are also incorporated here.

Boreholes were advanced by means of diamond drilling, and continuous rock-cores of BXL size were obtained. In the overburden disturbed samples were also recovered by means of a split-spoon sampler driven into the soil in accordance with the specification of the Standard Penetration Test. The number of blows required to advance the sampler a foot into the soil is recorded as the 'N' values.

In the lab, all rock-core samples were subjected to careful inspection by a geologist, whose report is contained in the Appendix.

4. SUBSOIL AND BEDROCK TYPES:

Figure (1) illustrates a typical sequence of rock formations and thicknesses as encountered in the boreholes. Variation in the given elevations may be found in practice due to the loss of samples during coring or lack of clear definition of bedding contacts.

The rock formations were found to be essentially horizontally bedded. Outcrops on the Escarpment in this locale are normally limited to the upper four formations, the remainder being concealed by talus material covering the lower two-thirds of the slope.

A description of the talus and the various rock formations is given below:

4. SUBSOIL AND BEDROCK TYPES (cont'd.):

4.1) Talus:

The components are heterogeneous and very variable, consisting mainly of clayey silt with sand, gravel and rock fragments. In some areas the talus is mixed with till washed from the till plain above.

The 'N' values of the Standard Penetration Test indicate a very dense or stiff material; however, the presence of stones and boulders may invalidate the normal interpretation of these test results, and may not apply to the matrix material.

The talus is found to exist east of Sta. 107 + 50, with a depth increasing from a few feet at Sta. 107 + 50 to over 40 ft. near Sta. 118 + 00. At present, the talus surface has an average 2.5:1 slope, corresponding to an angle of repose of 21.7° . From results reported on the stability of talus slopes in the Hamilton area, which indicate a range of only 18° to 22.5° for ϕ , it is reasonable to assume that the stability of the present talus slope is marginal. Therefore, any construction should be directed towards improvement of the geometry of the slope and/or the groundwater conditions.

4.2) Bedrock:

The various rock strata encountered in the boreholes are summarized as follows:

Lockport Dolomite - grey, massive, fine to coarse textured, and porous. Occasional vertical joints are encountered. In general it is hard and sound. Due to the presence of joints, it must be considered as highly permeable.

Rochester Shale - grey, soft to medium hard, with many limestone/dolomite interbeds, impervious.

Clinton Dolomite - light grey to grey, fine to medium textured, hard and sound, with some fractures and vertical joints. High overall permeability.

4. SUBSOIL AND BEDROCK TYPES (cont'd.):

4.2) Bedrock (cont'd.):

Grimsby-Thorold Sandstone & Shale - Here we have shale and sandstone interbedded with dolomite; grey to greenish grey, medium hard, rather impervious.

Cabot-Head Shale - red to reddish grey, with dolomitic lenses and layers, occasionally interbedded with fine sandstone seams, very soft to soft, and impervious.

Manitoulin Limestone - dolomitic, with numerous grey shale partings, pervious overall, and hard.

Whirlpool Sandstone - light grey, massive and fine grained, quartzose.

Queenston Shale - brick red, with green mottling and streaks, impervious.

4.3 Groundwater:

No long term observations of groundwater were made during this field investigation. Those encountered in the boreholes are reported in the Borehole Record Sheets. The results showed that the groundwater levels were not relatable to the ground surface profile.

In addition, slight seepage from the slope was observed in some spots near the Subway structure, and there is a spring near Sta. 104 + 00, the supply of which was sufficient to maintain the rock coring operation. It is also known that some residents here obtain water from wells sunken into the dolomite.

.....6

5. COMMENTS AND RECOMMENDATION:

Considerable amount of earth-rock excavation is required for the proposed relocation of Hwy. 8 in this locale. The stability of the resulting slopes and retaining structures therefore has been studied. Based on the results of our findings, the following comments and recommendations are made:

5.1) It is possible to construct a stable side hill without retaining structures, provided the following precautions are followed:

A slope no steeper than 1/4 (horizontal) : 1 (vertical) is provided for dolomite, 2:1 for shale, and 2.5:1 for talus, respectively. Also, a bench of minimum width 10ft., with a drainage ditch at the back, must be provided at each upper contact of the shale strata below the dolomite. These benches serve three main purposes. Firstly, they prevent undercutting of the dolomite due to differential erosion. Secondly, drainage ditches can be installed at the backs of the benches to intercept water that percolates through the dolomite. Thirdly, they help to retain rocks falling down from the dolomite strata.

Typical cross-sections of these recommended rock slopes are shown in Drawings 5365605-B, C, and D.

It is to be noted that excavation must proceed from top to bottom of slope so as to avoid failures during construction. Sodding or replanting of the slope is desirable as it will beautify the appearance and help protect the slope from erosion. A plant, known as Crown-Vetch, which resembles Alfalfa, is believed to grow well on these slopes.

5. COMMENTS AND RECOMMENDATIONS (cont'd.):

5.2) Alternatively, retaining structures can be constructed to reduce the amount of excavation. Two tentative suggestions are shown in Drawings 5365605-B, C and D. For design purposes, the following recommendations are made:

a.) From Sta. 107 +50 to Sta. 117 +50, the various retaining walls can be supported on footing foundations with the bases taken at least 2 ft. into "sound" bedrock. A safe bearing pressure of up to 20 tsf ^{for dolomite + 8.0 tsf} for shale (20% less than our normal recommendation of 10 tsf). To protect the shale from softening, a working slab should be provided upon exposure of the shale.

Dewatering can be achieved by means of sump pumps. All footings in shale should have a minimum 4 ft. cover for frost protection.

General design requirements for the retaining walls are shown in Fig. (2).

b.) Adequate drainage should be provided behind the walls to prevent any build-up of hydro-static pressure. Surface run-off should be diverted so as to eliminate direct discharge into the backfill.

c.) If the overburden is removed and drainage is provided, and the general requirements shown in Fig.(2) are followed, the lateral pressures exerted on the walls will be those due to the granular backfill. The walls may be designed in an at-rest condition subjected to a triangular distribution of pressure, with 0.6 assumed for K_0 and 130 pcf for the density of the backfill.

To evaluate the sliding resistance along the base of the footing, a coefficient of friction $f=0.35$ may be assumed for shale, and $f=0.42$ for dolomite. A factor of safety of 1.5 minimum is required for safety against sliding and 2.0 minimum against overturning.

5.2) c.) (Cont'd.)

If these requirements cannot be fulfilled by friction along the footing base itself, additional resistance can be achieved by one of the following methods - a key along the heel of the footing, or dowels grouted into bedrock, or applying rock anchors, or using grouted tie-cables to increase the normal forces on the footings.

d.) The temporary back-slopes excavated for the retaining walls should be stable at 1/3 : 1 for shale, and 1/4:1 for dolomite. In the case of the multi-wall scheme (see Fig. 2), the toe of the footings should be located at least 10 ft. or the width of the footing, whichever is the greater, from the forward slope of the rock excavation line. Also, a line drawn from the toe of the footing at 45° to the horizontal must not intercept the rock excavation line (see Fig.2).

e.) The finished slope should be sodded or seeded to protect against erosion.

5.3) In a meeting held recently, queries were raised to examine the affect of excavation on the water supply of wells sunken in the dolomite, and the feasibility of retaining the overburden in order to conserve the environment.

As we do not have sufficient related information, we are unable to assess any potential temporary or permanent damage; however, a reduction in water supply in these walls could be anticipated. As to the proposal of retaining the overburden, apart from the difficulties in construction, the tremendous forces acting on the walls, as illustrated in Fig. (3), make it economically unfeasible (according to Structural Design).

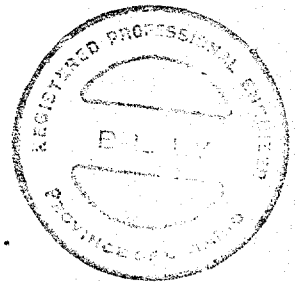
If it is undesirable, from an environmental point of view, to remove the overburden, and economically unfeasible to retain it, it may be necessary to relocate the proposed route slightly south of the existing alignment so that a compromise may be achieved.

6. MISCELLANEOUS:

Field work was carried out during the period of September 19 to October 29, 1974. The equipment used was owned and operated by Master Soil Investigation, Ltd.

This report was prepared by Mr. B. Ly, Project Engineer, and reviewed by Mr. K. G. Selby, Supervising Engineer.

B. Ly, P. Eng.



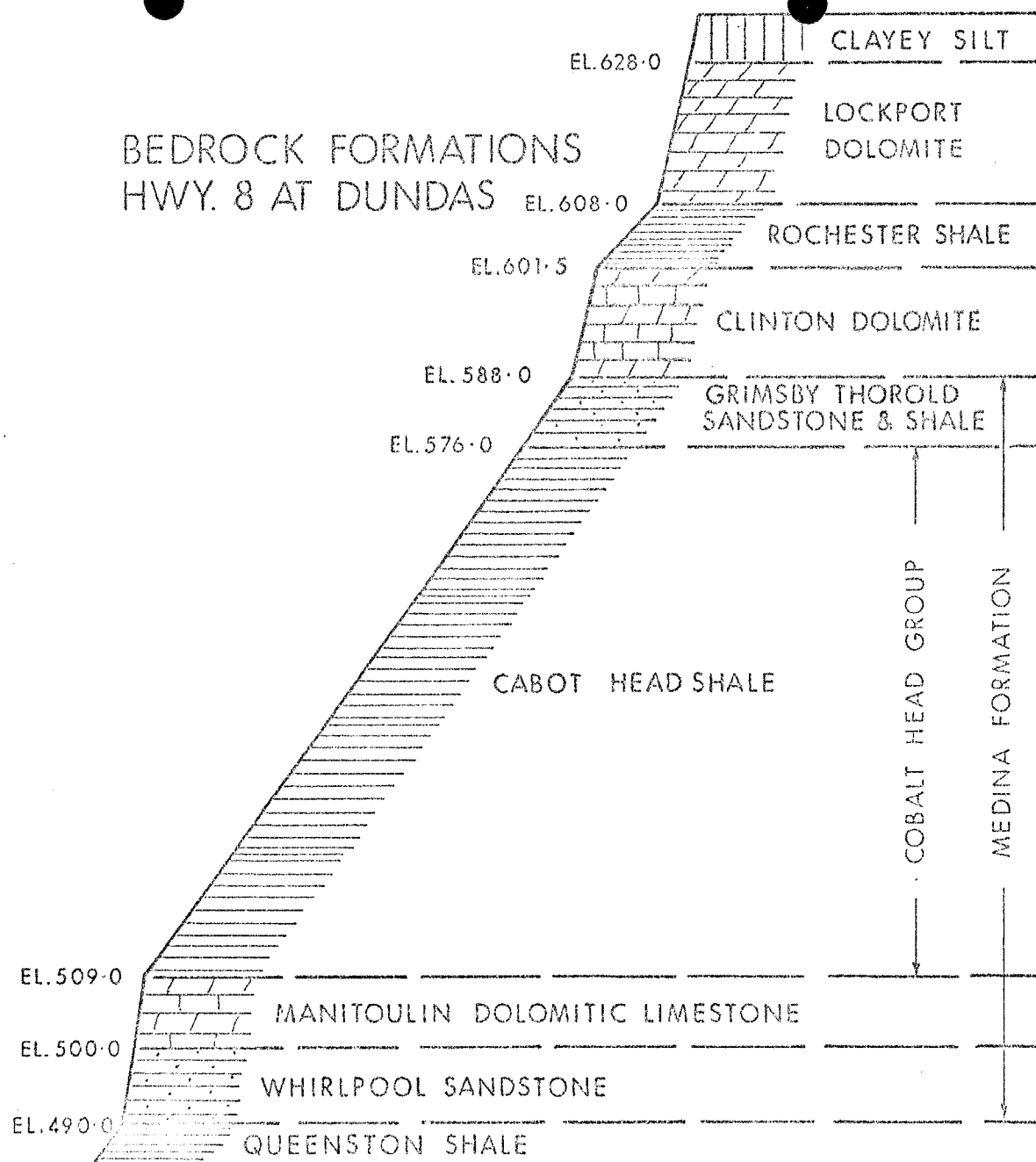
K. G. Selby

K. G. Selby, P.Eng.

BL:mt

Dec. 9/74

BEDROCK FORMATIONS HWY. 8 AT DUNDAS



Some Sand and gravel

Grey, massive, porous, crinoidal

Dark grey, thin-bedded dolomite, interbedded with shale, with grey thin-bedded soft shale, with grey limestone

Grey and dark grey, massive, coarse, dense.

Light grey, quartzose, grey to greenish grey with interbedded bluish shale.

Red, interbedded with sandstones and limestones. Grey shale with 2 to 4 inch interbeds of grey sandstone and sandy limestone.

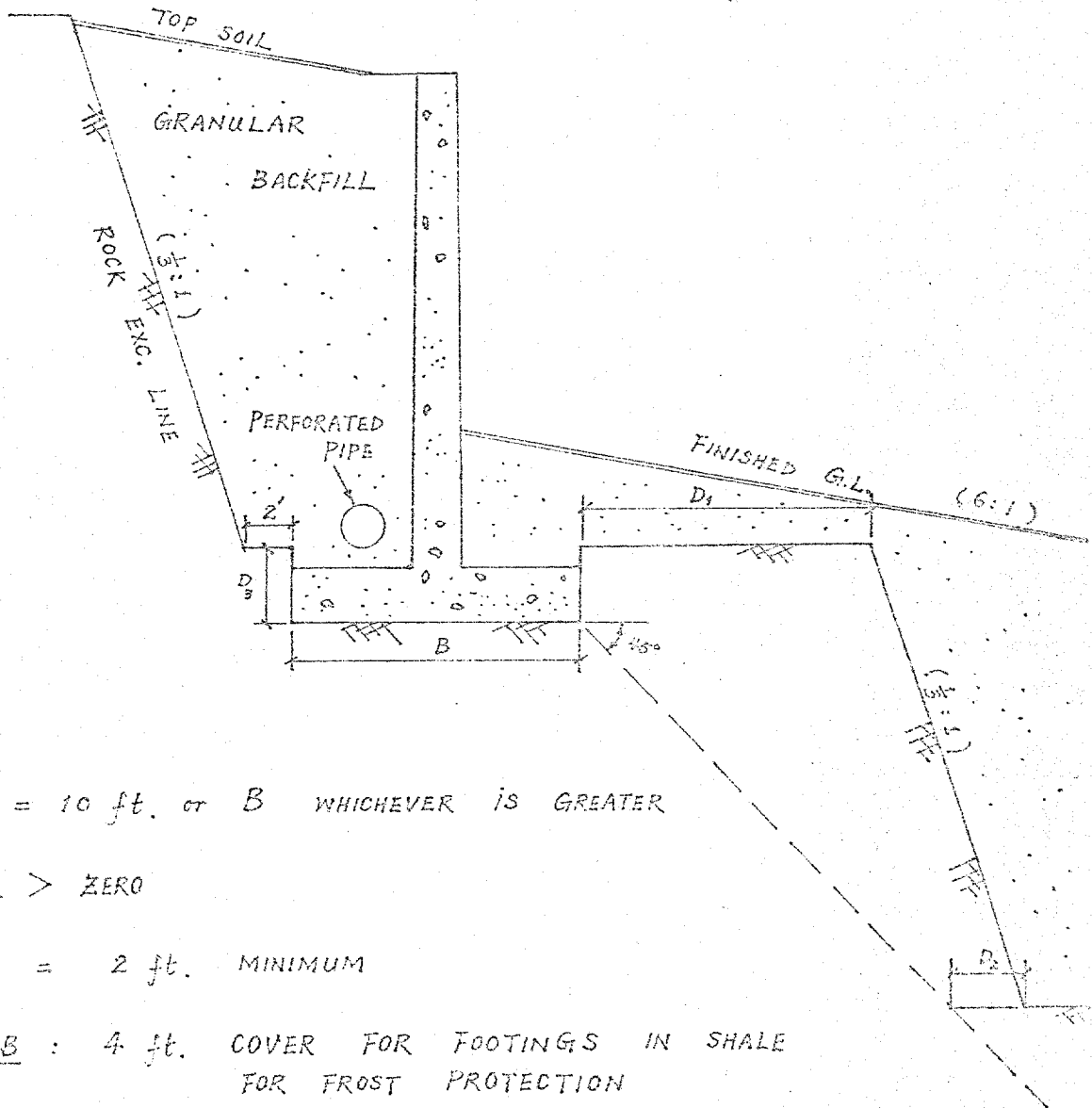
Thin calcareous beds with numerous grey shale partings.

Massive, white to light grey, fine grained, cross bedded quartzose.

Bed of greenish shale, then red shale with green metallic and siliceous.

FIG. 1

FIG. 2. GENERAL REQUIREMENTS



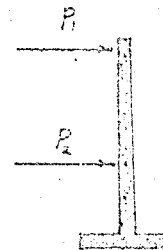
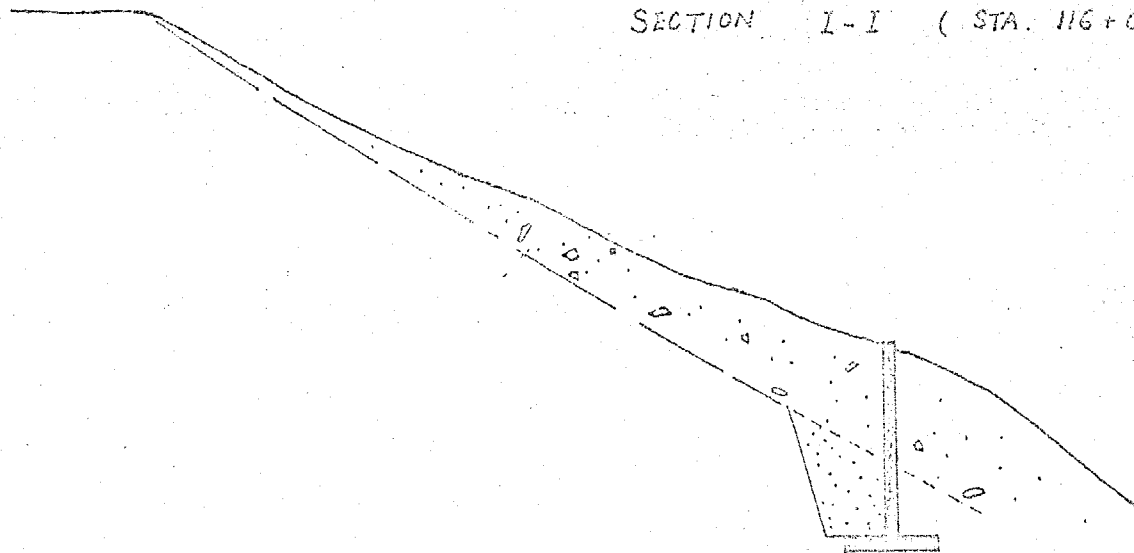
$D_1 = 10 \text{ ft. or } B \text{ WHICHEVER IS GREATER}$

$D_2 > \text{ZERO}$

$D_3 = 2 \text{ ft. MINIMUM}$

B : 4 ft. COVER FOR FOOTINGS IN SHALE FOR FROST PROTECTION

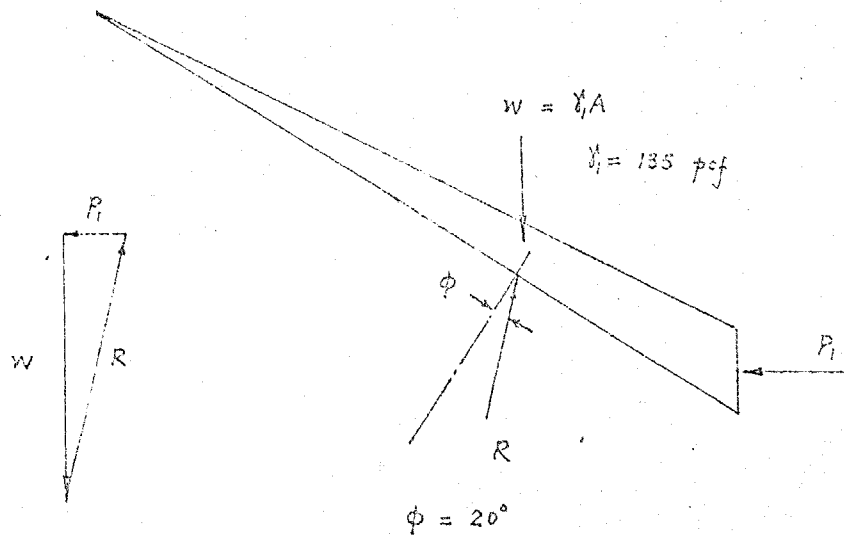
SECTION I-I (STA. 116+00, BL A)



$$P_2 = \frac{K_o}{2} \gamma H^2$$

$$K_o = 0.6$$

$$\gamma = 130 \text{ pcf}$$



For $H = 44 \text{ ft.}$

$$P_1 = 49.1 \text{ Kips}, \quad P_2 = 75.5 \text{ Kips}$$

$$\therefore \text{REQ. SHEAR RESISTANCE} = 1.5 (P_1 + P_2) \\ = 186.9 \text{ Kips. per ft.}$$

$$\therefore \text{REQ. MOMENT RESISTANCE} = 2.0 (P_1 x_1 + P_2 x_2) \\ = 2.0 \left(49.1 \times \frac{44}{3} + 75.5 \times \frac{44}{3} \right) \\ = 6520 \text{ ft-Kips. per ft.}$$

FIG. 3

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 101

W.P. 536-56-05 LOCATION Base Line 'A' Site 102 - 230' Lt. ORIGINATED BY BL
DIST 4 HWY. 8 BORING DATE September 23, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
636.4	Ground Level															
0.0	Sandy silt, trace of clay.		1	SS	21											
632.7																
3.7	Dolomite		2	BXL	75%	630										
	Hard, light grey, coarse to fine textured & porous. A vertical joint from 6'7" to 9'7". (Lockport f.)		3	BXL	93%											
			4	BXL	90%	620										
			5	BXL	100%											
			6	BXL	96%	610										
			7	BXL	100%											
605.0																
31.4	Shale, grey, medium soft.		8	BXL	100%	600										
599.0	(Rochester f.)															
37.4	Dolomite: Hard, coarse texture		9	BXL	98%											
594.5	(Clinton f.)															
41.9	End of Borehole															

RECORD OF BOREHOLE NO 102

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 103 + 10 120' Lt. ORIGINATED BY BL
 DIST. 4 HWY. 8 BORING DATE September 24, 1974 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w_L		
631.2	Ground Level														
0.0	Clayey sandy silt.		1	SS	65	630									
626.2															
5.2	Dolomite		2	BXL	94%										
	Light grey, hard, coarse textured, with occasional thin shaley seams.		3	BXL	98%	620									
	(Lockport f.)		4	BXL	99%										
606.1			5	BXL	86%	610									
25.1	Shale: Grey, med.- soft, with dolomitic section. (Rochester f.)		6	BXL	99%	600									
599.9															
31.3	End of Borehole														

OFFICE REPORT ON SOIL EXPLORATION

RECORD OF BOREHOLE No 103

W.P. 536-56-05

LOCATION Base Line 'A' Sta. 104+40 84' Lt.

ORIGINATED BY BL

DIST. 4 HWY. 8

BORING DATE Sept. 19, 1974

COMPILED BY BT

DATUM Geodetic

BOREHOLE TYPE BXL Core Drilling

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w		
629.4	Ground Level														
637.9	5" Topsoil, clayey silt		1	CS											GR. SA. S. CL.
1.5	Dolomite: light grey, hard & porous (Lockport f.)		2	BXL	61.1%										
			3	KYL	66.7%										
			4	BXL	91.7%	620									
			5	BXL	96.7%										
			6	BXL	95.0%	610									
602.1	Shale: med. grey & med. hard, with occ. dolomitic layers. (Rochester f.)		7	BXL	79.6%										
21.3	Dolomite: light grey, med. to fine textured Vertical joint at 28 ft. (Clinton f.)		8	BXL	91.7%	600									
601.7			9	BXL	93.3%										
27.7	Sandstone: Hard, with some sandy shale seams (Grimsby-Invercauld f.)					590									
582.6															
40.3															
585.1															
43.3	End of Borehole														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 104

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 105+50 85' Lt. ORIGINATED BY BL
 DIST. 4 HWY. 8 BORING DATE Sept. 19, 1974 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	W_P	W		
628.6	Ground Level														
628.3	4" top Soil over clayey silt.		1	SS	19.4										
2.3	Dolomite: light grey, med. to fine textured Hard. Interbedded with grey shale par- tings below 19 ft. (Lockport f.)		2	BXL	96.7										
			3	BXL	93.8	620									
			4	BXL	100										
608.0						610									
20.6	Shale Med. grey (Rochester f.)		5	BXL	100										
601.3			6	BXL	98.3										
27.3	Dolomite: med. to fine textured. Grey, with some thin shaley seams. (Clinton f.)		7	BXL	100	600									
			8	BXL	98.2										
590.6															
38.0	End of Borehole					590									

RECORD OF BOREHOLE NO 105

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 106+90 72' Lt. ORIGINATED BY EL
 DIST. 4 HWY. 8 BORING DATE September 20, 1974 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE EXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS % GR. SA SI CL
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w_L		
634.0	Ground Level														
0.0	5" Top Soil over clayey silt, some sand.		1	SS	48	630									
627.5			2	SS	117										
6.5	Dolomite: Grey, med./coarse textured. Very Hard, with few shaley layers below 24', a vertical joint at 18 ft. 9 in (Lockport f.)		3	EXL	100%	620									
			4	EXL	100%										
			5	EXL	98.8%										
608.5			6	EXL	97.5%	610									
25.5	Shale: Med. grey Med. Hard. (Rochester f.)		7	EXL	100%										
601.5															
32.5	Dolomite: light grey fine textured, med. hard, fractured. (Clinton f.)		8	EXL		600									
590.2															
43.8	End of Borehole														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 106

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 107 + 80 198' Tr. ORIGINATED BY BL
DIST. 4 HWY. 8 BORING DATE September 20, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE EXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
641.2	Ground Level															GR SA SI CL
0.0	5" Top Soil over clayey silt, some sand.		1	SS	44	640										
			2	SS	69											
			3	SS	115											
			4	SS	125											
628.2						630										
13.0	Dolomite: Grey, med. textured, hard, with few silty shale layers below 30 ft. Vertical joints at 15' - 16' and 27' - 28' depth. (Lockport f.)		5	EXL	100%	620										
			6	EXL	100%											
			7	EXL	85%	610										
608.2																
33.0	Shale: Med. hard with dolomitic seams. (Rochester f.)		8	EXL	87%											
601.4																
40.0	End of Borehole					600										

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 107

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 105 + 65 133' L.R.
DIST. 4 HWY. 8 BORING DATE September 26, 1974
DATUM Geodetic BOREHOLE TYPE BXL Core Drilling
ORIGINATED BY BL
COMPILED BY BL
CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
640.5	Ground Level															
0.0	Clayey silt with sand		1	SS	7	640										
			2	SS	19											
			3	SS	49											
630.5			4	SS	60/10											
10.0	Dolomite		5	BXL	100%	630										
	Hard. Med. textured.															
	(Lockport f.)		6	BXL	100%											
619.5						620										
21.0	End of Borehole															

20
15 \diamond 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 108

W.P. 536-56-05

LOCATION Base Line 'A' Sta. 109+60 84' Lt.

ORIGINATED BY BL

DIST. 4 HWY. 8

BORING DATE September 25, 1974

COMPILED BY BL

DATUM Geodetic

BOREHOLE TYPE BXL Core Drilling

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
592.6	Ground Level															
0.0	Clayey silt with sand		1	SS	32	590										
585.1			2	SS	10											
7.5	Siltstone, fine textured, med-hard, interbedded with green shale		3	BXL	38%											
579.6	(Therold-Crimby f.)		4	BXL	53%	580										
13.0	Shale: med. grey & med.-hard, with few thin dolomite layers.		5	BXL	60%											
	Vertical joints below 32.5 ft.		6	BXL	50%	570										
	(Cabot Head f.)		7	BXL	33%											
			8	BXL	90%	560										
			9	BXL	93%											
550.1																
42.5	End of Borehole															

20
15 ϕ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 109

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 110+05 107' Lt.
DIST. 4 HWY. 8 BORING DATE September 27, 1976 ORIGINATED BY BL
DATUM Geodetic BOREHOLE TYPE EXL Core Drilling COMPILED BY BL
CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N° VALUES		20	40	60	80	100	w_p	w	w_L	
600.8	Ground Level														
0.0	Sandy, clayey silt, occasional boulders and some rock fragments.		1	SS	22	600									
			2	SS	65/3"										
			3	SS	49										
			4	SS	65/3"	590									
587.1	Sandstone with occ. shale layers. (Thorold-Grimsty f.)		5	BXL	81%										
579.5			6	BXL	77%	580									
21.3	Shale Mostly light to med. grey, (red from 23.8 to 35.5 ft.) medium soft, inter- bedded with occ. dolomitic or sandy layers. (Cabot Head f.) Dolomite		7	BXL	100%										
			8	BXL	67%	570									
			9	BXL	60%										
			10	BXL	83%	560									
			11	BXL	80%										
			12	BXL	80%	550									
			13	BXL	80%										
			14	BXL	80%	540									
			15	BXL	50%										
530.8						530									
70.0	End of Borehole														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 110

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 110+55 103' Lt.
DIST. 4 HWY. 8 BORING DATE October 2, 1974
DATUM Geodetic BOREHOLE TYPE EXL Core Drilling
ORIGINATED BY BL
COMPILED BY BL
CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
590.6	Ground Level															
0.0	Talus: Sandy silt, trace of clay, some gravel and rock fragments.		1	SS	32	590										GR SA. SI. CL.
584.1			2	SS	40/1											
6.5	Dolomite with shale & sandstone.		3	EXL	93%											
577.1			4	EXL	63%	580										
13.5	SHALE: red, change to grey below 32 ft. deep. Very Shaley Dolomite		5	EXL	40%											
			6	EXL	94%											
			7	EXL	20%	570										
			8	EXL	34%											
	Soft with occ. dolomitic layers. (Cabot Head f.)		9	EXL	33%											
			10	EXL	67%											
			11	EXL	40%	550										
			12	EXL	90%											
			13	EXL	55%	540										
535.9																
54.7	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 111

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 111+15 141' Lt. ORIGINATED BY BL
DIST. 4 HWY. 8 BORING DATE October 8, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS % 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				
						WATER CONTENT %					w_p ——— w ——— w_L					
594.3	Ground Level															
0.0	Tallus: Sandy silt, rock fragments and slabs.		1	SS	58	590										
585.2			2	SS	107											
8.5	Dolomite, with. sand- stone & sandy shale.		3	BXL	100											
	Hard		4	BXL	88	580										
576.8			5	BXL	35											
17.5	Shale: red, change to greenish grey below 28 ft. Soft interbedded with dolomite layers. (Cabot Head f.)		6	BXL	60	570										
			7	BXL	74											
			8	BXL	90											
	dolomite		9	BXL	94	560										
	dolomite		10	BXL	94											
551.8																
42.5	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 112

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 11+65 115' Lt. ORIGINATED BY BL
DIST. 4 HWY. 8 BORING DATE October 3, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE EXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w		
581.2	Ground Level														GR SA SI C
0.0	Talus: mostly sandy silt, some rock fragments.		1	SS	44	530									
576.7			2	SS	125										
4.5	Till: clayey silt		3	SS	66										
573.9	Very Hard.														
7.3	Shale: red change to grey below 17' deep.		4	BXL	29%	570									
	Soft with dolomite bands.		5	BXL	38%										
			6	BXL	48%	560									
			7	BXL	38%										
	(Cabot Head f.)		8	BXL	53%	550									
			9	BXL	18%										
			10	BXL	87%	540									
			11	BXL	92%										
			12	BXL	80%										
			13	BXL	91%	530									
529.8															
51.4	End of Borehole														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 113

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 112+55 125' Lt. ORIGINATED BY BL
DIST. 4 HWY. 8 BORING DATE September 27, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p w w_L				
							SHEAR STRENGTH									
							O UNCONFINED * FIELD VANE ● QUICK TRIAXIAL X LAB VANE					WATER CONTENT %				
573.1	Ground Level															
0.0	Clayey Silt		1	SS	42	570										
565.6			2	SS	100	4"										
7.5	Shale: red in the upper 1 ft. becoming grey.		3	EXL	89%											
			4	BXL	30%											
			5	BXL	75%	560										
			6	BXL	56%											
	dolomite		7	BXL	90%	550										
	Soft, with occasional thin dolomitic bands.		8	BXL	74%											
	Vertical fracture @ 19.2 to 20.2 ft.		9	BXL	73%	540										
			10	BXL	77%											
	(Cabot Head f.)		11	BXL	80%											
			12	BXL	100%	530										
	dolomite		13	BXL	100%											
519.6			14	BXL	*	520										
53.5	End of Borehole															
	* No recovery due to worn out core spring.															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 114

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 113+70 130' Lt. ORIGINATED BY EX BL
DIST. 4 HWY. 8 BORING DATE October 11, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE EXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w_L		
572.0	Ground Level														
0.0	Sandy silt with gravel matrices & occasional rock slabs		1	SS	27	570									
			2	SS	27										
565.0			3	SS	50										
7.0	Shale: grey & soft		4	SS	NR	560									
	dolomite with alternate shale & sand stone layers		4	EXL	38%										
	becoming medium hard below 40 ft. deep, with occasional thin dolomite layers.		5	EXL	40%										
			6	EXL	75%	550									
			7	EXL	33%										
	(Cabot Head f.)		8	EXL	87%										
			9	EXL	100%	540									
			10	EXL	93%	530									
			11	EXL	100%										
	dolomite		12	EXL	89%	520									
	dolomite		13	EXL	100%										
514.2															
57.8	End of Borehole														

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 115

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 114+70 122' Lt.
DIST. 4 HWY. 8 BORING DATE October 22, 1974
DATUM Geodetic BOREHOLE TYPE EXL Core Drilling
ORIGINATED BY BY
COMPILED BY BY
CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	SHEAR STRENGTH				
							O UNCONFINED + FIELD VANE X QUICK TRIAXIAL X LAB VANE					w_p w w_L				
564.7	Ground Level															
0.0	Tallus: Silty sand with rock fragments, cobbles & boulders.		1	SS	10											
			2	SS	55	3"										
			3	EXL	47%											
			4	SS	40											
			6	EXL	11%											
			7	EXL	13%											
548.0			8	SS	68											
16.7			9	EXL	57%											
	Shale: grey, soft to medium, with layers of dolomite.		10	EXL	65%											
			11	EXL	93%											
			12	EXL	91%											
			13	EXL	86%											
			14	EXL	65%											
	(Cabot Head f.)		15	EXL	92%											
			16	EXL	98%											
			17	EXL	100%											
509.7			18	EXL	96%											
55.0	End of Borehole															

RECORD OF BOREHOLE NO 116

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 114+35 182' Lt. ORIGINATED BY BL
 DIST. 4 HWY. 8 BORING DATE October 17, 1974 COMPILED BY BL
 DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
594.6	Ground Level															GR SA. SI. CL
0.0	Tallus		1	SS	18	590										
	Sandy silt with		2	SS	56											
	gravel & rock fragments		3	SS	62											
			4	SS	148											
579.6			5	SS	160	580										
15.0	dolomite		6	BXL	67%	570										
	Shale- greenish grey		7	BXL	94%	570										
	to 17.5 ft. then															
	changes to Very		8	BXL	90%	560										
	red and Shaley		9	BXL	82%											
	becomes grey		10	BXL	95%											
	below 29.4 ft.															
	Soft to medium, with		11	BXL	95%	550										
	layers of dolomite		12	BXL	98%											
544.6	(Cabot Head f.)															
50.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 117

W.P. 536-56-05

LOCATION Base Line 'A' Sta 108+5 56' Lt.

ORIGINATED BY BL

DIST. 4 HWY. 8

BORING DATE October 8, 1974

COMPILED BY BL

DATUM Geodetic

BOREHOLE TYPE EXL Core Drilling

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES		20	40	60	80	100	WP	W	WL		
507.0	Ground Level															GR SA. SI. CL
0.0	Clayey silt, some sand with rock fragments.		1	SS	100	56"										
602.2			2	SS	56											
4.8	Dolomite-light grey, medium to hard, fine/medium textured		3	EXL	100	600										
	(Clinton f.)		4	EXL	96%											
588.2			5	EXL	100	590										
18.8	Very Sandy Dolomite with shale partings.		6	EXL	73%											
581.5	(Grimsby-Thorold f.)															
25.5	Shale - greenish grey change to red @ 30 ft become grey below 40 ft. Soft to medium		7	EXL	54%	580										
	with layers of dolomite.		8	EXL	67%	57"										
	(Cabot Head f.)		9	EXL	83%											
			10	EXL	80%	560										
	dolomite		11	EXL	92%											
551.7																
55.3	End of Borehole					550										

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 118

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 115 + 70 110' Lt. ORIGINATED BY BL
DIST. 4 HWY. 8 BORING DATE October 25, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES		20	40	60	80	100	w_p	w	w_L		
557.0	Ground Level															
0.0	Sandy silt with some sand & gravel.		1	SS	20	65/5"										
			2	SS												
	Very Dense (Glacial Till)		3	SS	38	550										
			4	SS	110											
			5	SS	37											
			6	SS	29											
			7	SS	27											
			8	SS	100	540										
			9	SS	122											
531.8	dolomite		10	SS	27											
25.2	Shale- grey, very soft to soft, with layers of dolomite		12	BXL	80%	530										
			13	BXL	92%											
	dolomite		14	BXL	90%											
	becomes dolomitic below 42.8 ft.		15	BXL	100%	520										
	(Cabot Head f.)		16	BXL	92%											
509.0			17	BXL	97%	510										
48.0	Dolomite (Manitoulin Shale), medium grey with shale partings.		18	BXL	100%											
501.7			19	BXL	100%											
55.3	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 119

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 115+80 180' Lt. ORIGINATED BY BL
DIST. 4 HWY. 8 BORING DATE October 25, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	W _N VALUES		20	40	60	80	100	W _P	W	W _L		
581.9	Ground Level															
0.0	Sandy/clayey silt (Glacial Till) Hard, change to weathered shale at 12.8 ft.		1	SS	67	580										
			2	AX												
			3	SS	46											
			4	SS	71											
569.1			6	SS	85/6	75 1/2" 570										
12.8	Very Shaley Dolomite		7	BXL	68%											
	Shale - grey or green ish grey. Soft to medium with seams of dolomite		8	BXL	50%	560										
			9	BXL	65%											
			10	BXL	41%	550										
	(Cabot Head f.)		11	BXL	90%											
			12	BXL	88%	540										
535.9			13	BXL	68%											
46.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 120

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 115+80 230' Lt. ORIGINATED BY BL
DIST. 4 HWY. 8 BORING DATE October 23 - 23, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	W VALUES		20	40	60	80	100	w_p	w	w_L		
606.2	Ground Level															
0.0	Clayey silt (Glacial Till)		1	SS		75/6"										
601.4	Hard															
4.8	Weathered Zone Dolomite- grey, fine textured, med. hard with few shaley seams (Clinton f.)		3	BXL	100%	600										
590.7			4	BXL	92%	590										
15.5	Silty/sandy dolomite greenish grey medium hard															
581.0	(Grimsby-Therold f.)		5	BXL	84%	580										
25.2	Shale - Red to Reddish Grey with dolomite bands. (Cabot Head f.)															
571.0			6	BXL	92%											
35.2	End of Borehole					570										

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 121

W.P. 536-56-05 LOCATION Base Line 'A' Sta. 117+10 208' Lt. ORIGINATED BY BL
DIST. 4 HWY. 8 BORING DATE October 17, 1974 COMPILED BY BL
DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L	
582.7	Ground Level														
0.0	Sandy/clayey silt (Glacial Till) Hard, some gravel, change to weathered shale below 15 ft.		1	SS	31	580									
			2	SS	26										
			3	SS	94										
			4	SS	105										
567.5			5	SS	150	570									
			6	SS	145	10"									
15.2	Shale - red in upper 1ft. then change to grey Dolomite Soft to medium with dolomite partings. (Cabot Head f.)		7	BXL	88%	560									
			8	BXL	92%										
			9	BXL	86%	550									
			10	BXL	94%	540									
			11	BXL	75%										
			12	BXL	42%	530									
524.2			13	BXL	69%										
58.5	End of Borehole														

RECORD OF BOREHOLE NO 122

W.I. 536-56-05 LOCATION Base-Line 'A' Sta. 106+24 35' Lt. ORIGINATED BY BL
 DIST. 4 HWY. 8 BORING DATE October 11, 1974 COMPILED BY
 DATUM Geodetic BOREHOLE TYPE BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	VALUES		20 40 60 80 100					w_p — w — w_L				
							SHEAR STRENGTH					WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
611.7	Ground Level															
0.0	1 ft. black sandy silt top soil over hard clayey silt with some sand.		1	SS	55	610										
			2	SS	114											
601.7			3	SS	135											
10.0	Dolomite - Grey to Buff. Med/fine tex- tured. Slightly weathered, with verti- cal joints. (Clinton f.)		4	BXL	95%	600										
587.2			5	BXL	96%	590										
24.5	Sandstone & shady dolomite		6	BXL	97%											
575.7	Shale: greenish grey soft to medium (Grimsby-Thorold f.)		7	BXL	55%	580										
36.0	Shale, red, medium to soft (Cabot Head f.) Dolomite		8	BXL	85%	570										
560.7			9	BXL	65%											
51.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

W.P. 535-56-01 LOCATION Sta. 26 + 60 69' Rt. Line 'A' ORIGINATED BY HS
DIST. 4 HWY. 8 Existing BORING DATE February 16 - 19, 1971 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Washboring, BXL Core Drilling CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	W_P	W	W_L		
628.0	Ground Level															
626.7	Topsoil															
1.3																
	Lockport Dolomite		1	BXL	96%	620										
			2	BXL	92%	610										
608.4																
19.6	Rochester Shale		3	BXL	98%	600										
600.2																
27.8	Clinton Limestone		4	BXL	100%	590										
586.5																
41.5	Grimsby-Thorold Shale & Siltstone					580										
578.0																
50.0	Cabot Head Shale		5	BXL	97%	570										
567.2																
60.8	End of Borehole															



RECORD OF BOREHOLE No 2

W.P. 536-56-01 LOCATION Sta. 26 + 28 132' Rt. Line 'A' ORIGINATED BY HS
 DIST. 4 HWY. 8 Existing BORING DATE January 11, 1971 COMPILED BY _____
 DATUM Geodetic BOREHOLE TYPE Auger & Coredrill CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
630.6	Ground Level															
0.0	Sandy silt, traces of clay.		1	SS	45	630										
625.6	Hard Brown		2	SS	50/11"											0 22 68 10
5.0	Dolomite Bedrock (Lockport Formation)		3	RC	90%											
618.2			4	RC	95%	620										
12.4	End of Borehole															

ENGINEERING SERVICES BRANCH - GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION

W.P. 536-56-01 LOCATION Sta. 20 + 00 159' Rt. Line 'A' ORIGINATED BY HS
DIST. 4 HWY. 8 Existing BORING DATE January 21, 1971 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Hand Auger CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT		LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100		w_p ——— w ——— w_L			
							SHEAR STRENGTH					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		WATER CONTENT %			
635.3	Ground Level											
0.0	Clayey silt. Brown											
631.5	Probable Bedrock											
3.8	End of Borehole											

15 ϕ 5 % STRAIN AT FAILURE

RECORD OF BOREHOLE NO 4

W.P. 536-56-01 LOCATION Sta. 16 + 47 114' Rt. Line 'A' ORIGINATED BY HS
 DIST. 4 HWY. 8 Existing BORING DATE January 29, February 3, 1971 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	N' VALUES		20	40	60	80	100	w_p	w	w_L		
578.9	Ground Level															
0.0	Clayey silt with decomposed shale talus		1	SS	47											
	Red and Grey		2	SS	43											
570.9			3	SS	100											
8.0	Shale Bedrock		4	RC	75	570										
	Red Cabot Head formation		5	RC	85											
	layers of dolomitic shale		6	RC	85											
	Grey		7	RC	85	560										
556.4																
22.5	End of Borehole															

RECORD OF BOREHOLE NO 5

W.P. 536-56-01 LOCATION Sta. 15 + 00 260' Rt. Line 'A' ORIGINATED BY ES
 DIST. 4 HWY. 8 Existing BORING DATE January 21, 1971 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Hand Auger CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS			
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE					w_p	w	w_L
630.2	Ground Level																		
628.4	Probable Bedrock																		
1.8	End of Borehole																		

RECORD OF BOREHOLE NO 6

W.P. 536-56-01 LOCATION Sta. 12 + 82 300' Rt. Line 'A' ORIGINATED BY HS
 DIST. 4 HWY. 8 Existing BORING DATE January 21, 1971 COMPILED BY AKB
 DATUM Geodetic BOREHOLE TYPE Hand Auger CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
633.4	Ground Level															
0.0	Clayey silt. Brown															
627.5	Probable Bedrock					630										
5.9	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7

W.P. 536-56-01 LOCATION Sta. 12 + 48 210' Ft. Line 'A' ORIGINATED BY HS
DIST. 4 HWY. 8 Existing BORING DATE February 3, 1971 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Washboring, NY Casing CHECKED BY _____

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N ^o VALUES		20	40	60	80	100	w_p	w	w_L		
583.5	Ground Level															
0.0	Silty clay, decomposed shale talus		1	SS	7	580										
575.5	Firm		2	SS	5											
8.0	Shale Bedrock		3	RC	60%	570										
	Red Cabot Head formation		4	RC	75%											
564.6	Grey															
18.9	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 8

W.P. 536-56-01 LOCATION Sta. 12 + 00 140' Rt. Line 'A' ORIGINATED BY HS
DIST. 4 HWY. 8 Existing BORING DATE January 7, 1971 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Auger & Coredrill CHECKED BY

SOIL PROFILE		SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		N' VALUES	20 40 60 80 100					W_P W W_L																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
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553.1	Ground Level														GR. SA. SI. CL.																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																													
0.0	Sandy gravel with some silt.	0.0 0.5 1.0 1.5 2.0 2.5 3.0 3.5 4.0 4.5 5.0 5.5 6.0 6.5 7.0 7.5 8.0 8.5 9.0 9.5 10.0 10.5 11.0 11.5 12.0 12.5 13.0 13.5 14.0 14.5 15.0 15.5 16.0 16.5 17.0 17.5 18.0 18.5 19.0 19.5 20.0 20.5 21.0 21.5 22.0 22.5 23.0 23.5 24.0 24.5 25.0 25.5 26.0 26.5 27.0 27.5 28.0 28.5 29.0 29.5 30.0 30.5 31.0 31.5 32.0 32.5 33.0 33.5 34.0 34.5 35.0 35.5 36.0 36.5 37.0 37.5 38.0 38.5 39.0 39.5 40.0 40.5 41.0 41.5 42.0 42.5 43.0 43.5 44.0 44.5 45.0 45.5 46.0 46.5 47.0 47.5 48.0 48.5 49.0 49.5 50.0 50.5 51.0 51.5 52.0 52.5 53.0 53.5 54.0 54.5 55.0 55.5 56.0 56.5 57.0 57.5 58.0 58.5 59.0 59.5 60.0 60.5 61.0 61.5 62.0 62.5 63.0 63.5 64.0 64.5 65.0 65.5 66.0 66.5 67.0 67.5 68.0 68.5 69.0 69.5 70.0 70.5 71.0 71.5 72.0 72.5 73.0 73.5 74.0 74.5 75.0 75.5 76.0 76.5 77.0 77.5 78.0 78.5 79.0 79.5 80.0 80.5 81.0 81.5 82.0 82.5 83.0 83.5 84.0 84.5 85.0 85.5 86.0 86.5 87.0 87.5 88.0 88.5 89.0 89.5 90.0 90.5 91.0 91.5 92.0 92.5 93.0 93.5 94.0 94.5 95.0 95.5 96.0 96.5 97.0 97.5 98.0 98.5 99.0 99.5 100.0																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										

RECORD OF BOREHOLE NO 9

W.P. 536-56-01 LOCATION Sta. 11 + 85 312' Rt. Line 'A' ORIGINATED BY ES
 DIST. 4 HWY. 8 Existing BORING DATE February 9, 1971 COMPILED BY AKE
 DATUM Geodetic BOREHOLE TYPE Washboring, NX & BX Casing CHECKED BY

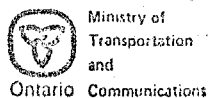
SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
587.3	Ground Level															
0.0	Silty clay with limestone fragments & decomposed shale		1	SS	18											
	Talus		2	SS	60	580										
578.0	Shale Bedrock		3	RC	95%											
9.3	Red		4	RC	80%	570										
	Cabot Head		5	RC	80%											
	Grey formations															
563.3																
24.0	End of Borehole															

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO
ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 10

W.P. 536-56-01 LOCATION Sta. 11 + 37 240' Rt. Line 'A' ORIGINATED BY HS
DIST. 4 HWY. 8 Existing BORING DATE February 11, 1971 COMPILED BY AKB
DATUM Geodetic BOREHOLE TYPE Washboring, BX & NX Casing CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV.	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
558.3	Ground Level															
0.0	Clayey silt with gravel, traces of sand.		1	SS	70/7	550										
	Decomposed shale & limestone talus.		2	SS	58											
540.3	Hard															
18.0	Shale Bedrock		3	SS	100	540										
	Grey		4	PC	55%											
	Cabot Head Formation		5	RC	65%	530										
525.3			6	PC	90%											
33.0	End of Borehole															



DIAMOND DRILL RECORD

HOLE NO. 1 SHEET NO. 1

DIP

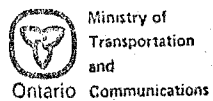
PROPERTY _____ W.P. 536-56-01 _____
LOCATION _____ Dundas Highway #3 _____
LATITUDE _____
DEPARTURE _____
BEARING _____

900	
TOTAL FOOTAGE	41' 11"

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____
 Z. Koniuszy

[illegible]

DATE OF EXAMINATION October 8, 1974



HOLE NO. 2 SHEET NO. 1

900

[illegible]

LOGGED BY

Z. Koniuszy

[illegible]

DATE OF EXAMINATION October 8, 1974

DIAMOND DRILL RECORD

HOLE NO. 3 SHEET NO. 1

W.P. 536-56-01

DIP

90°

PROPERTY _____
 LOCATION Dundas, Hwy. 8

 LATITUDE _____
 DEPARTURE _____
 BEARING _____

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

TOTAL FOOTAGE 43'4"

FOOTAGE		FORMATION	SAMPLE NUMBER	% Shale	REMARKS
FROM	TO				
3'5"	16'6"	Dolomite, light grey, med. textured, hard with occasional blue chert module.			4'5" - 1 foot of core ground
16'6"	17'2"	Dolomite as above only darker - some organic matter present.			
17'2"	19'10"	Dolomite, light grey fine textured, hard, with 1 1/2" shale section.			first 8" core broken
19'10"	21'2"	Shale, med. grey, med. hard with some shaly dolomite.		89	
21'2"	22'0"	Dolomite, light grey, fine to med. textured, hard with shale and shaly sections.		12	
22'0"	23'1"	Shale, med. grey, med. hard with dolomite seams.		95	
23'1"	23'6"	Dolomite, light grey, fine textured, hard.			
23'6"	24'7"	Shale, med. grey, med. hard		100	
24'7"	29'4"	Dolomite, light grey, med. grain. Slightly weathered on 28'.			Vertical joint
29'4"	30'2"	Dolomite, light grey, fine textured, hard.			
30'2"	35'2"	Dolomite, light grey, fine textured, med. hard, highly shaly.		10	4' of core missing

DATE OF EXAMINATION _____

Z. D. Koniuszy



PROPERTY	
LOCATION	Dundas Hwy. E
LATITUDE	
DEPARTURE	
BEARING	

DIP

99^o

TOTAL FOOTAGE 421.4"

HOLE NO. 3 SHEET NO. 2

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



PROPERTY _____
LOCATION Dundas, Hwy. 8 _____

LATITUDE _____
DEPARTURE _____
BEARING _____

DIP

900

TOTAL FOOTAGE 38'0"

HOLE NO. 4 SHEET NO. 1

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

DATE OF EXAMINATION _____

Z. D. Koniuszy

DIAMOND DRILL RECORD

HOLE NO. 5 SHEET NO. 1

W.P. 536-56-01

DIP

90°

TOTAL FOOTAGE 43' 10"

PROPERTY LOCATION Dundas, Hwy. 8
LATITUDE
DEPARTURE
BEARING

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE		FORMATION	SAMPLE NUMBER	%	REMARKS
FROM	TO				
6'5"	19'7"	Dolomite, light grey, med. to coarse textured, very hard, fossiliferous in places		Shale	18'9" weathered zone, vertical joint.
19'7"	22'0"	Dolomite, grey, med. to coarse textured, very hard, dark sections from sedimentary pyrite and organic matter.			1 foot of core missing.
22'0"	23'11"	Dolomite, light grey, med. to coarse, very hard with darker sections of organic matter. Some sections fossiliferous.			
23'11"	24'10"	Dolomite with shale in layers			core broken
24'10"	25'4"	Dolomite, light grey, med. textured, very hard			
25'4"	32'1"	Shale, med. grey, med. hard		100	
32'1"	32'7"	Dolomite, light grey, fine textured, very hard, with few shaly sections		5	
32'7"	37'9"	Dolomite, light grey, fine to med. textured, very hard			

DATE OF EXAMINATION _____

Z. D. Koniuszy



W.P. 536-56-01

HOLE NO. 5 SHEET NO. 2

DIP

90°

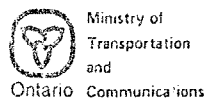
PROPERTY	
LOCATION	Dundas, Hwy. 8
LATITUDE	
DEPARTURE	
BEARING	

TOTAL FOOTAGE	43'10"

ELEV. COLLAR	_____
DATUM	_____
DATE STARTED	_____
DATE COMPLETED	_____
DRILLED BY	_____
LOGGED BY	_____

DATE OF EXAMINATION _____

Z. D. Koniuszy



PROPERTY	Dundas, Hwy. 8
LOCATION	
LATITUDE	
DEPARTURE	
BEARING	

012

900

TOTAL FOOTAGE 40'0"

HOLE NO. 6 SHEET NO. 1

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

DATE OF EXAMINATION _____

Z. D. Koniuszy



PROPERTY LOCATION Dundas, Hwy. 8

LATITUDE

DEPARTURE

BEARING

01P

90°

TOTAL FOOTAGE 21'0"

HOLE NO. 7 SHEET NO. 1

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



HOLE NO. 8 SHEET NO. 1

DIP

90⁹

PROPERTY LOCATION Dundas, Hwy. 8

LATITUDE _____

DEPARTURE _____

BEARING _____

TOTAL FOOTAGE 4215''

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



Ministry of
Transportation
and
Ontario Communications

W.P. 536-56-01

DIAMOND DRILL RECORD

HOLE NO. 9 SHEET NO. 1

PROPERTY LOCATION Dundas, Hwy. 8

LATITUDE
DEPARTURE
BEARING

DIP
90°

TOTAL FOOTAGE 70'0"

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE		FORMATION	SAMPLE NUMBER	%		REMARKS
FROM	TO					
13'7"	15'11"	Sandstone, light grey to greenish grey, fine grained, hard to very hard with few thin seams of silty shale.		Shale		
15'11"	16'10"	Sandy dolomite, light grey to greenish grey, fine grained, hard with occasional seam of silty greenish grey shale.		2		
16'10"	18'5"	Sandy dolomite, light grey to greenish grey, fine grained med. hard with numerous thin seams of sandy shale, 1 layer of shale 2".		10		1 foot of core missing.
18'5"	21'3"	Shale - silty, greenish grey, med. hard to soft with numerous thin silty and sandy dolomite seams.		50		
21'3"	23'9"	Shale, greenish grey, med. soft, fissile, with 1" sandy dolomite seam, & 1 chert module.		90		1 foot of core missing
23'9"	35'6"	Shale, red, med. hard to med. soft with shaly dolomite sections.		80		3 feet of core missing
35'6"	42'0"	Shale, med. grey, med. soft with thin sections of sandy dolomite.		85		core broken 1 foot of core missing

DATE OF EXAMINATION

Z. D. Koniuszy



PROPERTY LOCATION	Dundas, Hwy. 8
LATITUDE	
DEPARTURE	
BEARING	

DIAMOND DRILL RECORD

DIP

90°

TOTAL FOOTAGE 70'0"

HOLE NO. 9 SHEET NO. 2

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



Ministry of
Transportation
and
Ontario Communications

W.P. 536-56-01

DIAMOND DRILL RECORD

HOLE NO. 10 SHEET NO. 1

DIP

90°

PROPERTY _____
LOCATION Dundas, Hwy. 8

LATITUDE _____
DEPARTURE _____
BEARING _____

TOTAL FOOTAGE 54'7"

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER	%		REMARKS
FROM	TO					
6'5"	12'0"	Dolomite, light grey, med. textured, hard.				9' to 10'5" core broken, sign of vertical joint, 1 foot of core missing.
12'0"	14'5"	Dolomite, light grey, med. textured, hard, with shaly dolomite, fine textured, med. hard (1:1)				core ground, 1'6" core missing.
14'5"	14'11"	Silty dolomite, greenish grey, fine textured, hard				
14'11"	18'5"	Shale, red, soft. 2" section silty, med. hard.		98		
18'5"	23'7"	Highly shaly dolomite, red, med. textured, hard. 2" section of red shale		6		2'8" of core missing
23'7"	32'0"	Shale, red soft, -1 ft. with broken core of dolomite, light grey, fine textured, hard.				6 feet of core missing
32'0"	35'5"	Shale, greenish grey, soft with sections of dolomite, light grey, fine textured, slightly silty, very hard		60		core ground, sign of vertical joint, 2 feet of core missing
35'5"	41'5"	Dolomite, light grey, fine textured, silty in sections, med. hard, interbedded with shale, med. grey, soft		35		2 feet of core missing, sign of vertical joint.

DATE OF EXAMINATION _____

Z. D. Koniuszy



PROPERTY LOCATION Dundas, Hwy. 8

LATITUDE _____

DEPARTURE _____

BEARING _____

DIP

90°

TOTAL FOOTAGE 54'7"

HOLE NO. 10 SHEET NO. 2

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy

DIAMOND DRILL RECORD

HOLE NO. 11 SHEET NO. 1

W.P. 536-56-01

DIP

PROPERTY _____
LOCATION Dundas Hwy. 8

LATITUDE _____
DEPARTURE _____
BEARING _____

90°

TOTAL FOOTAGE 42'5"

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER	% Shale		REMARKS
FROM	TO					
8'5"	9'5"	Dolomite, light grey, fine textured, hard, silty with 3" layer of silty grey shale				
9'5"	11'5"	Dolomite, light grey, fine textured, med. hard, silty				9'5" - 9'8" - ground core
11'5"	18'0"	Shale, greenish - grey, med. soft to soft, fissile, with silty sections		95		3 feet of core missing
18'0"	28'9"	Red shale, med. soft to soft, fissile with highly shaly dolomite sections		85		2 feet of core missing
28'9"	35'10"	Shale, grey, med. soft to soft, fissile, with thin lenses of dolomite		95		
35'10"	36'7"	Dolomite, light grey, fine textured, hard				
36'7"	37'3"	Shale, med. grey, soft, fissile		100		
37'3"	40'1"	Dolomite, med. grey, fine textured, hard, occasional 2" shale seam		5		

DATE OF EXAMINATION _____

Z. D. Koniuszy



DIAMOND DRILL RECORD

HOLE NO. 11 SHEET NO. 2

DIP

90°

PROPERTY LOCATION	Dundas, Hwy. 8
LATITUDE	
DEPARTURE	
BEARING	

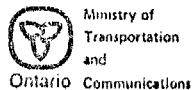
TOTAL FOOTAGE 42'5"

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



HOLE NO. 12 SHEET NO. 1

DiP

90°

TOTAL FOOTAGE	51'4"

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy

W.P. 536-56-01

DIAMOND DRILL RECORD

HOLE NO. 13 SHEET NO. 1

DIP

90°

PROPERTY LOCATION Dundas, Hwy. 8
LATITUDE _____
DEPARTURE _____
BEARING _____

TOTAL FOOTAGE 53'5"

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER	%	REMARKS
FROM	TO				
7'5"	9'0"	Shale red, med. soft with broken pieces of silty, shaly dolomite		75	
9'0"	19'3"	Shale, reddish-grey to greenish-grey, med. soft to very soft, few thin sections of dolomite, grey, fine textured, hard		90	core broken, some sections ground, 7 ft. of core missing
19'3"	20'3"	Dolomite, grey, fine texture, hard		-	vertical fracture
20'3"	21'3"	Shale, grey, med. soft, fissile with 2" section of dolomite, grey, fine textured, hard		80	core broken
21'3"	44'0"	Shale, grey, med. hard to soft, fissile with few thin sections of dolomite, grey, fine textured, hard		97	core broken, some sections ground 3'6" of core missing
44'0"	45'0"	Dolomite, grey, fine textured, hard with numerous vugs		-	
45'0"	46'4"	Shale, grey, med. soft, fissile		100	core broken and ground
46'4"	47'0"	Dolomite, grey, med. textured, hard, interbedded with shale, grey		25	core broken

DATE OF EXAMINATION _____

Z. D. Koniuszy



W.P. 536-56-01

DIAMOND DRILL RECORD

NO. NO. 13 SHEET NO. 2

PROPERTY LOCATION Dundas Hwy. 8

LATITUDE

DEPARTURE

BEARING

DIP

90°

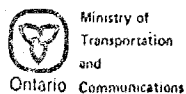
TOTAL FOOTAGE 53'5"

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



W.P. 536-56-05

DIAMOND DRILL RECORD

HOLE NO. 14 SHEET NO. 1

012

PROPERTY LOCATION Dundas Hwy. B

LATITUDE _____

DEPARTURE _____

BEARING _____

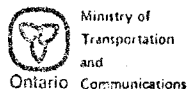
90 ⁰	
TOTAL FOOTAGE	57'8 ¹¹

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER	%	REMARKS
FROM	TO				
11'0"	14'5"	Dolomite, light grey, fine to med. textured, slightly silty, hard		Shale	core broken 1'5" of core missing
14'5"	19'5"	Dolomite, light grey, fine textured, hard, with (in first 2 ft) grey shale, soft		50	vertical joint in dolomite 3 ft. of core missing
19'5"	24'5"	Shale, grey, med. soft to soft, fissile		-	core broken, ground in places, 1 ft. of core missing
24'5"	27'5"	Shale, grey, med. soft, fissile with 4" section of dolomite, grey, fine textured, hard		80	core ground 2 ft. of core missing
27'5"	30'5"	Shale, grey, med. soft, fissile with few sections of dolomite up to 2" grey, fine textured, hard		95	
30'5"	42'5"	Shale, grey to greenish grey, med. hard to soft, fissile, interbedded with dolomite, grey, med. to fine textured, hard. Some sections with vugs.		60	some sections of shale ground 1/2 ft. of core missing
42'5"	48'5"	Shale, grey, med. hard to med. soft, fissile, with very thin seams of dolomite, grey, med. to fine textured, hard		98	

DATE OF EXAMINATION _____

Z. D. Koniuszy



PROPERTY	
LOCATION	Dundas, Hwy. 8
LATITUDE	
DEPARTURE	
BEARING	

□: 尸

200

TOTAL FOOTAGE 57'8"

HOLE NO. 14 SHEET NO. 2

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



Ministry of
Transportation
and
Ontario Communications

W.P. 536-56-05

DIAMOND DRILL RECORD

HOLE NO. 15 SHEET NO. 1

DIP

90°

PROPERTY

LOCATION

Dundas Hwy. 8

LATITUDE

DEPARTURE

BEARING

TOTAL FOOTAGE 55'0"

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

FOOTAGE		FORMATION	SAMPLE NUMBER	%		REMARKS
FROM	TO					
5'0"	7'5"	Dolomite, yellowish grey, deeply weathered, med. textured, numerous vugs, med. soft				1'5" of core missing core broken and ground
7'5"	17'4"	Dolomite, grey to yellowish grey, fine to med. textured with some shale				9 feet of core missing core broken and ground
17'4"	25'7"	Shale, grey, med. soft to soft, fissile, with few thin (up to 1") layers of dolomite, grey, fine textured, hard		90		2 ft. of core missing few sections of core ground
25'7"	32'10"	Shale, grey, med. hard to med. soft with few lenses of dolomite		93		two short sections of shale ground
32'10"	35'2"	Dolomite, grey, to slightly reddish grey, fine to med. textured with vugs, hard, shaly in sections interbedded with shale, grey and greenish grey, med. soft to soft		25		6" of core missing shale core ground in few sections
35'2"	41'5"	Shale, grey, med. hard to soft, fissile with few thin lenses of dolomite		98		1 ft. of core missing 1 section of ground core 5"
41'5"	47'8"	Shale, grey or greenish grey, med. hard to soft, fissile, interbedded with dolomite and shaly dolomite, grey, fine to med. textured, hard		60		some of shale core ground

DATE OF EXAMINATION

Z. D. Koniuszy



DIAMOND DRILL RECORD

HOLE NO. 15 SHEET NO. 2

012

PROPERTY	
LOCATION	Dundas Hwy. 8
LATITUDE	
DEPARTURE	
BEARING	

99^o

TOTAL FOOTAGE 55'0"

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy

W.P. 536-56-05

DIAMOND DRILL RECORD

HOLE NO. 16 SHEET NO. 1

PROPERTY LOCATION Dundas, Hwy. 8
LATITUDE _____
DEPARTURE _____
BEARING _____

DIP 30°
TOTAL FOOTAGE 50'

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER	% Shale		REMARKS
FROM	TO					
14'0"	15'6"	Dolomite, greenish grey, fine textured, silty, hard		-		
15'6"	17'6"	Shale, greenish-grey, soft with up to 2" layers of dolomite, silty, hard		30		6" of core missing core ground
17'6"	25'5"	Shale, red, med. hard to soft, fissile, with 3 sections (1" to 2.5") of dolomite, reddish, highly shaly, med. texture, med. hard		90		1 ft. of core missing first 6" of core ground
25'5"	29'5"	Dolomite, reddish, highly shaly, med. to fine textured, hard, interbedded with shale, red, med. hard to med. soft, fissile		40		
29'5"	39'3"	Shale, grey, med. hard to soft, fissile with thin lenses of dolomite, grey, hard 3" section of dolomite on 37 feet 2" section of dolomite on 39 feet		95		34' - 35' core ground
39'3"	40'0"	Dolomite, grey, fine textured, very hard		-		
40'0"	42'7"	Shale, grey, med. hard, fissile, interbedded with thin sections or lenses of dolomite, grey, fine textured, slightly silty, hard.		70		

DATE OF EXAMINATION _____

Z. D. Koniuszy



W.F. 536-56-05

DIAMOND DRILL RECORD

HOLE NO. 16 SHEET NO. 2

Die

99C

PROPERTY LOCATION Dundas, Hwy. 8

LATITUDE _____

DEPARTURE _____

BEARING _____

TOTAL FOOTAGE 50'

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



Ministry of
Transportation
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Communications

W.P. 536-56-01

DIAMOND DRILL RECORD

HOLE NO. 17 SHEET NO. 1

PROPERTY
LOCATION Dundas, Hwy. 8

LATITUDE
DEPARTURE
BEARING

DIP
90°

TOTAL FOOTAGE 55'3"

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE		FORMATION	SAMPLE NUMBER	%	REMARKS
FROM	TO				
5'5"	10'1"	Dolomite, light grey, med. textured, pitted, hard			
11'1"	16'10"	Dolomite, light grey, fine textured, med. hard to hard			1 ft. of core missing
16'10"	17'10"	Dolomite, light grey, fine textured, med. hard with seams of shaly dolomite		1	
17'10"	18'8"	Dolomite, light grey, fine to med. textured, hard			glauconite zone 18'4" - 18'8"
18'8"	18'11"	Dolomite, greenish grey, fine textured, highly shaly and sandy, med. soft			
18'11"	22'0"	Sandy Dolomite, greenish grey, fine textured, hard to med. hard with shaly partings			
22'0"	25'5"	Dolomite, sandy, greenish grey, fine textured, med. hard to soft, with shale and shaly partings		7	
25'5"	27'10"	Shale, light greenish grey, soft, with silty sections		60	2 ft. of core missing core ground

DATE OF EXAMINATION

Z. D. Koniuszy



Ministry of
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Ontario Communications

W.P. 536-56-01

DIAMOND DRILL RECORD

HOLE NO. 17 SHEET NO. 2

DIP

PROPERTY _____
LOCATION Dundas, Hwy. 8

LATITUDE _____
DEPARTURE _____
BEARING _____

90°

TOTAL FOOTAGE 55'3"

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER	Shale		REMARKS
FROM	TO					
27'10"	33'0"	Shale, green changing to red, soft		100		core ground 2 1/2 ft. of core missing
32'0"	38'3"	Shale, red, med. soft to soft with shaly dolomite partings, med. hard		80		1 ft. of core missing
38'3"	40'0"	Dolomite, shaly, red, coarse textured, med. hard		-		core broken
40'0"	43'0"	Shale, green, soft fissile		100		2 ft. of core missing core ground
43'0"	50'0"	Shale, greenish grey, med. hard to soft, fissile		100		1 ft. of core missing core broken, few sections ground
50'9"	52'0"	Shale, greenish grey, med. hard, interbedded with sandy dolomite, light grey, fine textured, hard		50		core broken
52'0"	52'10"	Shale, greenish grey, med. hard		100		
52'10"	53'6"	Dolomite, buff, sandy, fine textured, med. hard		-		

DATE OF EXAMINATION _____

Z. D. Koniuszy



W.P. 536-56-01

DIAMOND DRILL RECORD

HOLE NO. 17 SHEET NO. 3

DIP

PROPERTY LOCATION Quadas, Hwy. 8

LATITUDE _____

DEPARTURE _____

BEARING _____

300	
TOTAL FOOTAGE	55'3"

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION: _____

Z. D. Koniuszy



Ministry of
Transportation
and
Ontario Communications

DIAMOND DRILL RECORD

HOLE NO. 18 SHEET NO. 1

DIP

PROPERTY W.P. 530-56-05
LOCATION Highway #8 - Dundas

LATITUDE _____
DEPARTURE _____
BEARING _____

90°

TOTAL FOOTAGE 55'3"

ELEV. COLLAR _____
DATUM _____
DATE STARTED _____
DATE COMPLETED _____
DRILLED BY _____
LOGGED BY _____

FOOTAGE		FORMATION	SAMPLE NUMBER	° % Scale		REMARKS
FROM	TO					
25'2"	26'2"	Dolomite grey, medium textured pitted hard				core broken
26'2"	32'0"	Shale, grey, soft to very soft, fissile, some sections plastic		100		core ground in few sections
32'0"	32'5"	Dolomite, grey, fine textured, hard				
32'5"	33'3"	Shale, grey, medium hard		100		
33'3"	33'7"	Dolomite as above				
33'7"	35'4"	Shale, grey, medium hard to medium soft		100		core broken
35'4"	36'4"	Dolomite - shaly, grey, fine textured, medium hard, slightly silty				core broken
36'4"	38'5"	Shale, grey, soft with dolomite layers up to 2"		50		core ground in sections
38'3"	42'0"	Shale, grey, medium hard to soft, interbedded with dolomite and shaly dolomite, grey, fine textured, hard to medium hard		50		Some sections of core broken vertical joint on 41' - 42'
42'0"	42'8"	Shale, grey, soft, fissile				vertical joint

DATE OF EXAMINATION _____

Z. D. Koniuszy



NO. 10, 18 SHEET NO. 2

900

TOTAL FOOTAGE 55'3"

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



Ministry of
Transportation
and
Ontario Communications

W. P. 536-56-05

DIAMOND DRILL RECORD

HOLE NO. 19 SHEET NO. 1

DIP

90°

PROPERTY LOCATION Highway #8 - Dundas
LATITUDE
DEPARTURE
BEARING

TOTAL FOOTAGE 46'0"

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE		FORMATION	SAMPLE NUMBER	% Shale	REMARKS
FROM	TO				
13'0"	18'0"	Red shaly dolomite, fine to medium texture, interbedded with red shale and weathered shaly clay layers		60	core broken and ground in sections, 1 foot of core missing
18'0"	19'0"	Shale, green and grey, medium soft with 2" layer of shaly dolomite, greenish-grey, fine textured, medium hard		70	
19'0"	27'0"	Shale, grey and greenish grey, medium soft to soft, fissile in sections interbedded with layers (up to 2") of dolomite, grey, fine textured, hard		65	4 feet of core missing core broken and ground in sections
27'0"	28'5"	Dolomite, yellowish, medium textured, sandy, hard			
28'5"	35'0"	Shale, grey, soft, interbedded with dolomite, grey, fine textured, hard		50	2 feet of core missing
33'0"	35'0"	Shale, grey, medium hard to medium soft, fissile		100	
35'0"	40'3"	Dolomite shaly, grey, fine textured, hard			
40'3"	46'0"	Shale, grey, medium hard to medium soft with 4 - 1" seams of dolomite		90	

DATE OF EXAMINATION _____

Z. D. Koniuszy



DIAMOND DRILL RECORD

HOLE NO. 20 SHEET NO. 1

012

PROPERTY LOCATION	Highway #8 - Dundas
LATITUDE	
DEPARTURE	
BEARING	

300

TOTAL FOOTAGE 3513

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



HOLE NO. 21 SHEET NO. 1

590

PROPERTY	
LOCATION	Highway #8 - Durdas
LATITUDE	
DEPARTURE	
BEARING	

TOTAL FOOTAGE 46'8"

ELEV. COLLAR _____
 DATUM _____
 DATE STARTED _____
 DATE COMPLETED _____
 DRILLED BY _____
 LOGGED BY _____

[illegible]

DATE OF EXAMINATION _____

Z. D. Koniuszy



Ministry of
Transportation
and
Ontario Communications
W. P. 536-56-05

DIAMOND DRILL RECORD

HOLE NO. 22 SHEET NO. 1

PROPERTY LOCATION Highway #8 - Dundas

LATITUDE
DEPARTURE
BEARING

DIP
90°

TOTAL FOOTAGE 51'0"

ELEV. COLLAR
DATUM
DATE STARTED
DATE COMPLETED
DRILLED BY
LOGGED BY

FOOTAGE		FORMATION	SAMPLE NUMBER	%	REMARKS
FROM	TO				
10'7"	16'7"	Dolomite, grey to buffy, medium to fine textured, very hard, slightly pitted			vertical joint on 10'10" - 11'5"
16'7"	18'7"	Dolomite, grey to buffy, fine textured, medium hard with few shaly sections		1	vertical joint on 16'7" - 17'2"
18'7"	21'1"	Dolomite, buffy, medium to fine texture, hard to medium soft, slightly weathered			vertical joint through all sections with deeply weathered faces. Probable water zone.
21'1"	24'1"	Dolomite, grey, fine textured, medium hard with shaly sections		1	glauconitic zone on 23'9" - 24'1"
24'1"	24'6"	Shale, green, silty, medium soft fissile		100	10' of core missing
24'6"	27'5"	Sandstone, greyish-green, fine textured, hard			vertical joint through all sections
27'5"	30'0"	Dolomite-shaly-silty, grey, fine textured, hard to medium hard with numerous shale seams		40	1 foot of core missing, core broken
30'0"	36'2"	Shale, greenish-grey, medium hard to medium soft fissile with 3 - 2" sections of dolomite, grey, fine textured, hard		55	3 feet of core missing, core broken, some sections ground

DATE OF EXAMINATION

Z. D. Koniuszy

W, P, 536-56-05

DIAMOND DRILL RECORD

HOLE NO. 22 SHEET NO. 2

DIP

909

PROPERTY

LOCATION

LATITUDE

DEPARTURE

BEARING

TOTAL FOOTAGE 51'0"

ELEV. COLLAR

DATUM

DATE STARTED

DATE COMPLETED

DRILLED BY

LOGGED BY

[illegible]

DATE OF EXAMINATION

Z.D. Koniuszy

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

'N' = STANDARD PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>c LB/SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 250	VERY LOOSE	0 - 4
SOFT	250 - 500	LOOSE	4 - 10
FIRM	500 - 1000	COMPACT	10 - 30
STIFF	1000 - 2000	DENSE	30 - 50
VERY STIFF	2000 - 4000	VERY DENSE	> 50
HARD	> 4000		

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CD	" " DRAINED "	S	SENSITIVITY
CAU	" " ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORTSOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
w_s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

Oversized Drawings

proposed retaining walls. 5365605-A

-B

-C

-D

Mr. G. C. E. Burkhardt
Structural Planning Office
1201 Dufferin Street
Downsview

Soil Mechanics Section
Geotechnical Office
West Building, Downsview

May 6, 1975

W.P. 536-56-00

IMPROVEMENT OF HIGHWAY 8
along the Niagara Escarpment
West of City of Dundas
Central Region, District 4
W.P. 536-56-00

We have reviewed the feasibility of the various proposals for improvement of Hwy. 8 at the above location. Summarized below are our comments:

(1) Subway Line with Retaining Walls

This scheme is not feasible unless the retaining walls are substituted by rock and earth cut slopes. However, as we understand it, these slopes are apparently not acceptable to the public for environmental reasons.

(2) Overhead Line with Long Structure and No Fills

This scheme should be feasible but costly. Due to the possible inherent instability of the escarpment, it will be necessary to install slope indicators for about one year to determine the feasibility of this scheme.

(J) Overhead Line with Structure and High Approach Fills

This scheme has a number of problems and uncertainties:

- (a) Inherent instability of the escarpment (see (2));
- (b) Performance of the very high fills (100 ft.+);
- (c) Construction problems - effect on adjacent properties;
- (d) Placing of the fills may hinder natural drainage of the escarpment;
- (e) Large amount of granular material required.

This scheme cannot be ruled out but should only be considered as a last resort.

/

(4) Widening on Existing Alignment (Half Road - Half Structure)

This scheme requires retaining walls in the vicinity of Station Road. As mentioned in (1), the retaining walls render this scheme unfeasible, unless the walls are replaced by earth and rock cut slopes. In addition, the feasibility of structure must be determined as for (2).

(5) Overhead Adjusted Alignment (Long Structure plus Long Length of Half Road - Half Structure)

This scheme should be feasible but will require the same study as mentioned in (2).

B. LY
Project Engineer

for: K. G. SELBY
Supervising Engineer

c.c. Files
Record Services

REGIONAL PRESENTATION

JUNE 18th, 1975, 2:00 P.M.

BOARDROOM "A"

3501 DUFFERIN STREET

SUBJECT: W.P. 536-56-00, Highway No. 8
From Bond Street, Town of Dundas
to Peter's Corners (Junction of
Highways 8, 5 and 52) District 4, Hamilton

POINTS OF PRESENTATION

1. PROJECT BACKGROUND
2. CONCLUSIONS TO DATE
3. REVIEW OF SECTION BETWEEN BULLOCK'S CORNERS AND DUNDAS
4. ADDITIONAL OPTIONS TO CLIMB ESCARPMENT (SEE ATTACHMENTS)
5. RECOMMENDED OPTION
6. COMPARISON OF COSTS
7. APPROACH TO BE ADOPTED TO INFORM AFFECTED MUNICIPALITIES AND PUBLIC OF FINAL DECISION

W.P. 536-56
HWY. 8

TO PETER'S COR'S.

BULLOCK'S COR'S.

ROSEBOUGH AVE.

HILLCREST AVE.

ESCARPMENT

EXIST. HWY. 8

STATION RD.

C-N-R
SUBWAY

GOLF CLUB RD.

SPENCER
CREEK

BOND ST.

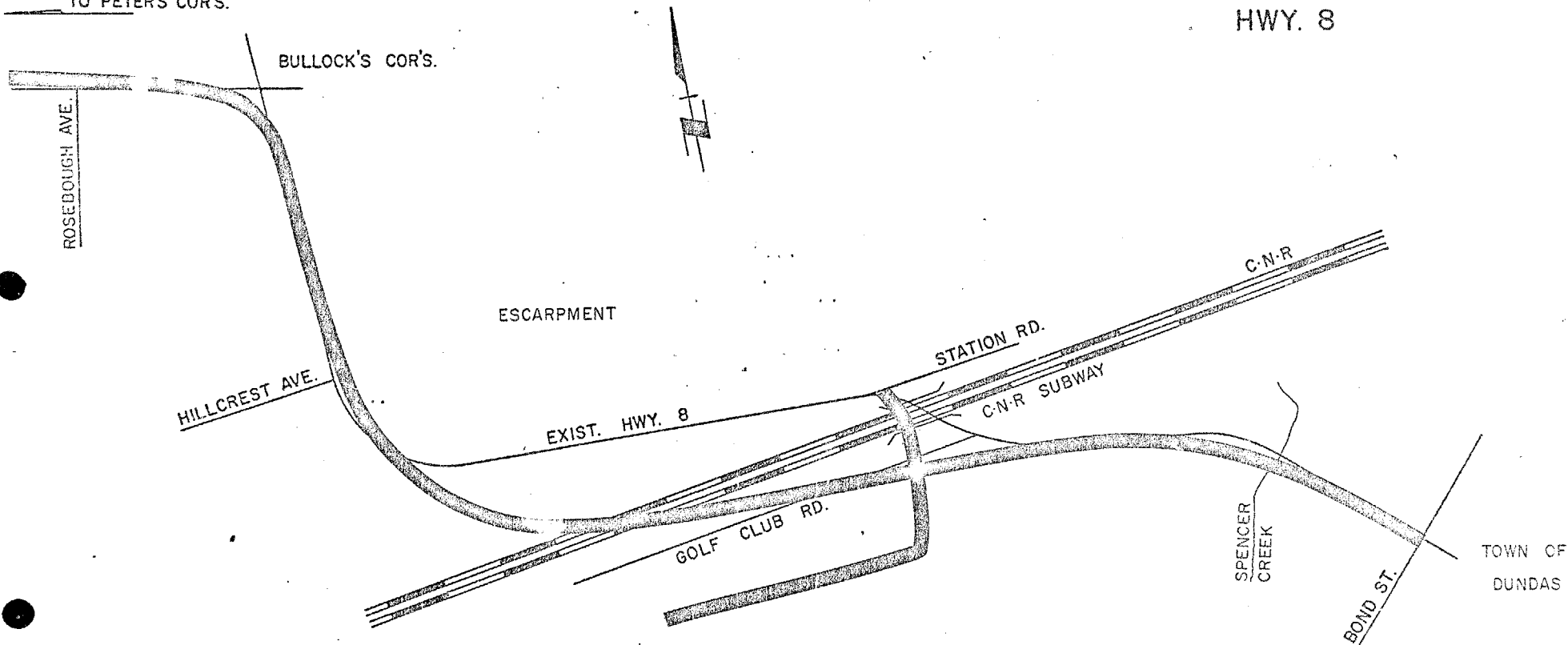
TOWN OF
DUNDAS

EXISTING

TO PETER'S COR'S.

W.P. 536-56

HWY. 8



OPTIONS 1 & 2

PETER'S COR'S. TO ROSEBOUGH AVE. — \$1,750,000

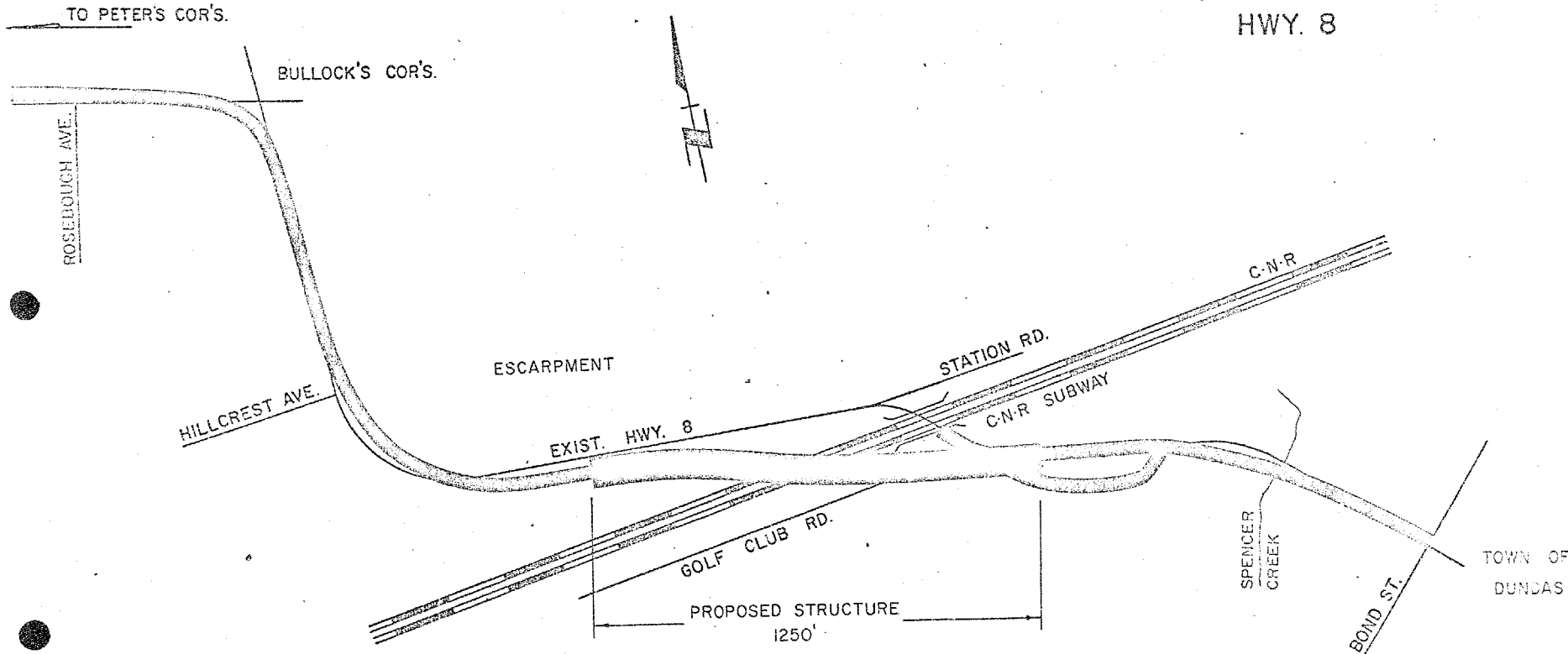
1. OVERHEAD LINE - FILL & STRUCT. - ROSEBOUGH AVE. TO BOND ST. — \$6,614,000

2. OVERHEAD LINE - ALL STRUCTURE - ROSEBOUGH AVE. TO BOND ST. — \$8,361,000

1. TOTAL — \$8,364,000

2. TOTAL — \$10,111,000

W.P. 536-56
HWY. 8



OPTION 3 - Recommended

ALL STRUCTURE - MINIMUM VERTICAL CLEARANCE	PETER'S COR'S. TO ROSEBOUGH AVE.	— \$1,750,000
	ROSEBOUGH AVE. TO BOND ST.	— \$5,850,000
	TOTAL	— \$7,600,000

TO PETER'S COR'S.

W.P. 536-56

HWY. 8

BULLOCK'S COR'S.

ROSEBOUGH AVE.

HILLCREST AVE.

ESCARPMENT

EXIST. HWY. 8

STATION RD.

C-N-R

C-N-R SUBWAY

GOLF CLUB RD.

SPENCER
CREEK

BOND ST.

TOWN OF
DUNDAS

OPTION 4

PETER'S COR'S. TO ROSEBOUGH AVE. — \$1,750,000

WIDENING ON EXISTING ALIGNMENT — ROSEBOUGH AVE. TO BOND ST. — \$5,550,000

TOTAL — \$7,300,000

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30MS-98

DIST. 4 REGION CENTRAL

W.P. No. 536-56-25

CONT. No. N.A. PROJ. CANCELLED

W. O. No. _____

STR. SITE No. _____

HWY. No. 8

LOCATION HWY. 8. RET. W. DUNDAS

OVERSIDE DRAWINGS TO BE INCLUDED WITH THIS REPORT 5

REMARKS: DOCUMENTS TO BE UNFOLDED
BEFORE MICROFILMING

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AID TO HIGHWAYS
PROGRAM STATUS REPORT

U.S. DISTRICT COURT
DESCRIPTION OF WORK
FISCAL YEAR 1976
DATE INITIATED July 11/75

As preliminary design investigations under U.S. 516-56-00 have not identified an economical means of constructing existing highway 1 between Dundas and Dundas Creek, which is partially and continuously acceptable, and it has been decided that safety standards can be improved by eliminating force only, the following work projects are cancelled.

U.S. DISTRICT COURT	DESCRIPTION	STATUS
516-56-00	From Road St., Dundas City to: 1. Dundas Creek, 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled
516-56-00	From Road St., 0.5 mi. W. of Dundas Creek, 1.5 mi. S.W. of Dundas.	Cancelled

A Study Report documenting the investigations carried out under U.S. 516-56-00 is expected to be completed by the end of this year.

PRE-CONTRACT	ENGINEERING SCHEDULE
1. STATUS REPORT	21. STRENGTH REPORTS COMPLETE
2. DESIGN PLANNING STUDIES	22. STRENGTH REPORTS COMPLETE
3. DESIGN ISSUES	23. STRENGTH REPORTS COMPLETE
4. PRELIMINARY DESIGN STUDIES	24. STRENGTH REPORTS COMPLETE
5. DESIGN STUDY ISSUED	25. STRENGTH REPORTS COMPLETE
6. DESIGN STUDY ISSUED	26. STRENGTH REPORTS COMPLETE
7. DESIGN STUDY ISSUED	27. STRENGTH REPORTS COMPLETE
8. DESIGN STUDY ISSUED	28. STRENGTH REPORTS COMPLETE
9. DESIGN STUDY ISSUED	29. STRENGTH REPORTS COMPLETE
10. DESIGN STUDY ISSUED	30. STRENGTH REPORTS COMPLETE
11. DESIGN STUDY ISSUED	31. STRENGTH REPORTS COMPLETE
12. DESIGN STUDY ISSUED	32. STRENGTH REPORTS COMPLETE
13. DESIGN STUDY ISSUED	33. STRENGTH REPORTS COMPLETE
14. DESIGN STUDY ISSUED	34. STRENGTH REPORTS COMPLETE
15. DESIGN STUDY ISSUED	35. STRENGTH REPORTS COMPLETE
16. DESIGN STUDY ISSUED	36. STRENGTH REPORTS COMPLETE
17. DESIGN STUDY ISSUED	37. STRENGTH REPORTS COMPLETE
18. DESIGN STUDY ISSUED	38. STRENGTH REPORTS COMPLETE
19. DESIGN STUDY ISSUED	39. STRENGTH REPORTS COMPLETE
20. DESIGN STUDY ISSUED	40. STRENGTH REPORTS COMPLETE

U.S. DISTRICT COURT
FISCAL YEAR 1976
DATE INITIATED July 11/75

