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CONT. No.

W. O. No. 73-11042

STR. SITE No.

HWY. No. 17

LOCATION PEMBROKE By-Pass

Hwy 17N & County Rd 15

No. of PAGES -

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

Mr. T. C. Kingsland, (2)
Regional Structural Planning Eng.,
Eastern Region,
Kingston, Ontario.

FROM:

Foundations Office,
Design Services Branch,
West Bldg., Downsview.

ATTENTION:

DATE:

September 18, 1973.

OUR FILE REF.

IN REPLY TO

SEP 24 1973

SUBJECT:

PRELIMINARY
FOUNDATION INVESTIGATION REPORT FOR
Structure and Related Crossing Along
Hwy. #17 'New'
From the Existing Hwy. #17
Westerly 10 Miles to Co. Rd. #15
Alternate Alignments A, B, C, D and E
County of Renfrew, District #9 (Ottawa)
W.O. 73-11042 -- W.P. 1-67-02

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Attached, we are forwarding to you our Preliminary Foundation Investigation Report pertaining to the above area. Presented in this report are the results of the investigation, together with our general comments pertaining to the stability of the approaches and recommendations regarding structure foundations at various crossings.

We believe that the information contained therein, will prove adequate for your immediate use. Should you require further data, or clarification of the report, please do not hesitate to contact this Office.

AGS/ao
Attch.

c.c. E. J. Orr
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Foundations Files
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A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

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PRELIMINARY
FOUNDATION INVESTIGATION REPORT FOR
Structure and Related Crossing Along
Hwy. #17 'New'
From the Existing Hwy. #17
Westerly 10 Miles to Co. Rd. #15
Alternate Alignments A, B, C, D and E
County of Renfrew, District #9 (Ottawa)
W.O. 73-11042 -- W.P. 1-67-02

1. INTRODUCTION:

The Foundations Office was requested to carry out a preliminary investigation for the possible structures and related crossings within the aforementioned 10 mile stretch of Hwy. #17 N. Five alternate alignments were investigated (designated lines A, B, C, D and E). The purpose of the investigation is to provide information pertaining to foundation design to aid in the planning studies for Hwy. #17 N in this area.

The foundation investigation was requested by Mr. T. C. Kingsland, Regional Structural Planning Engineer, Eastern Region, in a memorandum dated June 4, 1973. Following this request a field investigation was carried out by the Foundations Office to determine the subsoil, bedrock and groundwater conditions across the area.

The engineering aspects related to foundation design have been verbally discussed at a meeting held between personnel from the Eastern Region and this Office. This request contains the results of the field investigation together with our recommendations pertaining to foundation design at the various possible crossings, as well as the stability and settlement considerations associated with the required approaches.

2. DESCRIPTION OF THE AREA AND GEOLOGY:

The area under investigation extends from Hwy. #17 westerly to Co. Rd. #15 for a distance of about 10 miles.

Topographically, the area in general, with the exception of the river valleys, railway and roadway embankments is flat. The ground surface ranges from elevation 405 to elevation 501.

Physiographically, this region is known as the Ottawa Valley Clay Plains. The extensive deposits of clay are interrupted by ridges of sand and/or bedrock. The sensitive marine clay was deposited by the Champlain Sea. The clay is generally underlain by glacial till followed in turn by granitic gneiss bedrock of Precambrian Age.

3. FIELD AND LABORATORY INVESTIGATION PROCEDURES:

A total of 26 sampled boreholes and 20 dynamic cone penetration tests was carried out during the field investigation. Boring was achieved by Bombardier mounted hollow-stem auger machines and diamond drilling equipment adapted for soil sampling purposes.

During the field work, disturbed samples were obtained by standard split-spoon samplers driven into the subsoil. The driving energy conformed to the requirements of the Standard Penetration Test (SPT). In the cohesive deposits where possible "undisturbed" samples were obtained by 2-inch O.D. Shelby tubes, which were pushed into the soil manually or hydraulically. Where possible, field vane tests were carried out to determine the in-situ undrained shear strength and the sensitivity of the cohesive strata.

The bedrock was proven at 20 boring locations by obtaining BX size rock core samples.

Dynamic cone penetration tests were also carried out adjacent to some of the boreholes. Driving energy to advance the cone was 350 ft.-lbs. The elevation of the various borings were determined in the field by personnel from the Eastern Region Engineering Surveys. The elevations in this report are referenced to a Geodetic Datum. The exact boring locations were not determined due to the lack of pre-engineering survey in this area.

The elevations and the approximate boring locations are shown on Drawing No. 73-11042A.

The groundwater level conditions across the site were determined by recording the water levels in the open boreholes during the course of the field investigation. The artesian conditions encountered in B.H.'s #3 and #18 were completely sealed at the source.

All samples were visually examined in the field as well as in the laboratory. Following this inspection, laboratory testing was carried out on selected samples to determine the following physical characteristics of the overburden.

Natural Moisture Content

Atterberg Limits

Grain-Size Distribution

Undrained Shear Strength

Bulk Density

Consolidation Characteristics

The test results are plotted on the accompanying Record of Borehole sheets and summarized on Figures No. 1 to 7 inclusive, all contained in the Appendix of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

Stratigraphical sections showing the variation for alternate alignments are shown on Drawings No. 73-11042 B and C. The details of these stratigraphical sections are as follows:

- i) Hwy. #17 N Line 'B' and 'D' Crossing Co. Rd. #15
(Refer to B.H.'s #1 & #18).
- ii) Hwy. #17 N Line 'E' and 'D' Crossing C.N.R. (Refer to B.H.'s #3, & #2).
- iii) Hwy. #17 N Line 'A', 'B', 'C', 'D', & 'E' Crossing Indian River (Refer to B.H.'s #4, #7, #8, #14 and #19).
- iv) Hwy. #17 N Line 'A', 'B' and 'D' Crossing Hwy. #41
(Refer to B.H.'s #15, #16 and #20).
- v) Hwy. #17 N Line 'A', 'B' and 'D' Crossing Muskrat River
(Refer to B.H.'s #23, #24 and #25).
- vi) Hwy. #17 N Line 'A' and 'D' Crossing C.P.R. (Refer to B.H.'s #28 and #29).

In view of the variable nature of the subsoil conditions over the entire area, no detailed description of the various strata are given. However, a summary of the subsoil strata is given at each pertinent structure crossing and in addition a detailed Record of Borehole showing the stratigraphy and related properties is appended to this report.

5. GROUNDWATER CONDITIONS:

Groundwater level observations were carried out during the course of the field investigation, by recording the water level in the open boreholes. The observations are plotted on the Record of Borehole sheets.

The groundwater levels obtained by these observations, vary from ground surface to a maximum depth of 39 ft. (Site #7).

Artesian water conditions were encountered at Sites #3 and #18. The observed head was found to be 3 ft. and 4.5 ft. respectively, above the surrounding ground surface.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to realign Hwy. #17, south of Pembroke, to bypass the city. At the time of the report writing five different alignments are considered. The purpose of this report is to provide preliminary information relating to the foundation aspects associated with this particular area.

All these lines (A, B, C, D & E) were investigated and the encountered subsoil, bedrock and groundwater conditions are presented on the Record of Borehole sheets. Structures will be required at various roadway, railway and river crossings along these alignments. These crossings are shown in plan on Drawing No. 73-11042A.

At this stage, the profile grades at the crossings as well as other pertinent data, have not been finalized.

Preliminary design data, recommendations pertaining to foundation design of the various structures, as well as the stability and settlement considerations for the approaches are presented in tabular form in the following subsection [Subsection 6.2)].

It is pointed out that the recommendations given in this report are of a preliminary nature. Once the design details are available for a final adapted alignment, a complete foundation investigation will be required at the crossings.

6.2) Hwy. #17 N Crossings:

<u>Site No.</u>	<u>Crossing</u>	<u>Type</u>	<u>Line(s)</u>
1	Co. Rd. #15	Underpass Structure	B & E
2	C.N.R.	Overhead Structure	D
3	C.N.R.	Overhead Structure	E
4	Hwy. #62 and Indian River	Overpass Structure	B
6	Hwy. #62	Underpass Structure	D
7	Indian River	Overpass Structure	B
8	Indian River	Overpass Structure	C
14	Indian River	Overpass Structure	A
15	Hwy. #41	Underpass Structure	B & E
16	Hwy. #41	Underpass Structure	A & C
18	Co. Rd. #15	Underpass Structure	D
19	Indian River	Overpass Structure	D
20	Hwy. #41	Underpass Structure	D
21	Co. Rd.	Underpass Structure	B
23	Muskrat River	Overpass Structure	A
24	Muskrat River	Overpass Structure	B
25	Muskrat River	Overpass Structure	C & D
26	Co. Rd. #19	Underpass Structure	B & D
27	Co. Rd. #24	Underpass Structure	A
28	C.P.R.	Overhead Structure	A
29	C.P.R.	Overhead Structure	C
30	C.P.R. (Not Carried Out)		
31	Hwy. #17	Underpass Structure	A,B,C,D & E

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. # 17N (Lines 'B' & 'C') & Co. Rd. 15---

SITE No. 1

BOREHOLE (S) No. 1

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
481.1	<p>0.0 - 9.8 Sandy Silt and Silty sand, some clay, trace of gravel - loose to compact Bedrock - sound (granite) (471.3)</p> <p>Water Level: 1.2' Below Ground Level (El. 479.9)</p>	<p><u>Pier(s)</u>: Spread footings founded on sound bedrock. Allowable bearing pressure up to 20 t.s.f.</p> <p><u>Abutments</u>: Perched within the approaches and founded on compacted granular 'A' Allowable bearing pressure 2.5 t.s.f.</p> <p>Alternatively, end bearing piles driven to bedrock and designed for the maximum capacity for the pile section chosen.</p>	<p><u>Stability</u>: Fills up to 25 ft. with 2:1 slopes will be stable.</p> <p><u>Settlements</u> will be elastic in nature and negligible.</p>	<p>The excavation for pier(s) footings will extend below the ground water level. A dewatering scheme will be necessary.</p>

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. #17N (Line, 'D') & C.N.R.

SITE No. 2

BOREHOLE (S) No. 2

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS, FT.)	STRUCTURE	APPROACHES	REMARKS								
480.9	<p>0.0 - 4.0 Sandy silt compact (4')</p> <p>4.0 - 38.0 Silty clay, some sand, trace of gravel, firm to stiff (34')</p> <p>Sound - granite bedrock (El. 443[±])</p> <p>Water Level: 1.0' below ground level (El. 479.9)</p>	<p><u>Pier(s) and Abutments:</u> Supported on end-bearing piles driven to bedrock. Estimated tip elevation 443[±]. Designed for the maximum capacity of the pile section chosen.</p>	<p><u>Stability:</u> 1) Fills up to 25 ft. will be stable, 2:1 slopes. 2) Fills in excess of 25 ft. will require counter balancing berms.</p> <table><tr><th><u>Fill Height</u></th><th><u>Berm Length</u></th></tr><tr><td>25'</td><td>0'</td></tr><tr><td>30'</td><td>35'</td></tr><tr><td>35'</td><td>50'</td></tr></table> <p><u>Probable Consolidation Settlement:</u> 25' high fill (2:1 slopes) 2" to 3" in 2 to 3 years 4" to 6" in 8 to 10 years</p>	<u>Fill Height</u>	<u>Berm Length</u>	25'	0'	30'	35'	35'	50'	<p>The excavation for pier(s) footings will extend below the groundwater level. A dewatering scheme will be necessary.</p>
<u>Fill Height</u>	<u>Berm Length</u>											
25'	0'											
30'	35'											
35'	50'											

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. #17M (Line. 'E') & C.H.R. _____

SITE No. 3 BOREHOLE (S) No. 3

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS								
442.6	<p>0.0 - 31.0 Silty clay to clayey silt, some sand, firm to stiff (3')</p> <p>31.0 - 63.5 Sandy silt, some clay, loose to compact, (occasional layers of clayey silt) (32.5')</p> <p>Bedrock - Granite (sound) (El. 379.1)</p> <p>Water Level: Artesian condition immediately above bedrock surface Head: 3 ft. above ground level.</p>	<p><u>Pier(s) and Abutments:</u></p> <p>Supported on end bearing piles driven to bedrock. Designed for the maximum capacity of the pile section chosen.</p> <p>Estimated tip elevation 379⁺.</p>	<p><u>Stability:</u></p> <p>1) Fills up to 25 ft. will be stable. 2:1 slopes</p> <p>2) Fills in excess of 25 ft. will require counter balancing berms.</p> <table><tr><th><u>Fill Height</u></th><th><u>Berm Lengths</u></th></tr><tr><td>25'</td><td>0'</td></tr><tr><td>30'</td><td>25'</td></tr><tr><td>35'</td><td>40'</td></tr></table> <p><u>Probable Consolidation Settlement:</u></p> <p>25' high fill (2:1 slopes)</p> <p>4" to 6" in 1½ to 2 years</p> <p>12" to 14" in 8 to 10 years</p>	<u>Fill Height</u>	<u>Berm Lengths</u>	25'	0'	30'	25'	35'	40'	
<u>Fill Height</u>	<u>Berm Lengths</u>											
25'	0'											
30'	25'											
35'	40'											

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. 17N (Line 1E1) and Crossing of Hwy. 62 and Indian River

SITE No. 4

BOREHOLE (S) No. 4

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
443.7	<p>0.0 - 18.0</p> <p>Heterogeneous mixture of gravel, sand, silt and clay (glacial till) loose to compact (18')</p> <p>18.0 - 42.9</p> <p>Sand and gravel, trace of silt, compact to very dense. (24.9')</p> <p>(Compact-silty sand layer between El. 420.7 and El. 414.3)</p> <p>Sound-granite.</p> <p>Bedrock (el. 400.8)</p> <p>Water level: el. 420.7 (23 ft. below ground level)</p>	<p><u>Pier(s):</u></p> <p>Supported on end-bearing piles driven to bedrock. Designed for the maximum capacity of the pile section chosen. Estimated tip elevation 359[±].</p> <p><u>Abutments:</u></p> <p>1) Perched within the approaches and founded on compacted granular 'A'. Allowable bearing value: 2.5 t.s.f.</p> <p>2) End-bearing piles driven to bedrock (el. 471[±]) and designed for the maximum capacity for the pile section chosen.</p>	<p><u>Stability:</u></p> <p>1) Fills up to 25 ft. with 2:1 slopes will be stable.</p> <p><u>Settlements</u> will be elastic in nature and negligible.</p> <p>2) <u>Cuts:</u> Cuts in this area can be maintained with 2:1 slopes, provided they are not carried out below the prevailing water level. If cuts are to be carried out below water level some special measures will be necessary to control seepage.</p>	<p>Consideration should be given for the construction of Approach embankments in the area of abutments prior to the structure foundations.</p>

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. # 17N (LINE 'D') & HWY. 62

SITE No. 6 BOREHOLE (S) No. 6

73-11042

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
486.7	<p>0.0 - 7.0</p> <p>Fill material mixture of silt, sand, clay and organics (7')</p> <p>7.0 - 26.8</p> <p>Silty clay to clayey silt, some sand, occasional seams of silt, firm to stiff (19.8')</p> <p>26.8 - 29.0</p> <p>Sand and gravel. Compact (2.2')</p> <p>Sound. Granite - bedrock (el. 457.7)</p> <p>Water level: at ground level (el. 486.7)</p>	<p><u>Pier(s) and Abutments:</u></p> <p>Supported on end-bearing piles driven to bedrock. (el. 457.7) and designed for the maximum capacity of the pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills up to 25 ft. (with 2:1 slopes) will be stable.</p> <p><u>Probable Consolidation Settlement:</u></p> <p>25 ft. fill (2:1 slopes)</p> <p>2" to 3" in 1 to 2 years</p> <p>6" to 8" in 3 to 4 years</p>	<p>1) Pier footing excavations will extend below the observed ground water level. A dewatering scheme will be required.</p> <p>2) The fill material contains organics. It may be necessary to remove the existing fill material prior to placing any new fill in this area.</p>

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. #17 N (Line 'B') & Indian River

73-11042

SITE No. 7

BOREHOLE (S) No. 7

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
432.6	<p>0.0 - 20.0</p> <p>Silty clay, some sand, Stiff to very stiff (20')</p> <p>20.0 - 63.5</p> <p>Silty sand. Compact to dense (43.5')</p> <p>Sound. Granite - bedrock El. 369±.</p> <p>Water level: 39' below ground level (el. 393.6)</p>	<p><u>Pier(s):</u></p> <p>1) Spread footings founded within the silty clay deposit. Allowable bearing pressure up to 2.5 t.s.f.</p> <p>2) End bearing piles driven to bedrock. (el. 369±) designed for the maximum capacity of pile section chosen.</p> <p><u>Abutments:</u></p> <p>End-bearing piles. (Similar to those discussed for pier(s) 2.</p>	<p><u>Stability:</u></p> <p>River banks should not be cut any steeper than the existing ones.</p> <p>In any case, 2:1 slopes will be stable for the approaches.</p>	<p>A dewatering scheme will be necessary for the pier(s) foundations within the confinements of the river.</p>

FOUNDATION RECOMMENDATIONS
LOCATION Hwy. # 17N (Line 'C') & Indian River
SITE No. 8 **BOREHOLE (S) No.** 8

73-11042

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
417.6	<p>0.0 - 10.0</p> <p>Silty sand Loose to compact (10')</p> <p>10.0 - 36.2</p> <p>Silty clay Trace of sand Stiff (26.2')</p> <p>36.2 - 77.6</p> <p>Silty sand Loose (41.4')</p> <p>Sound Bedrock - granite (Sound) (el. 340.0)</p> <p>Water level: 3 feet below ground level (el. 414.6)</p>	<p><u>Pier(s) and Abutments:</u></p> <p>End-bearing H-piles driven to bedrock surface (el. 340.0) Designed for maximum allowable load.</p>	<p><u>Stability:</u></p> <p>Fills in the order of 25 ft. will be necessary for the approaches These embankments (with 2:1 slopes) will be stable.</p> <p><u>Probable Consolidated Settlements:</u></p> <p>25' fills (2:1 slopes) 2" to 3" in 1½ to 2 years</p>	<p>The excavation for pier(s) will extend below the ground water level within the silty sand deposit. A dewatering scheme will be required.</p>

FOUNDATION RECOMMENDATIONS

LOCATION Nwy. #17N (Line 'A') & Indian River

73-11042

SITE No. 14

BOREHOLE (S) No. 14

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
417.3	<p>0.0 - 8.8</p> <p>Sandy silt Trace of clay Compact (8')</p> <p>Silty clay Some Sand Firm to stiff (35')</p> <p>43.0 - 75.0</p> <p>Silty sand Loose to very dense (32')</p> <p>Water level: 4.5' below ground level (el. 412.8')</p>	<p><u>Pier(s) and Abutments:</u></p> <p>1) Timber piles driven some 45' into the original ground. Safe design loads up to 25 tons per pile are recommended.</p> <p>2) Piles driven into the very dense silty sand stratum. Pile capacity will be as per Hiley Formula.</p>	<p><u>Stability:</u></p> <p>Fills up to 25 ft. (with 2:1 slopes) will be stable.</p> <p><u>Probable Consolidation Settlement:</u></p> <p>25 ft. fill (2:1 slopes)</p> <p>2" to 3" in 1 to 2 years</p> <p>6" to 7" in 3 to 4 years</p>	<p>The excavation for pier(s) will extend below the ground water level within the sandy silt deposit. A dewatering scheme will be required.</p>

FOUNDATION RECOMMENDATIONS
 LOCATION Hwy. 17N (Line 'B' & 'E') & Hwy. 41
 SITE No. 15 BOREHOLE (S) No. 15

73-11042

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS, FT.)	STRUCTURE	APPROACHES	REMARKS						
454.4	0.0 - 1.5 Fill material (Roadway) 1.5 - 10.1 Silty clay. Some sand. Firm. (8.6) Sound (Bedrock - Granite) (El. 444.3) Water Level: 0.6' Below Ground Level (El. 453.8')	<u>Piers:</u> Spread footings placed at or below bedrock surface. Allowable bearing pressure up to 20 t.s.f. <u>Abutments:</u> Perched within the approach- es and supported on end- bearing piles driven to bedrock surface and designed for the maximum capacity for the pile section chosen	<u>Stability:</u> Fills up to 18 ft. with 2:1 slopes will be stable. Fills over 18 ft. will require counter- balance berms. <table><tr><td><u>Fill Ht.</u></td><td><u>Berm Length</u></td></tr><tr><td>12ft.</td><td>0'</td></tr><tr><td>25ft.</td><td>20'</td></tr></table> <u>Probable Consolidation Settlement:</u> 18 ft. fill (2:1 slopes) 2" to 3" in 2 - 3 years.	<u>Fill Ht.</u>	<u>Berm Length</u>	12ft.	0'	25ft.	20'	
<u>Fill Ht.</u>	<u>Berm Length</u>									
12ft.	0'									
25ft.	20'									

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. 17N (Line 'A' & 'C') & Hwy. 41 -----

SITE No. 16

BOREHOLE (S) No. 16

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS, FT.)	STRUCTURE	APPROACHES	REMARKS
451.6	<p>0.0 - 2.0</p> <p>Roadway Fill: Sand & gravel. (2')</p> <p>2.0 - 24.5</p> <p>Silty clay. Trace of sand. Soft to stiff. (22.5')</p> <p>Sound (Bedrock - Granite) (El. 427.1)</p> <p>Water Level: 1.8' below ground level (El. 449.8')</p>	<p><u>Pier(s) and Abutments:</u></p> <p>End-bearing piles driven to bedrock surface. (El. 427.1) and designed for the maximum capacity for the pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills up to 22 ft. (with 2:1 slopes) will be stable.</p> <p><u>Probable Consolidation Settlement:</u></p> <p>22 ft. fill (2:1 slopes)</p> <p>3" to 4" (maximum)</p>	

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. 17N (Line 'D') & Co. Rd. 15

73-11042

SITE No. 18

BOREHOLE (S) No. 18

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS, FT.)	STRUCTURE	APPROACHES	REMARKS
494.4	<p>0.0 - 28.0</p> <p>Clayey silt to silty clay with sand. (Occasional silt layers up to 4" thick) Firm to stiff. (28).</p> <p>28.0 - 41.6</p> <p>Sandy silt. Some gravel & silty clay. Loose to compact. (13.6')</p> <p>Refusal at El. 452.8</p> <p>Water level: Artesian conditions encountered at el. 459 Head: 4.5' above ground level.</p>	<p><u>Pier(s) and Abutments:</u></p> <p>End-bearing piles driven to refusal at approximately elevation 453. The design load should be controlled by Hiley Formula</p>	<p><u>Stability:</u></p> <p>No stability problems are anticipated for fills up to 20 ft. in height with 2:1 slopes</p> <p><u>Probable Consolidation Settlement:</u></p> <p>20' fill (2:1 slopes)</p> <p>6" to 7" maximum will be completed in 8 to 10 years.</p>	<p>Due to Artesian condition encountered at el. 459, borings were terminated but however, this will be determined at the time of final investigation.</p>

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. 17N (Line 'D') & Indian River

73-11042

SITE No. 19

BOREHOLE (S) No. 19

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
422.2	<p>0.0 - 29.0</p> <p>Clayey silt. Trace of sand. Soft to very stiff. (29')</p> <p>29.0 - 40.4</p> <p>Sand & Gravel. and Boulders. (11.4')</p> <p>Sound Bedrock - Granite (El. 381.8)</p> <p>Water Level: 1.0' below ground level. (el. 421.2)</p>	<p><u>Pier(s) and Abutments:</u></p> <p>End-bearing piles driven to bedrock surface at approximately el. 382.</p> <p>Designed for the maximum capacity of the pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills up to 22 ft. will be stable with 2:1 slopes.</p> <p>Estimated Settlement for 22ft. high fill with 2:1 9" to 10" (maximum)</p>	

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. 17N (Line 'D') & Hwy. 41

SITE No. 20 BOREHOLE (S) No. 20

73-11042

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
500.7	<p>0.0 - 2.9</p> <p>Topsoil, sand & gravel. (2.9')</p> <p>Sound bedrock - granite (el. 497.8)</p>	<p><u>Pier(s):</u></p> <p>Spread footings placed at or below the sound bedrock. Bearing pressures up to 20.0 t.s.f. may be used for design purposes.</p> <p><u>Abutments:</u></p> <p>1) Perched within the approaches and founded on compacted granular 'A'. Allowable bearing pressure 2.5 t.s.f.</p> <p>2) End-bearing piles driven to bedrock. Designed for the maximum capacity for the pile section chosen. Estimated tip elevation 498⁺.</p>	<p><u>Stability:</u></p> <p>No stability problems are anticipated for fills up to 22 ft. high with 2:1 slopes.</p> <p><u>Settlements:</u></p> <p>Will be elastic in nature and negligible.</p>	

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. 17N (Line 'B') & Co. Rd.

73-11042

SITE No. 21

BOREHOLE (S) No. 21

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
427.5	<p>0.0 - 24.5</p> <p>Silty clay to clayey silt. Trace of sand. Firm to stiff. (24.5)</p> <p>24.5 - 34.5</p> <p>Heterogeneous mixture of clayey silt, sand, gravel. Firm to stiff. (10')</p> <p>Sound (Bedrock - Granite) (el. 393.0)</p> <p>Water Level: 2.1' below ground level (el. 425.4')</p>	<p><u>Pier(s) and Abutments:</u></p> <p>End-bearing piles driven to bedrock surface. (el. 393.0). Designed for the maximum capacity of the pile chosen.</p>	<p><u>Stability:</u></p> <p>Fills up to 25 ft. may be required. No stability problems are anticipated for fills of this height with 2:1 slopes.</p> <p><u>Estimated Consolidated Settlement:</u></p> <p>Fills 25 ft. height 2:1 slopes.</p> <p>7" to 8" (maximum)</p>	

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. 17N (Line 'A') & Muskrat River

SITE No. 23

BOREHOLE (S) No. 23 - 1
23 - 2

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
405.2 B.H. # 23-1 (Borehole located on the lower terrace of the river bank.)	0.0 - 15.0 Silty clay. Some sand. Trace of gravel. Soft to firm. (15') Sound Bedrock - Granite (el. 390±) Water Level: at ground level	<u>Pier(s) and Abutments:</u> Supported on end-bearing piles driven to bedrock. Estimated tip elevation 390'. Designed for the maximum capacity of the pile section chosen.		At this time the details of the geometry of the river approaches and the position of the footings are not available. Stability and settlement considerations will depend upon these factors. A dewatering scheme may be necessary if pier foundations are located within confines of the river water.
415.2 B.H. # 23-2 (Borehole located on the top of the river bank.)	0.0 - 19.0 Silty clay to clay. Firm to stiff. (19' Minimum)			

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. 17N (Line 'B') & Muskrat River

73-11042

SITE No. 24

BOREHOLE (S) No. 24 - 1
24 - 2

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
406.9 (B.H. # 24 - 1)	<p>0.0 - 26.2 Clayey silt to silty clay. Some sand. Soft to firm. (26.2')</p> <p>26.2 - 33.6 Heterogeneous mixture of clayey silt, sand, gravel. Occasional boulders. (7.4) Sound bedrock - granite (el. 373.3)</p> <p>Water Level: at ground level.</p>	<p><u>Pier(s) and Abutments:</u></p> <p>End-bearing piles driven to bedrock (el. 373⁺) and designed for the maximum capacity for the pile section chosen.</p>		<p>It is possible that some of the piles will not reach bedrock, due to the encountered bouldery zone between el. 381⁺ and el. 373⁺.</p> <p>At this time the details of the geometry of the river approaches and the position of the footings are not available. Stability and settlement considerations will depend upon these factors.</p> <p>A dewatering scheme may be necessary if pier foundations are located within confines of the river water.</p>
407.9 (B.H. # 24 - 2)	<p>Silty clay to clay. Some sand. Firm. (23')</p> <p>23.0 - 34.0 Clayey silt to silt with sand. Trace of gravel. Firm. (11')</p> <p>34.0 - 37.9 Heterogeneous mixture of gravel, sand, silt and clay. Dense to very dense. (5.7) Water Level: at ground level.</p>			

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. 17W (Line 'C' & 'D') & Muskrat River

73-11042

SITE No. 25

BOREHOLE (S) No. 25

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
417.4	<p>0.0 - 19.0</p> <p>Silty clay to clayey silt. Trace of sand. Firm to very stiff. (19')</p> <p>19.0 - 25.3</p> <p>Silty sand. Some gravel. Loose.</p> <p>Sound (Bedrock - Granite) (el. 388.9)</p> <p>Water level: 3.5' below ground level (el. 413.9)</p>	<p><u>Pier(s) and Abutments:</u></p> <p>End-bearing steel piles driven to bedrock surface and designed for the maximum capacity for the pile section chosen.</p>		<p>At this time the details of the geometry of the River approaches and the position of the abutments and piers are not available.</p> <p>Stability and settlement considerations will depend upon these factors.</p> <p>A dewatering scheme may be necessary if pier foundations are located within confines of the river water.</p>

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. 17N (Line 'B/C' & 'D') & Co. Rd. 19

SITE No. 26

BOREHOLE (S) No. 26

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS								
422.5	0.0 - 4.0 Sand (4') 4.0 - 54.0 Silty clay to clayey silt. Some sand. Frequent silt layers below el. 397'. Soft to firm. (50') 54.0 - 62.3 Silty sand. Very loose to compact. (8.5') Sound granite - bedrock (el. 360.2) Water Level: el. 421.5	<u>Pier(s) and Abutments:</u> Supported on end-bearing piles driven to bedrock. Approximate el. 360. Designed for the maximum capacity for the pile section chosen.	<u>Stability:</u> Fills with 2:1 slopes up to 16 ft. will be stable. Embankments over 16 ft. will require counter balance berms. <table><tr><td><u>Fill Ht.</u></td><td><u>Berm Length</u></td></tr><tr><td>16 ft.</td><td>0'</td></tr><tr><td>20 ft.</td><td>15'</td></tr><tr><td>25 ft.</td><td>30'</td></tr></table> <u>Probable Consolidation Settlement:</u> Fills 16 ft. (2:1 slopes) 8" to 9" (maximum) Fill 20 ft. with 15' berm: 14" to 15" (maximum). Fill 25 ft. with 30' berm: 22" to 24" (maximum).	<u>Fill Ht.</u>	<u>Berm Length</u>	16 ft.	0'	20 ft.	15'	25 ft.	30'	Approach fills should be constructed and left in place as long a period as possible prior to the construction of structure foundations. This will minimize post construction maintenance problems
<u>Fill Ht.</u>	<u>Berm Length</u>											
16 ft.	0'											
20 ft.	15'											
25 ft.	30'											

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. 17N (Line 'A') & Co. Rd. 24 -----

SITE No. 27 BOREHOLE (S) No. 27

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
468.7	<p>0.0 - 36.0</p> <p>Sandy silt to silty sand. Traces of clay, gravel. Occasional boulders. Dense to very dense. (36')</p> <p>Sound granite - bedrock. (el. 432.7)</p> <p>Water Level: el. 468.0</p>	<p><u>Pier(s):</u></p> <p>Supported on spread footing in the granular deposit at or below el. 464.0. Allowable bearing pressure 2.5 to 3.0 t.s.f.</p> <p><u>Abutments:</u></p> <p>1) Perched within the approaches and founded on compacted granular 'A'. Allowable bearing pressure 2.5 t.s.f.</p> <p>2) End-bearing piles driven to bedrock. Designed for the maximum capacity for the pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills of the order of 25 ft. will be stable with 2:1 slopes.</p> <p><u>Settlements:</u></p> <p>Will be elastic in nature and negligible.</p>	<p>If pier foundations are located below the ground water level in the granular subsoil, a dewatering scheme will be necessary to prevent "boiling" of the foundation subsoil.</p>

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. 17N (Line 'A') & C.P.R.

SITE No. 28 BOREHOLE (S) No. 28

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS								
455.1	<p>0.0 - 4.5</p> <p>Sandy silt. Trace of clay. Loose. (4.5')</p> <p>4.5 - 33.0</p> <p>Silty clay to clay. Trace of sand. Occasional layers of clayey silt. Soft to firm. (28.5')</p> <p>Bedrock - Granite (el. 422.1)</p> <p>Water Level: at ground level (el. 455.1)</p>	<p><u>Pier(s) and Abutments:</u></p> <p>End-bearing piles driven to bedrock surface. (el. 422.1) and designed for the maximum capacity for the pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills up to 12 ft. (with 2:1 slopes) will be stable. Fills in excess of 12 ft. will require berms in both longitudinal and transverse direction. Berm requirements are as follows:</p> <table><tr><td><u>Fill Ht.</u></td><td><u>Berm Length</u></td></tr><tr><td>12 ft.</td><td>nil</td></tr><tr><td>18 ft.</td><td>30 ft.</td></tr><tr><td>22 ft.</td><td>45 ft.</td></tr></table> <p><u>Settlements:</u></p> <p>Fill 12 ft. (2:1 slopes)</p> <p>18" to 20" 18 ft. width 30 ft. berm</p> <p>22 ft. width 45 ft. berm</p>	<u>Fill Ht.</u>	<u>Berm Length</u>	12 ft.	nil	18 ft.	30 ft.	22 ft.	45 ft.	<p>Approach fills should be constructed and left in place as long a period as possible prior to the construction of structure foundations. This will minimize post construction maintenance problems.</p>
<u>Fill Ht.</u>	<u>Berm Length</u>											
12 ft.	nil											
18 ft.	30 ft.											
22 ft.	45 ft.											

FOUNDATION RECOMMENDATIONS

LOCATION Hwy. 17N (Line 'C') and C.P.R. _____
 SITE No. 29 BOREHOLE (S) No. 29

73-11042

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
455.5	<p>0.0 - 2.5</p> <p>Silty sand. Trace of organics (2.5')</p> <p>2.5 - 8.5</p> <p>Silty clay. Trace of sand. Stiff to very stiff. (6')</p> <p>Bedrock - Granite (el. 447.0')</p> <p>Water Level: 1.0' below ground level. (el. 454.5')</p>	<p><u>Pier(s):</u></p> <p>Spread footing placed on sound bedrock; design load up to 20 t.s.f.</p> <p><u>Abutments:</u></p> <p>Perched within the approach- es and supported on end= bearing piles. (el. 447.0'). And designed for the maximum capacity for the pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills up to 30 ft. may be required. Fills of this height will be stable with 2:1 slopes.</p> <p><u>Settlement Consider- ation</u></p> <p>Consolidation settlements due to sur- charge loading of the embankments. (30 ft. high) will be of the order of 2" to 3".</p>	

FOUNDATION RECOMMENDATIONS
 LOCATION Hwy. 17N (Line 'A', 'B', 'C', 'D' & 'E') & Hwy. 17
 SITE No. 31 BOREHOLE (S) No. 31

73-11042

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
467.9	<p>0.0 - 2.8</p> <p>Top soil and sand. (2.8')</p> <p>Sound bedrock - Granite. (el. 465.1)</p> <p>Water Level: 1.0' below ground level (el. 466.9)</p>	<p><u>Pier(s):</u></p> <p>Spread footing placed on sound bedrock. Design loads up to 20 t.s.f. may be used.</p> <p><u>Abutments:</u></p> <p>Perched within the approach- es and founded on well compacted granular 'A'. Allowable bearing pressure: 2.5 t.s.f.</p> <p>Alternatively, end-bearing piles driven to bedrock surface. (el. 465-) and designed for the maximum for the pile section chosen.</p>	<p><u>Stability:</u></p> <p>No stability problems are anticipated for approaches up to 25 ft. constructed with 2:1 slopes.</p>	

7. MISCELLANEOUS:

The field investigation was carried out from June 12 to June 21, 1973, under the supervision of Mr. J. Bangs, Project Foundations Engineer and Mr. P. Payer, Senior Foundations Engineer.

The equipment used was owned and operated by F. E. Johnston Drilling Co. Limited and Master Soil Investigation Limited.

This report was prepared by Mr. P. Payer and reviewed by Mr. M. Devata, Supervising Foundations Engineer.

P. Payer
P. Payer, P. Eng.



M. Devata
M. Devata, P. Eng.

PP/ao
Sept. 17, 1973.

APPENDIX I

DESIGN SERVICES BRANCH

SITE
RECORD OF ~~BOREHOLE~~ NO 1

FOUNDATIONS OFFICE

JOB 73-11042 LOCATION Hwy. #17N (Lines 'B' & 'D') and Co. Rd. ORIGINATED BY P.P.
 W.P. 1-67-01 BORING DATE June 13/73 #15 COMPILED BY J.B.
 DATUM Geodetic BOREHOLE TYPE CHS - Hollow Stem Auger CHECKED BY S.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W_P	W	W_L		
481.1	Ground Level															
0.0	Sandy silt to silty sand, trace of gravel and clay. Compact		1	SS	12	480										479.9
			2	SS	21											1 35 52
471.3			3	SS	14											8 56 (36)
9.8	Granite		4	RC	100	470										
466.6	Sound - bedrock															
14.5	End of Borehole					460										

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 2

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'D') & CNR

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 13, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	100	w_p	w	w_L		
480.9	Ground Level														
0.0	Sandy silt					480									El. 480.4
476.9	Compact		1	SS	17										0 13 (87)
4.0	Silty clay, some sand, trace of gravel. Firm to stiff.		2	SS	5										0 17 43 40
			3	TW	PH									102	
			4	TW	PH	470									
			5	TW	PM									105	2 14 54 30
			6	TL	PM										
			7	TL	PM	460									
			8	TW	PM									111	
			9	TW	PM	450									
442.9			10	SS	100%										
38.0	Sound														
439.9	Granite - bedrock		11	RC	99%	440									
41.0	End of Borehole.														
						430									

DESIGN SERVICES BRANCH

SITE
RECORD OF BOREHOLE NO 3

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'D') & CNR

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 14, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CMB - Hollow Stem Auger

CHECKED BY S.E.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — w_L			BULK DENSITY	REMARKS			
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT			PLASTIC LIMIT — w_p					WATER CONTENT %		
							20	40	60	80	100	w_p				w	w_L
SHEAR STRENGTH P.S.F.							UNCONFINED + FIELD VANE			QUICK TRIAXIAL x LAB VANE			P.C.F.				
							500 1500 2500			20 40 60							
442.6	Ground Level													445.6			
0.0	Silty clay to clayey silt, some sand, firm to stiff Grey.		1	SS	4	440			+9.5					0 0 57 43			
			2	SS	2		+18										
			3	TV	PM		+36							117			
			4	SS	2	430											
			5	TV	PM		+12							0 12 62 20			
			6	SS	2		+9.6							0 3 72 23			
						420											
			7	TV	PM		+6.7							112			
411.6			8	SS	16	410								0 27 62 11			
31.0	Sandy silt some clay loose to compact. (occasional layers of clayey silt)		9	SS	4	400								0 3 80 17			
						390											
						380											
379.1	Granite - bedrock		10	RC	100	380	End of cone test								Encountered Artesian Water el. 378.1		
64.5	End of Borehole.					370											

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

SITE RECORD OF ~~BOREHOLE~~ NO 4

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'E') & Hwy. 62

ORIGINATED BY P.P.

W.P. 1-67-01

BORING DATE June 13/73

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CMB - Hollow Stem Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L WATER CONTENT % 20 40 60				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
443.7	Ground Level															GR. SA. SI. CL.
0.0	Heterogeneous mixture of gravel, sand silt and clay (glacial till) Loose to compact		1	SS	8	440										9 26 43 20
			2	SS	14											22 27 38 13
			3	SS	16											
			4	SS	12	430										
425.7																
18.0			5	SS	24											22 70 (8)
	Silty sand Compact		6	SS	24	420										21.420.7
	Sand and gravel Trace of silt Compact to very dense.		7	SS	62											
			8	SS	45	410										
			9	SS	20											41 50 (9)
400.8																
42.9	Granite Gneiss		10	RC	100	400										
395.9	(Sound) Bedrock															
47.8	End of Borehole.															
						390										

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 6

FOUNDATIONS OFFICE

JOB 72-11042

LOCATION Hwy. 17N (Line 'D') & Hwy. 62

ORIGINATED BY P.P.

W.P. 1-67-01

BORING DATE June 12/73

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CHE - Hollow Stem Auger

CHECKED BY S.B.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W _P	W	W _L		
486.7	Ground Level															
0.0	Fill material. Mixture of sand, silt, clay and organics.		1	SS	6											El. 486.7
479.7			2	SS	2											0 34 46 20
7.0	Silty clay to clayey silt with sand, occasional seams of silt. Firm to stiff Grey.		3	SS	14											0 19 59 20
			4	SS	1											
			5	TW	PM											115
			6	TW	PM											112
			7	TW	PM											120
			8	SS	1											0 21 58 20
459.5	Sand and gravel.		9	SS	15											
457.7	Compact.															
29.0	Granite. Sound bedrock.		10	RC	100%											
451.7																
35.0	End of Borehole.															

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 7

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'B') & Indian River

ORIGINATED BY J.D.

W.P. 1-67-01

BORING DATE June 18, 1973

COMPILED BY J.D.

DATUM Geodetic

BOREHOLE TYPE CMB - Hollow Stem Auger

CHECKED BY J.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W_P	W	W_L		
432.6	Ground Level															
0.0	Silty clay Some sand Stiff to very stiff Grey.		1	SS	10	430										0 14 40 40
			2	SS	20											0 2 60 30
			3	SS	19											
			4	SS	20	420										
			5	SS	20											
412.6			6	SS	8											0 5 59 30
20.0	Silty Sand		7	SS	39	410										0 92 (8)
			8	SS	10											
	Compact to dense					400										
						390										
						380										
						370										
369.1																
63.5	Sound															
365.1	Granite bedrock		10	RG	95%											
67.5	End of Borehole					360										

DESIGN SERVICES BRANCH

SITE
RECORD OF BOREHOLE NO 8

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'C') & Indian River

ORIGINATED BY J.B.

W.P. 1-67-01

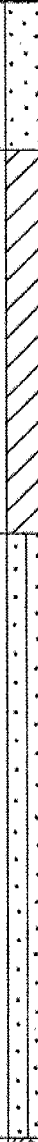
BORING DATE June 18, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			W_P W W_L					
							\circ UNCONFINED \bullet QUICK TRIAXIAL	+ FIELD VANE \times LAB VANE							
417.6	Ground Level					500	1500	2500				20 40 60		GR.SA.SI.CL.	
0.0	Silty Sand. Trace of clay. Loose to compact. Brown & Grey.		1	SS	10									WL El. 414.6	
			2	SS	7										
407.6			3	SS	2										
10.0	Silty clay. Trace (some) of sand.		4	TW	PM			+5.6							
			5	SS	14			+11							0 5 59 36
	Stiff.							+11.4							
	Grey.		6	TW	PM			+5.3						111	0 1 63 36
			7	SS	2										
			8	TW	PH			+10.2						118	
381.4			9	SS	6										0 18 60 22
36.2	Sandy silt to silty sand.		10	SS	4										0 80 (20)
	Loose.														
		11	SS	5										0 92 (8)	
		12	SS	5											
340.0	Grey.														
77.6	Ground Granite														
335.9	Bedrock		13	RC	100										
81.7	End of Borehole.														

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 14

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'A') & Indian River

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 19 & 20, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — w_L			BULK DENSITY γ	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT					PLASTIC LIMIT — w_p					
							20 40 60 80 100					WATER CONTENT — w					
							SHEAR STRENGTH P.S.F.					w_p — w — w_L					
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT %					
							500 1500 2500					20 40 60					
417.3	Ground Level																
0.0	Sandy silt.		1	SS	17											El.	
	Trace of clay.		2	SS	15												412.8
409.3	Compact.		3	SS	5												0 35 55 10
8.0	Silty clay.		4	FW	FW												0 21 46 33
	Some sand.		5	SS	4												
	Firm to stiff.		6	FW	FW												
	(Occasional fissures.)		7	SS	4												
	Grey.		8	SS	4												
			9	SS	6												
			10	SS	7												0 13 58 29
374.3			11	SS	3												0 88 (12)
43.0	Silty sand.		12	SS	8												
	Loose to very dense.		13	SS	11												
			14	SS	36												0 86 (14)
			15	SS	34												
			16	SS	71												
342.3																	
75.0	End of Borehole.																

SITE
RECORD OF ~~BOREHOLE~~ No 15

FOUNDATIONS OFFICE

ORIGINATED BY E.P.

COMPILED BY J.B.

CHECKED BY 52

20
15 ϕ 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

SITE
RECORD OF BOREHOLE NO 16

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Lines 'A' & 'C') & Hwy. 41

ORIGINATED BY P.P.

W.P. 1-67-01

BORING DATE June 14, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CMB - Hollow Stem Auger

CHECKED BY S.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W _P	W	W _L		
451.6	Ground Level															
0.0	Roadway Fill (sand & gravel)					450										Bl. 449.8
2.0	Silty clay. Trace of sand. Soft to stiff.		1	SS	4											0 1 82 17
			2	TW	PM	440									103	
			3	SS	1/18"											0 6 60 34
			4	TW	PM	430									117	
427.1	Granite. Sound bedrock.		5	RC	100%											
422.1																
29.5	End of Borehole.					420										

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 18

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'D') & Co. Rd. 15

ORIGINATED BY P.P.

W.P. 1-67-01

BORING DATE June 13, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE Washbore - BK - casing

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ	REMARKS ∇ Head el. 499.0 P.C.F. GR.SA.SI.CL.		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			W_P — W — W_L WATER CONTENT %						
							\circ UNCONFINED \bullet QUICK TRIAXIAL	$+$ FIELD VANE \times LAB VANE		500	1500	2500			20	40
494.4	Ground Level		1	SS	11											
0.0	Clayey silt to silty clay with sand. Occasional silt layers (up to 4"). Trace of organics. Firm to stiff.		2	SS	10	490									0 24 51 25	
			3	SS	10											
			4	SS	3											
			5	SS	5	480										
			6	TV	PM											115
			7	TV	PM											107
			8	TV	PM	470										110
466.4	Sandy silt. Some gravel, and clay. Loose to compact.		9	SS	8										112	
28.0			10	SS	12	460										5 34 38 13
452.8																
41.6	End of Borehole. (Refusal)					450									∇ Artesian water encountered el. 454.2	

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 19

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'D') & Indian River

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 22, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE Washbore - BX casing

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT — w_L			BULK DENSITY	REMARKS							
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT			PLASTIC LIMIT — w_p											
							20	40	60	80	100	WATER CONTENT — w									
SHEAR STRENGTH P.S.F.							500			1500			2500			WATER CONTENT %					
							○ UNCONFINED			+ FIELD VANE			w_p — w — w_L			P.C.F.					
							● QUICK TRIAXIAL			x LAB VANE			20			40			60		
422.2	Ground Level																				
0.0	Clayey silt. Trace of sand. Soft to very stiff					420															
			1	TW	PM																
			2	TW	PM																
			3	TW	PM																
			4	TW	PM																
			5	TW	PM																
393.2			6	SS	24																
29.0	Sand and gravel with numerous boulders.					390															
381.8																					
40.4	Granite bedrock		7	RC	63%	380															
378.0																					
44.2	End of Borehole.																				
						370															

DESIGN SERVICES BRANCH

SITE RECORD OF BOREHOLE NO 20

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'D') & Hwy. 41

ORIGINATED BY P.P.

W.P. 1-67-01


BORING DATE June 15, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT _____			LIQUID LIMIT _____ w_L PLASTIC LIMIT _____ w_p WATER CONTENT _____ w w_p — w — w_L			BULK DENSITY γ	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT %					
500.7	Ground Level					500									P.C.F. GR.SA.SI.CL.
0.0	Topsoil, sand & gravel.														
197.8	Sound - granite bedrock.														
2.9															
491.8			1	RC	100%										
8.9	End of Borehole.					490									

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 21

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'B') & Co. Rd.

ORIGINATED BY P.P.

W.P. 1-67-01

BORING DATE June 15, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY Y	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W _P	W	W _L	
427.5	Ground Level														
0.0	Fill material	X													
	Silty clay to clayey silt. Trace of sand. Firm to stiff.		1	SS	4	420									
			2	TV	PM										
			3	SS	17/18"	410									
			4	TV	PM										
403.0	Grey.														
24.5	Heterogeneous mixture of clayey silt, sand, gravel. Firm to stiff.		5	SS	4	400									
			6	SS	14										
393.0															
34.5	Sound - granite bedrock		7	RC	100%	390									
36.8	End of Borehole.														

DESIGN SERVICES BRANCH

SITE
RECORD OF BOREHOLE No 23 BOREHOLE No. 23-1

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'A') & Muskrat River

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 20, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.P.

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L			BULK DENSITY γ P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE 500 1500 2500			WATER CONTENT % 20 40 60					
405.2	Ground Level														
0.0	Silty clay. Some sand. Trace of gravel. Soft to firm.		1	SS	1/13"	400		+16					○		
			2	SS	1/13"			+9.3						○	
			3	EM	PH			+10						○	
								+12						110	
390.2						390									
15.0	Sound - granite bedrock		4	RC	100%										
385.2															
20.0	End of Borehole.					380									

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

SITE RECORD OF BOREHOLE No. 23 BOREHOLE No. 23-2

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'A') & Muskrat River

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 20, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W _P	W	W _L		
415.2	Ground Level															
0.0	Silty clay to clay. Firm to stiff.		1	SS	7	410										0.0 45 55 407.2'
			2	SS	6											
			3	TM	PM											
			4	TM	PM	400										
396.2																
19.0	End of Borehole.															
						390										

DESIGN SERVICES BRANCH

SITE
RECORD OF BOREHOLE No 24 - BOREHOLE No. 24-1

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'B') & Muskrat River

ORIGINATED BY P.P.

W.P. 1-67-01

BORING DATE June 14, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE Washbore - Bx casing

CHECKED BY S.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
406.9	Ground Level															
0.0	Clayey silt to silty clay. Some sand. Soft to firm.		1	SS	4	400										
			2	SS	5											
			3	TW	EM	390										
			4	TW	EM											
380.7	Grey.		5	TW	EM	380										
26.2	Heterogeneous mixture of clayey silt, sand, gr. Occasional bould.		6	RC	25%											
373.3																
33.6	Sound Granite Bedrock		7	RC	38%	370										
363.4			8	RC	94%											
42.5	End of Borehole.					360										

DESIGN SERVICES BRANCH

SITE
RECORD OF BOREHOLE NO 25

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Lines 'C' & 'D') & Muskrat River

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 26, 1973

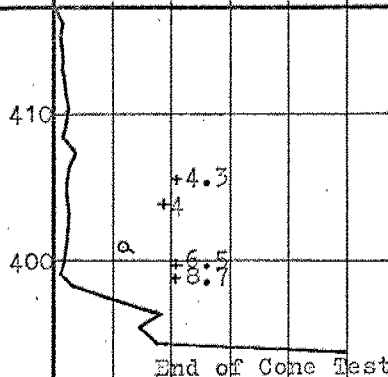
COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
417.4	Ground Level															
0.0	Silty clay to clayey silt. Trace of sand. Firm to very stiff.		1	SS	5											
			2	SS	5											
			3	SS	2											
			4	TV	FM											
398.4																
19.0	Silty sand. Some gravel. Loose.		5	SS	9											
392.1																
25.3	Granite bedrock		6	RC	99%											
28.5	End of Borehole.															



EL 413.9
0 1 49 50

117

16 54 (30)

OFFICE REPORT SOIL EXPLORATION

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 27

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'A') & Co. Rd. 24

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 19 & 21, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE Diamond Drill - Bx casing

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W			BULK DENSITY Y P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W _P	W	W _L	
468.7	Ground Level														
0.0	Sandy silt to silty sand. Traces of clay, gravel. Occasional layers of clayey silt. Dense to very dense. (Occasional boulders.)		1	SS	49										468.0
			2	SS	43										
			3	SS	65										8 41 43 8
			4	SS	57										
			5	SS	59										6 46 39 9
432.7	Grey.														
36.0	Granite - sound bedrock		6	RG	100%										
427.7															
41.0	End of Borehole.														

DESIGN SERVICES BRANCH

SITE RECORD OF BOREHOLE NO 28

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'A') & C.P.R.

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 21, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — W _L PLASTIC LIMIT — W _p WATER CONTENT — W			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W _p	W	W _L		
455.1	Ground Level															
0.0	Sandy silt. Trace of clay. Loose.		1	SS	6	450										0 27 66 7
450.6			2	SS	1/12"											
4.5	Silty clay to clay. Trace of sand. Occasional layers of clayey silt. Soft to firm.		3	TW	PM											
			4	SS	1/18"	440										0 0 75 25
			5	TW	PM											
			6	SS	1/18"	430										0 6 58 36
			7	SS	1/18"											
422.1	Granite - sound bedrock.		8	RC	100%	420										
417.2																
37.9	End of Borehole.					410										

DESIGN SERVICES BRANCH

SITE RECORD OF BOREHOLE NO 29

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'C') & C.P.R.

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 21, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CMT - Hollow Stem Auger

CHECKED BY J.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_P — W — W_L	BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT					
455.5	Ground Level									
453.0	Silty sand		1	SS	18					
2.5	Silty clay.		2	SS	10					
447.0	Trace of sand. Stiff to very stiff		3	RC	100%					
8.5	Sound - granite bedrock									
442.3										
13.2	End of Borehole.									

End of Core Test

0 6 73 21

DESIGN SERVICES BRANCH

SITE RECORD OF BOREHOLE NO 31

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Lines 'A', 'B', 'C', 'D', 'E') & Hwy. 17 (existing)

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 21, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CMB - Hollow Stem Auger

CHECKED BY S.R.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W_P	W	W_L		
467.9	Ground Level															
0.0	topsoil and sand															
465.1																
2.8	Granite - sound bedrock															
459.8			1	RC	100%	460										
8.1	End of Borehole.					450										

DESIGN SERVICES BRANCH

SITE RECORD OF BOREHOLE NO 32

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'E') & Indian River

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 25, 1973

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
462.0	Ground Level.															
0.0	Sand. Traces of clay, silt and gravel. Compact to dense.		1	SS	21	460						o				1 96 (3)
			2	SS	21	450						o				
			3	SS	42							o				2 95 (3)
439.5			4	SS	26	440						o				
22.5	Sandy silt. Some clay, Compact.		5	SS	27							o				VEL 0 31 58 11
429.5			6	SS	18	430						o				
32.5	Silt, Some clay, Trace of sand. Loose to compact.		7	SS	8							o				0 3 86 11
			8	SS	28	420						o				
418.0			9	SS	7							o				0 4 66 30
44.0	Silty clay to clayey silt. With sand.		10	SS	11	410						o				
			11	SS	7							o				
			12	SS	7	400						o				0 34 41 25
			13	SS	7							o				
			14	SS	8	390						o				
						380										
377.0																
85.0	End of Borehole.					370										

20
15 \diamond 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

 SITE
 RECORD OF BOREHOLE NO 33

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Line 'E') & Indian River

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 26, 1973

COMPILED BY J.B.

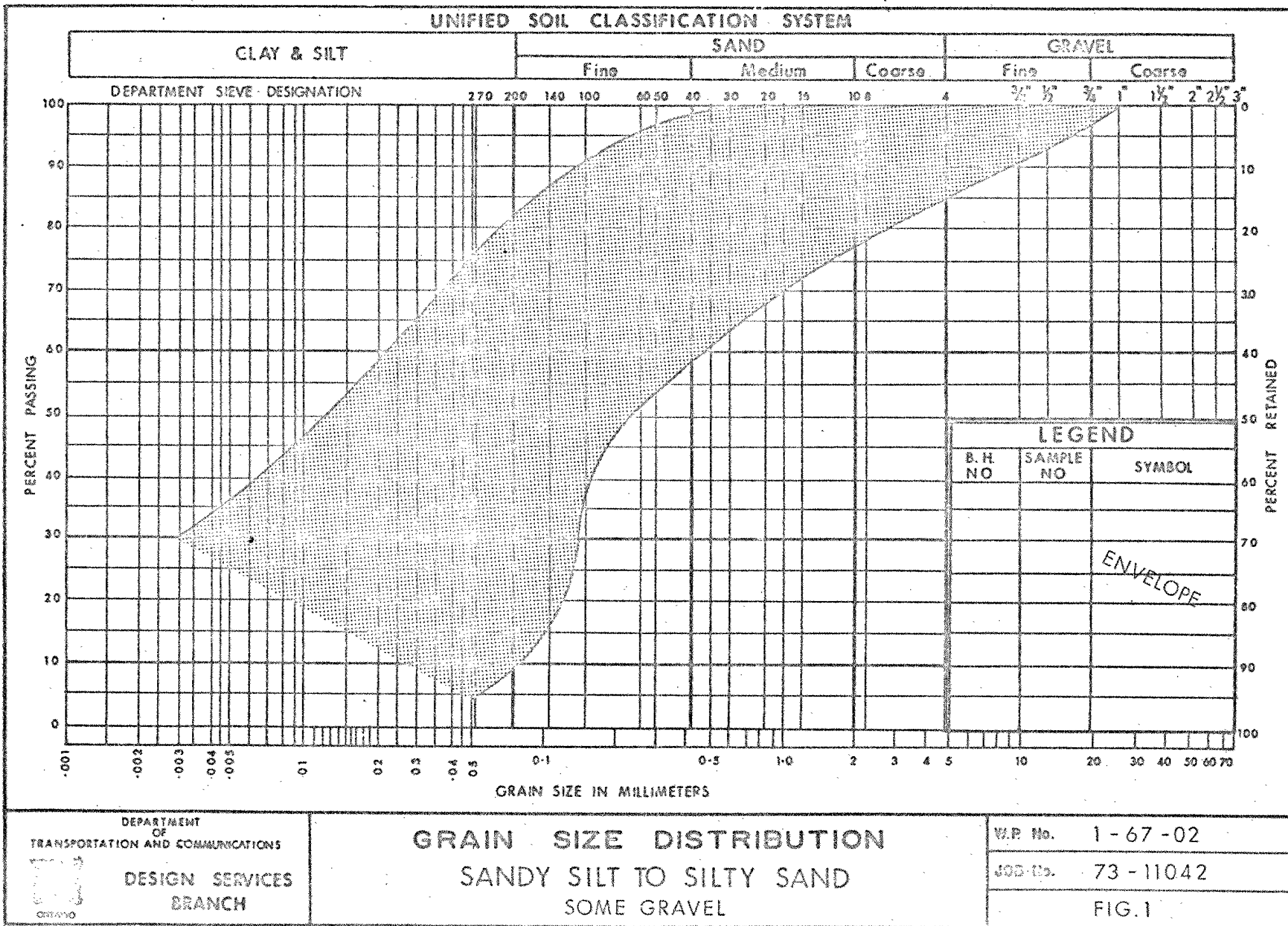
DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

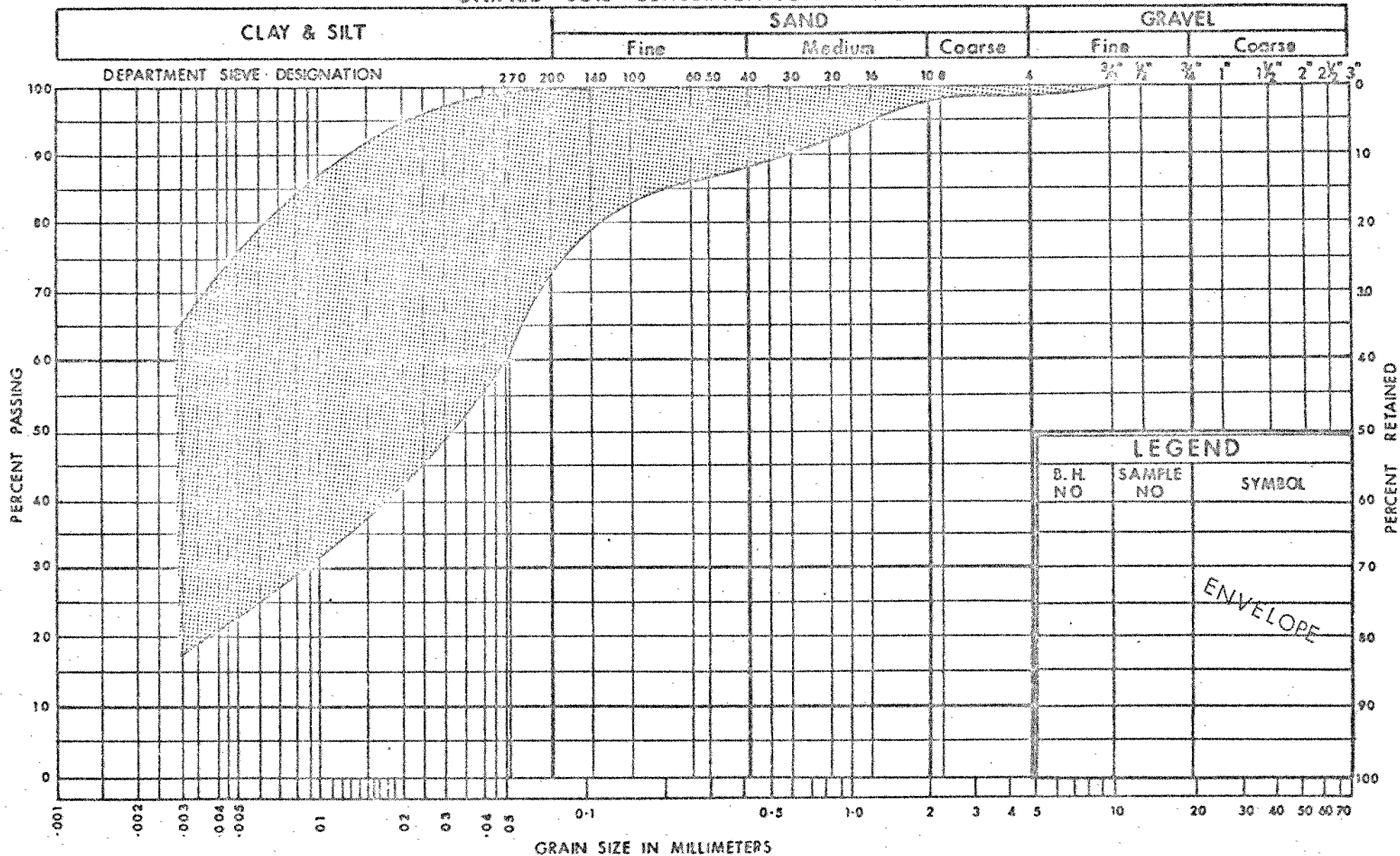
CHECKED BY J.B.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT ——— w_L PLASTIC LIMIT ——— w_p WATER CONTENT ——— w w_p ——— w ——— w_L			BULK DENSITY γ P.C.F. GR. SA. SI. CL.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % 20 40 60				
456.3	Ground Level													
0.0	Sand. Trace of silt. Dense.		1	SS	31	450								0 97 (3)
			2	SS	32									
			3	SS	50	440								0 92 (8)
424.3						430								
32.0	Probable silty clay.					420								
411.3														
45.0	End of Borehole.					410								

OFFICE REPORT SOIL EXPLORATION



UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS

DESIGN SERVICES
BRANCH

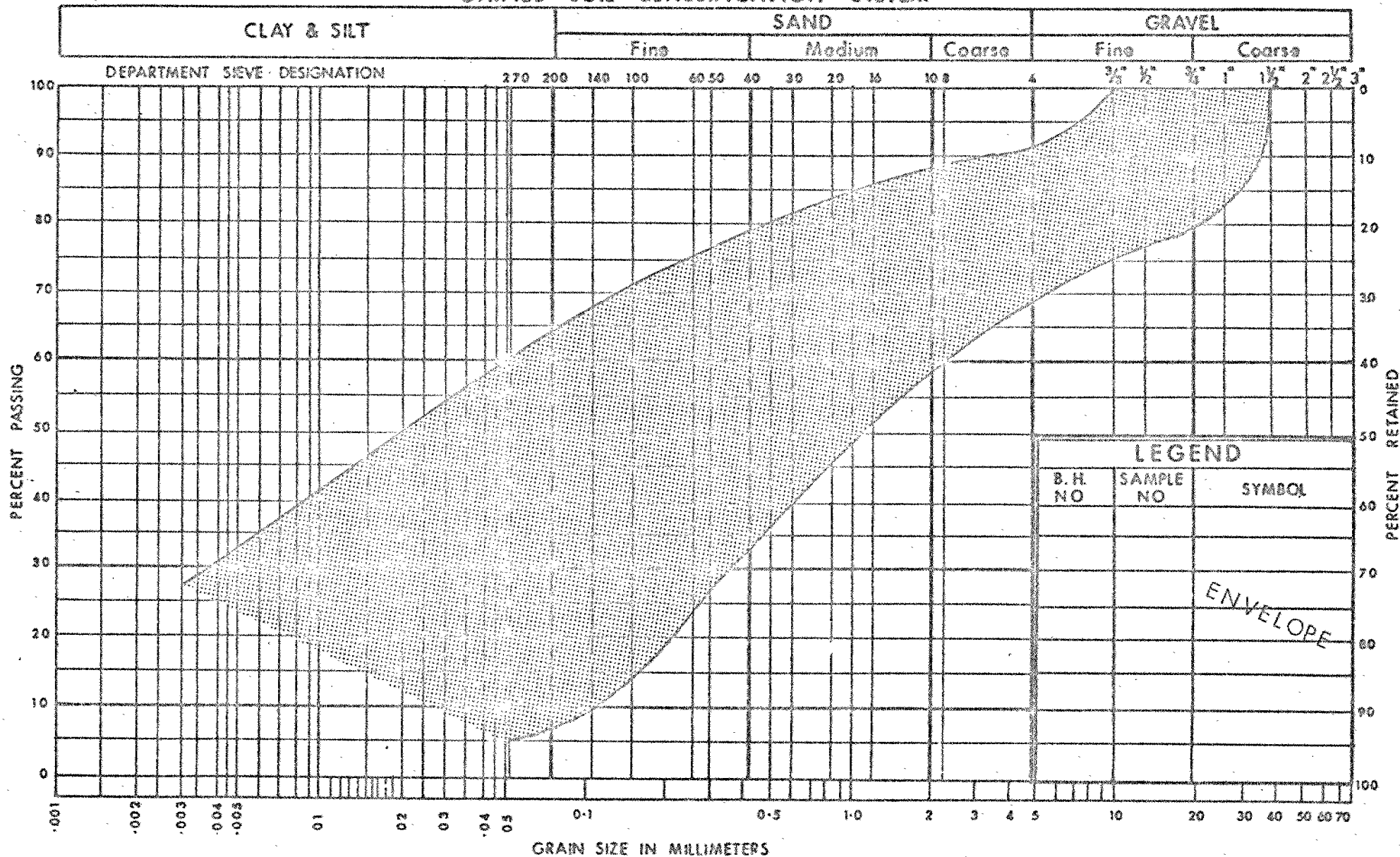
GRAIN SIZE DISTRIBUTION
CLAYEY SILT TO CLAY

W.P. No. 1-67-02

JCS No. 73-11042

FIG. 2

UNIFIED SOIL CLASSIFICATION SYSTEM



DEPARTMENT
OF
TRANSPORTATION AND COMMUNICATIONS



DESIGN SERVICES
BRANCH

GRAIN SIZE DISTRIBUTION GLACIAL TILL

HET. MIX. OF CLAYEY SILT INTO SAND & OCC. GRAVEL

W.P. No. 1-67-02

JOS No. 73-11042

FIG.3

VOID RATIO-PRESSURE CURVES

JOB NO. 73-11042

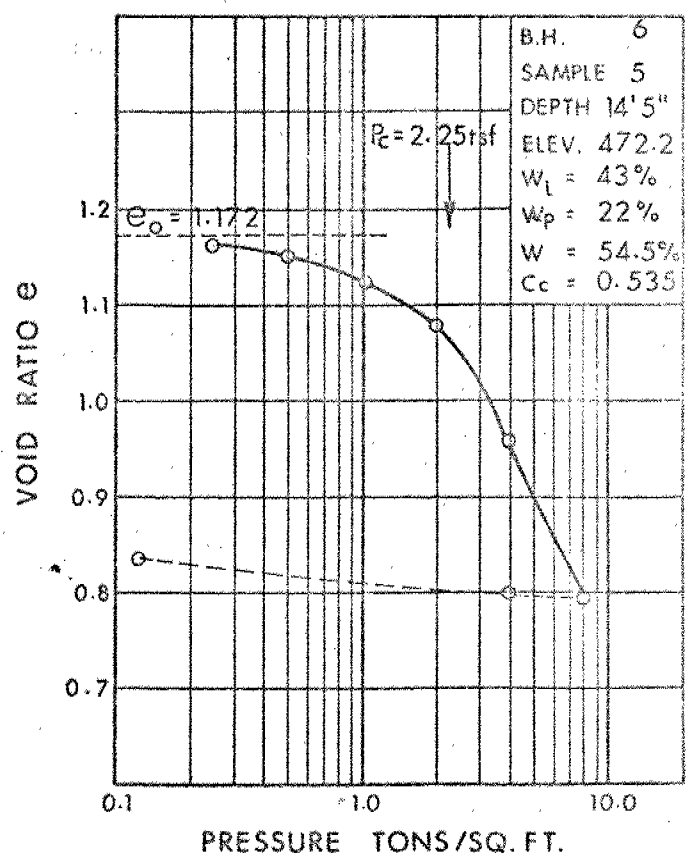
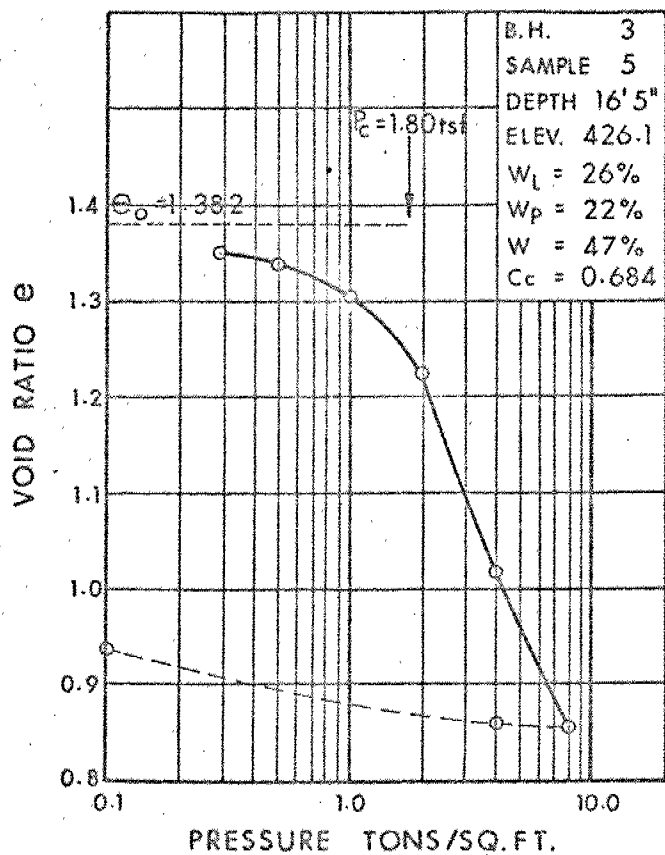
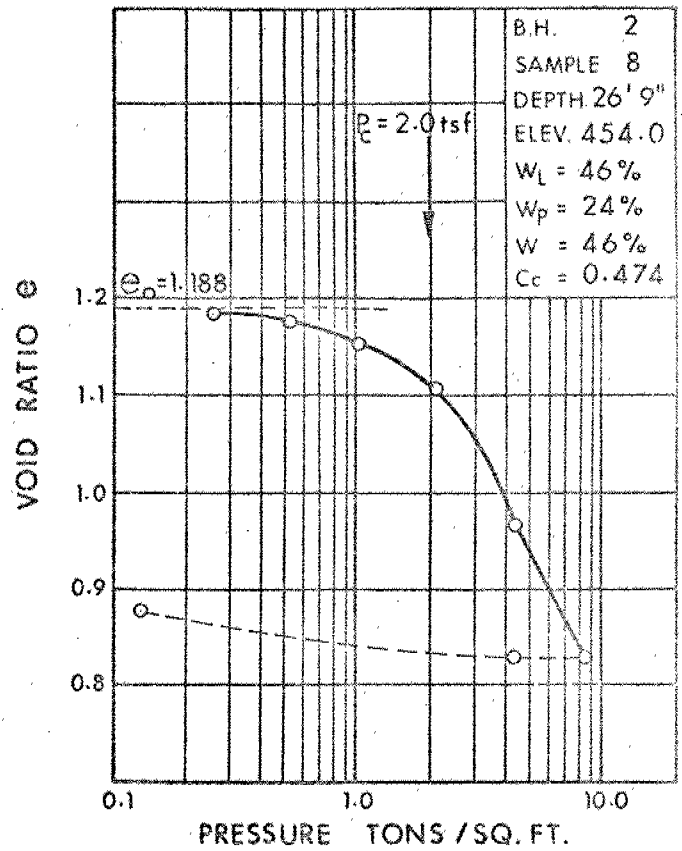
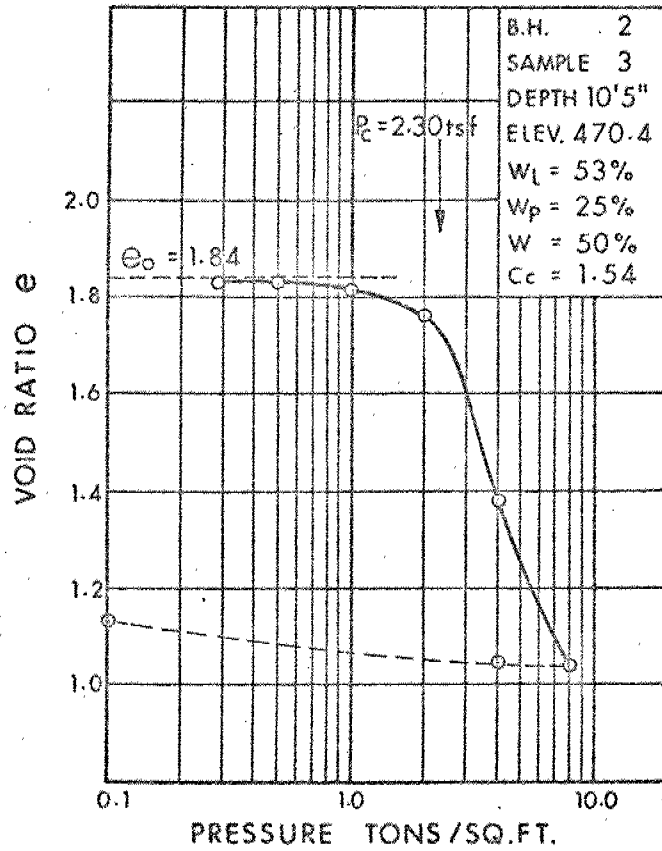


FIG. 4

VOID RATIO-PRESSURE CURVES

JOB NO. 73 - 11042

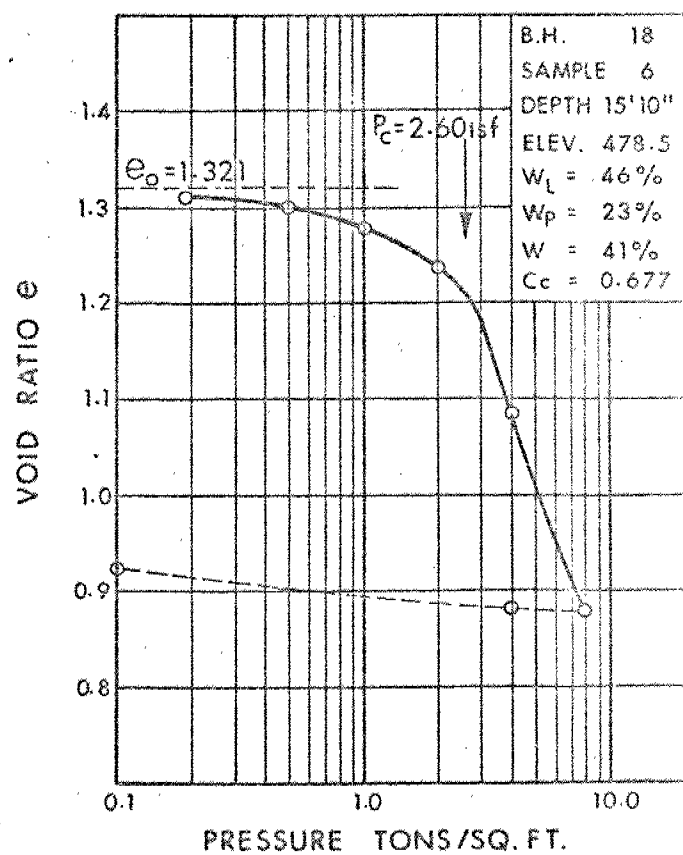
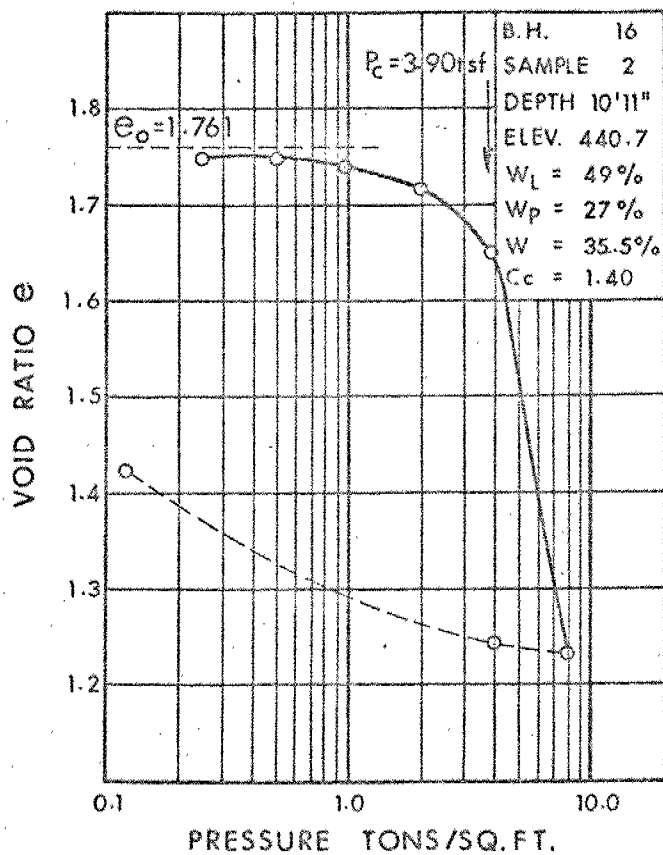
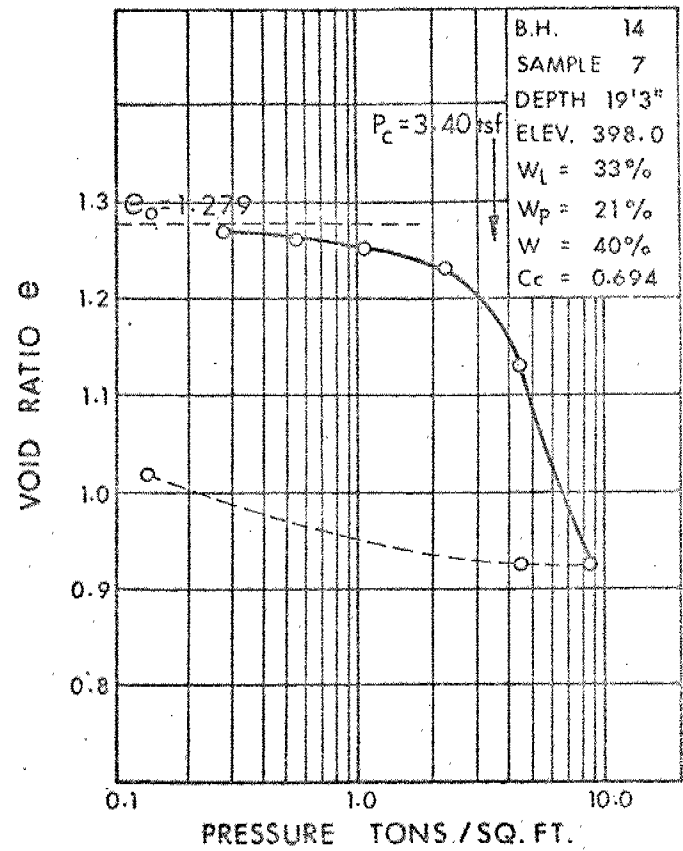
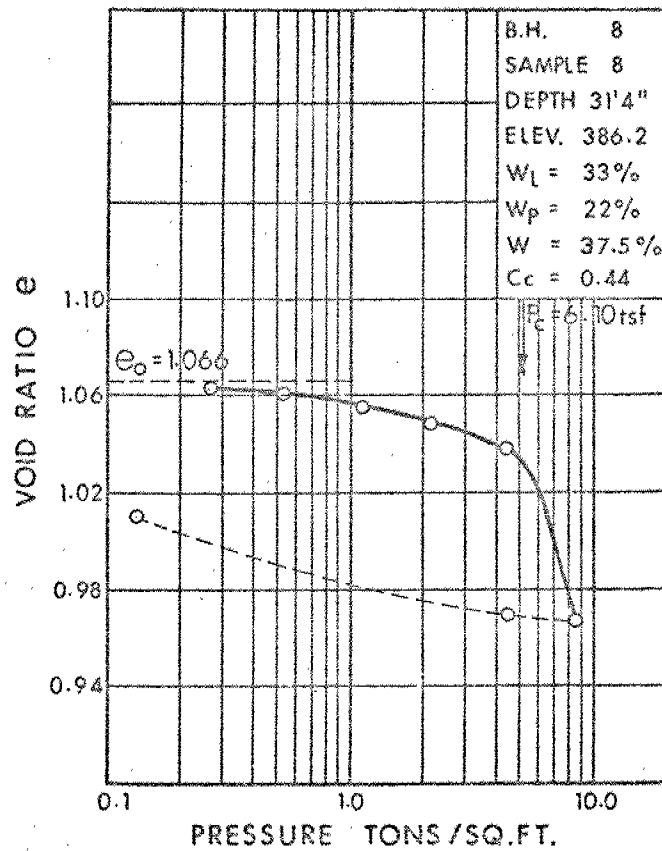


FIG. 5

VOID RATIO - PRESSURE CURVES

JOB NO. 73 - 11042

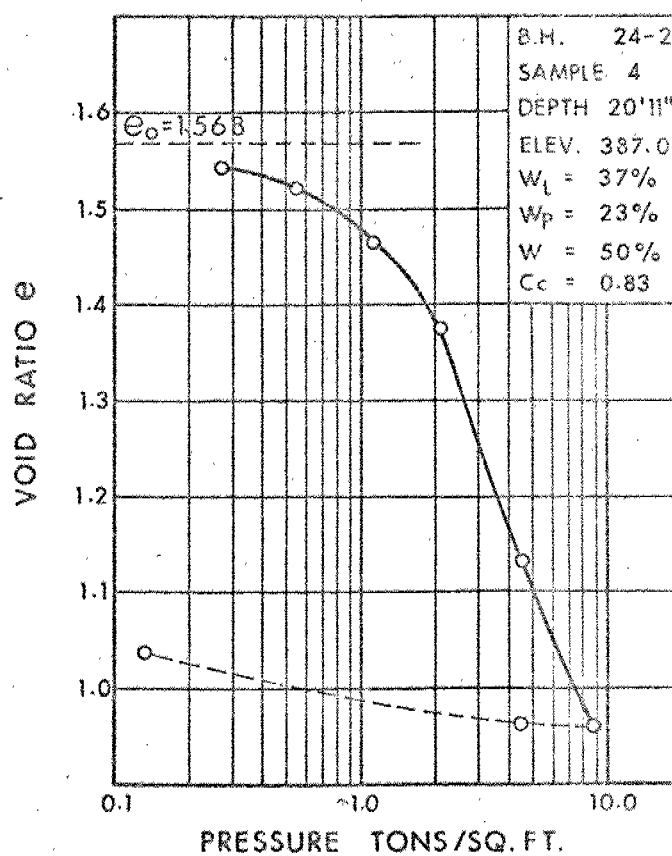
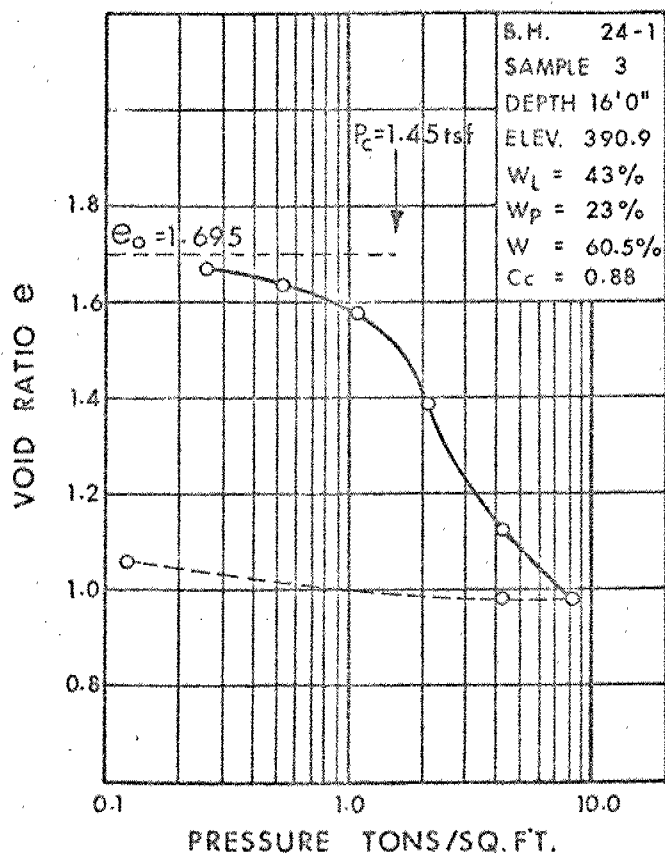
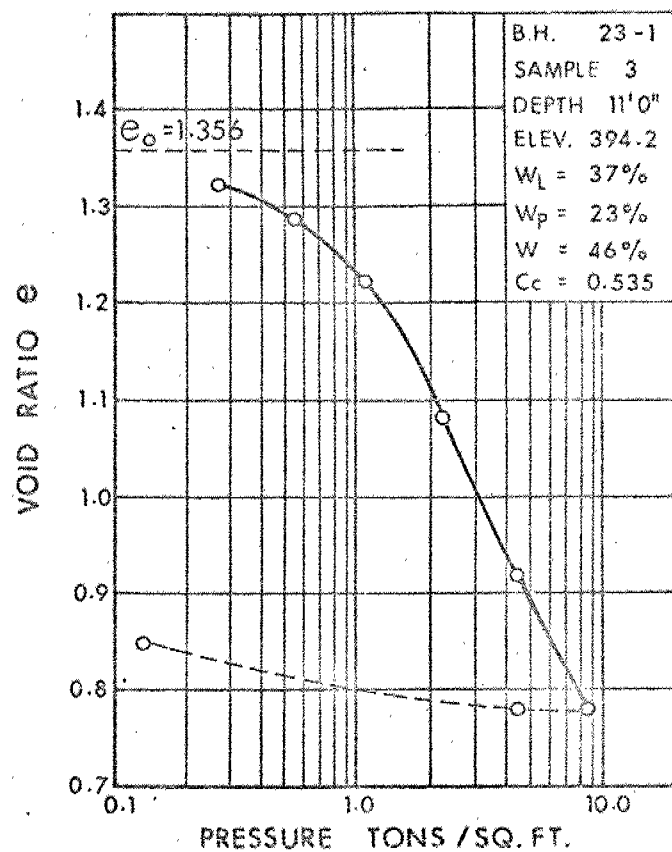
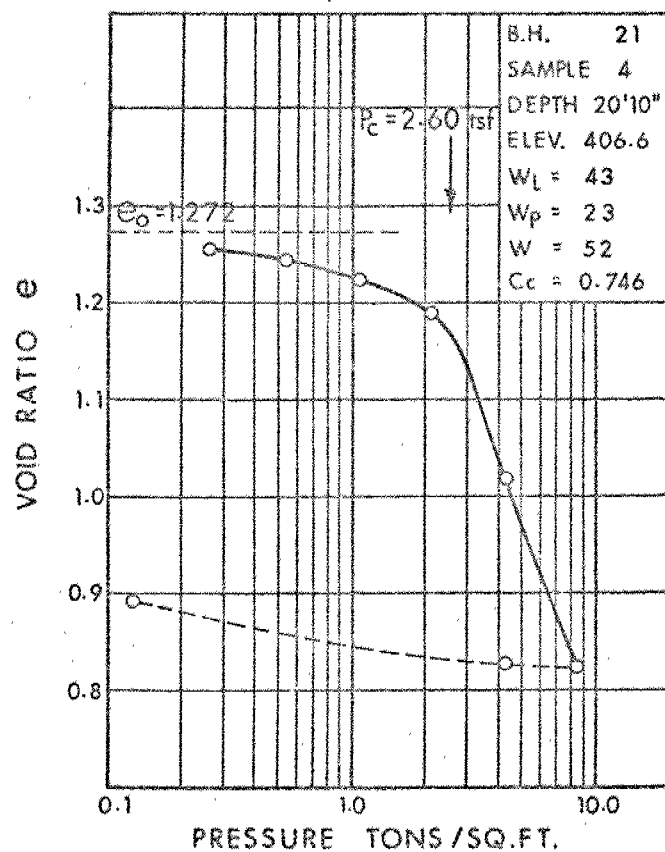


FIG. 6

VOID RATIO-PRESSURE CURVES

JOB NO. 73 - 11042

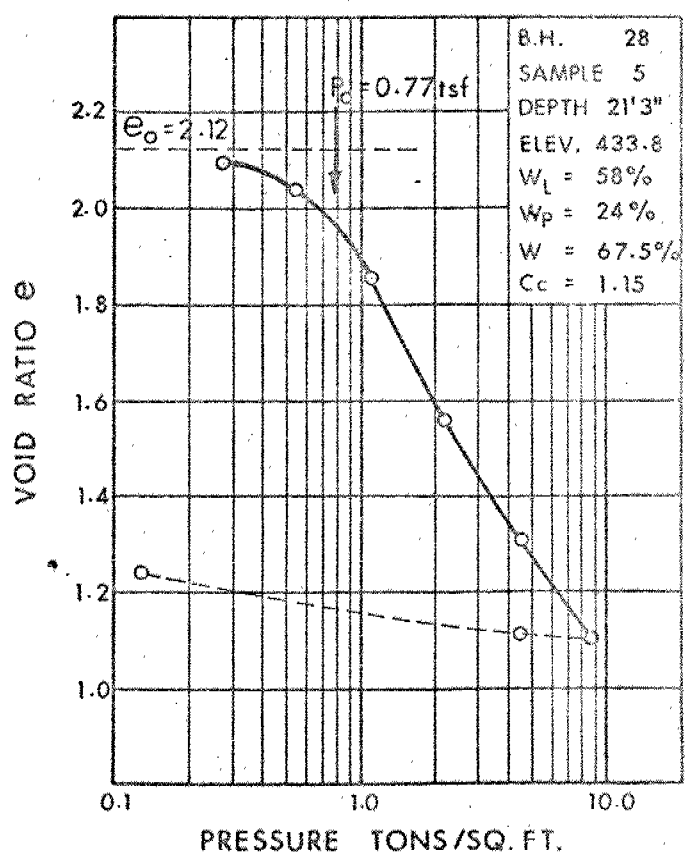
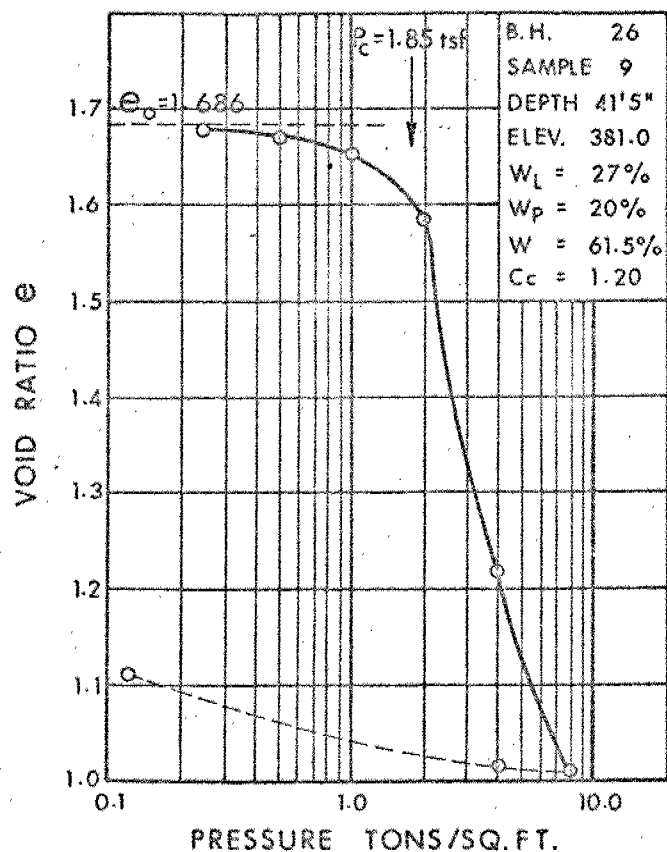
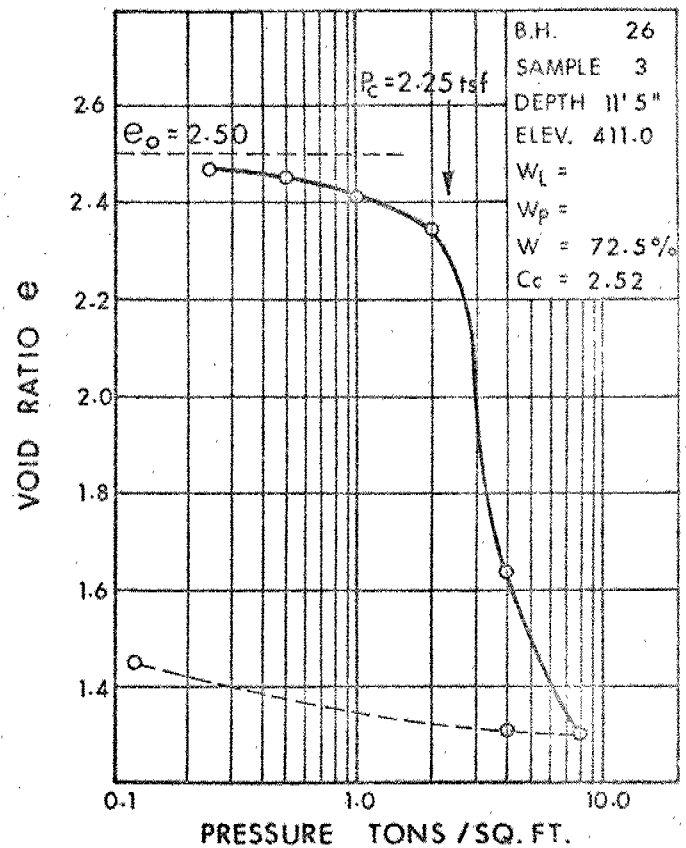
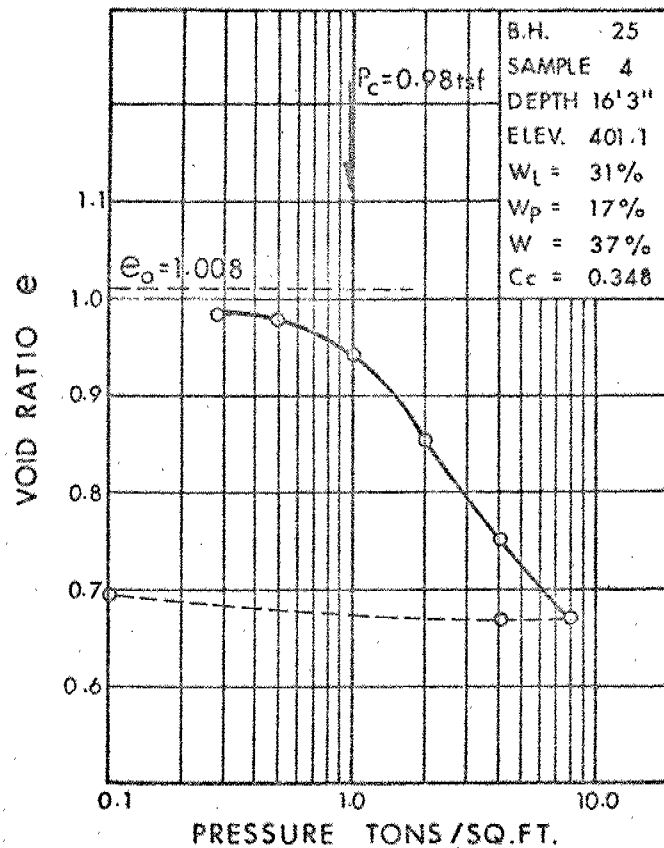


FIG. 7

ABBREVIATIONS & SYMBOLS USED IN THIS REPORTPENETRATION 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
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL 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
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
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ 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
σ'	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

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. T. C. Kingsland,
Regional Structural Planning Eng.,
Eastern Region,
Kingston, Ontario.

FROM: Foundations Office,
Design Services Branch,
West Bldg., Downsview.

ATTENTION:

DATE: November 9, 1973.

OUR FILE REF.

IN REPLY TO NOV 14 1973

SUBJECT: Pembroke Bypass, Hwy. #17 N,
Borehole #30
W.O. 73-11042 -- W.P. 1-67-01

Since the completion of the preliminary Foundation Report (W.O. 73-11042) for Hwy. #17 N (Pembroke Bypass) we have been requested to carry out additional borings at the crossing of Hwy. #17 N (Line B) and the C.P.R. These sites were inaccessible and as a result of this these additional borings have been carried out by means of portable drilling equipment. A detailed Record of Borehole sheets together with a stratigraphical section is attached to this memorandum. In addition, we have included recommendations pertaining to foundation design of the structure, as well as the stability and settlement considerations for the approach embankments which are presented in tabular form.

The foregoing additional information should be attached to the Appendix of the original report (W.O. 73-11042).

If you have any further queries, please contact our Office.

J. T. Bangs

J. T. Bangs,
Project Foundations Engineer,
For: M. Devata,
Supervising Foundations Eng.

JTB/ao
Attch.

c.c. E. J. Orr
B. R. Davis
A. Rutka
A. J. Percy
J. M. Childs
B. J. Giroux
E. R. Saint
G. A. Wrong
B. A. Singh

Foundations Files ✓
Documents

FOUNDATION RECOMMENDATIONS

73-11042

LOCATION Hwy. #17 N (Line B) & C.P.R.

SITE No. 30 BOREHOLE (S) No. 30

GROUND ELEV.	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	APPROACHES	STRUCTURE	REMARKS
454.5 (B.H.#30-1)	<p>0 - 12.0 Sand & gravel Trace of silt (Railway Embankment Material) Loose to compact (12.0') 12.0 - 24.9 Organic silt & wood chips Soft (12.9') 24.9 - 27.0 Silty sand loose (2.1') Artesian Condition at 27 ft. below ground level. Artesian head 1.0 ft. above ground surface (elev. 455.5)</p>	<p>The Organic deposit should be excavated to its full depth under the proposed approaches. If these measures are carried out, no stability problems are anticipated for fills up to 30 ft. in height provided with 2:1 slopes in the forward and side slopes. Settlement will be elastic in nature.</p>	<p><u>Pier(s):</u> Supported on end bearing piles driven to end bearing stratum. Design for the maximum capacity for the pile section chosen.</p> <p><u>Abutments:</u> 1) Perched within the approaches and founded on compacted granular 'A'. Allowable bearing pressure 2.5 t.s.f. 2) End bearing piles driven to bedrock. Designed for maximum capacity for pile section chosen.</p>	<p>Due to Artesian condition encountered at elev. 429, borings were terminated at this elev. The competent end bearing stratum and the bedrock should be determined at the time of the final investigation. However, it is recommended that the site be abandoned. Consideration should be given to realign Hwy. #17 N (Line 'B') where rock outcrops were observed.</p> <p>*Lower limits of this deposit were not established.</p>
454.0 (B.H.#30-2)	<p>0 - 8.1 Sand & gravel Trace of silt (Fill Material) loose (8.1') 8.1 - 10.0 *Organic silt & wood chips soft (1.9') Water level: 1.5' below ground level (elev. 452.5)</p>			

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 30-1

JOB 73-11042

LOCATION CPR & Hwy. #17N (Line B)

ORIGINATED BY JB

W.P. 10-67-01

BORING DATE October 22 & 23, 1973

COMPILED BY JB

DATUM Geodetic

BOREHOLE TYPE Wash Borehole

CHECKED BY H.J.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L WATER CONTENT % 20 30 40				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE									
454.5	Ground Level		1	AS		450									21 72 (7)	Art. Head El. 455.5 SA. SI. CL.
0.0	Sand & gravel trace of silt (Fill Material)		2	SS	4											
442.5	Loose to compact Black		3	SS	19											
12.0	Organic silt and wood chips Reddish brown Soft		4	SS	3	440							476		Org. Cont. 86%	Org. Cont. 71%
			5	SS	4									465		
			6	SS	2									482		
429.6	Silty sand					430										Art. Cond.
24.0	Loose Grey		7	SS	3											
27.0	End of borehole					420										

DESIGN SERVICES BRANCH

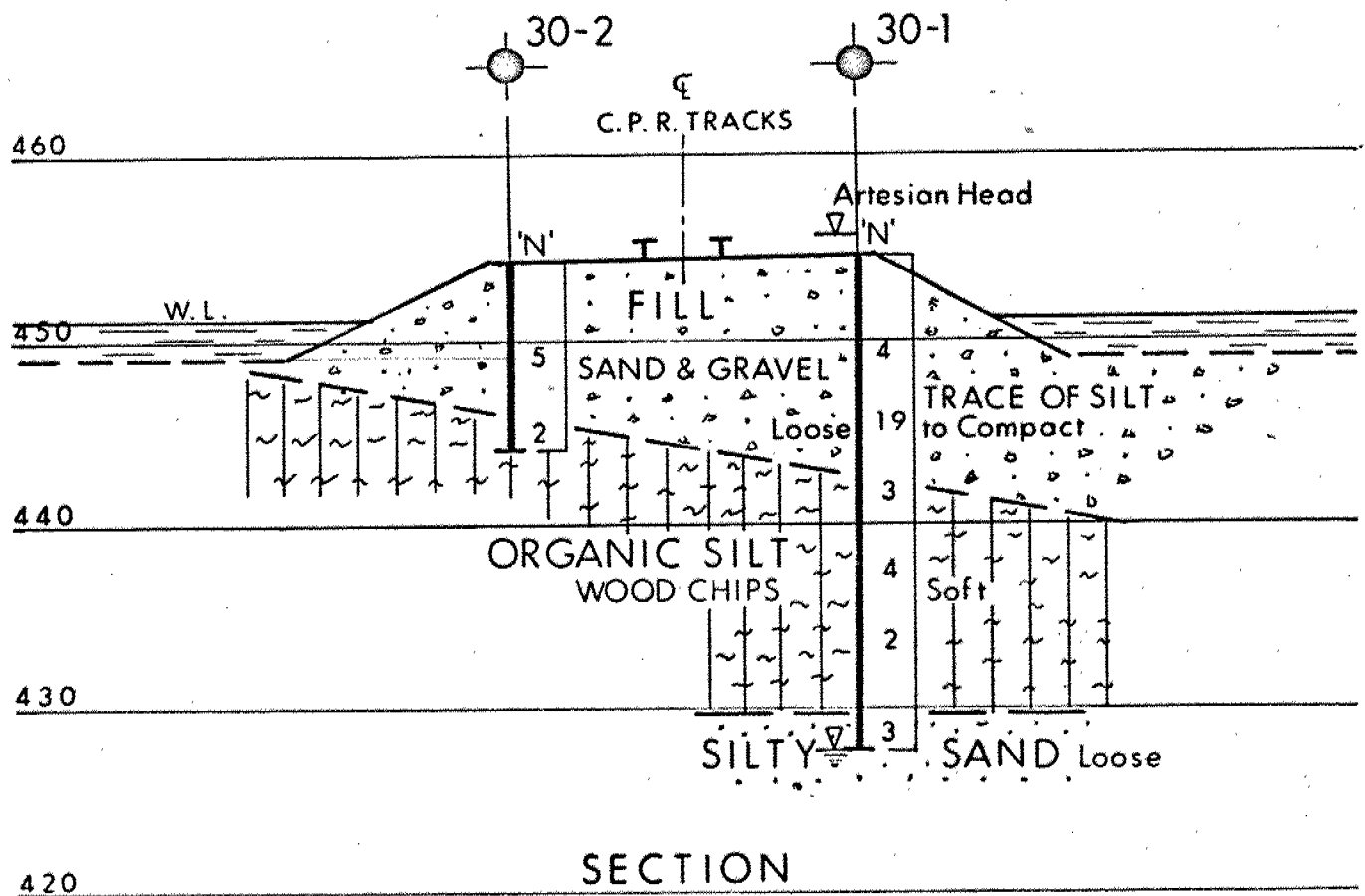
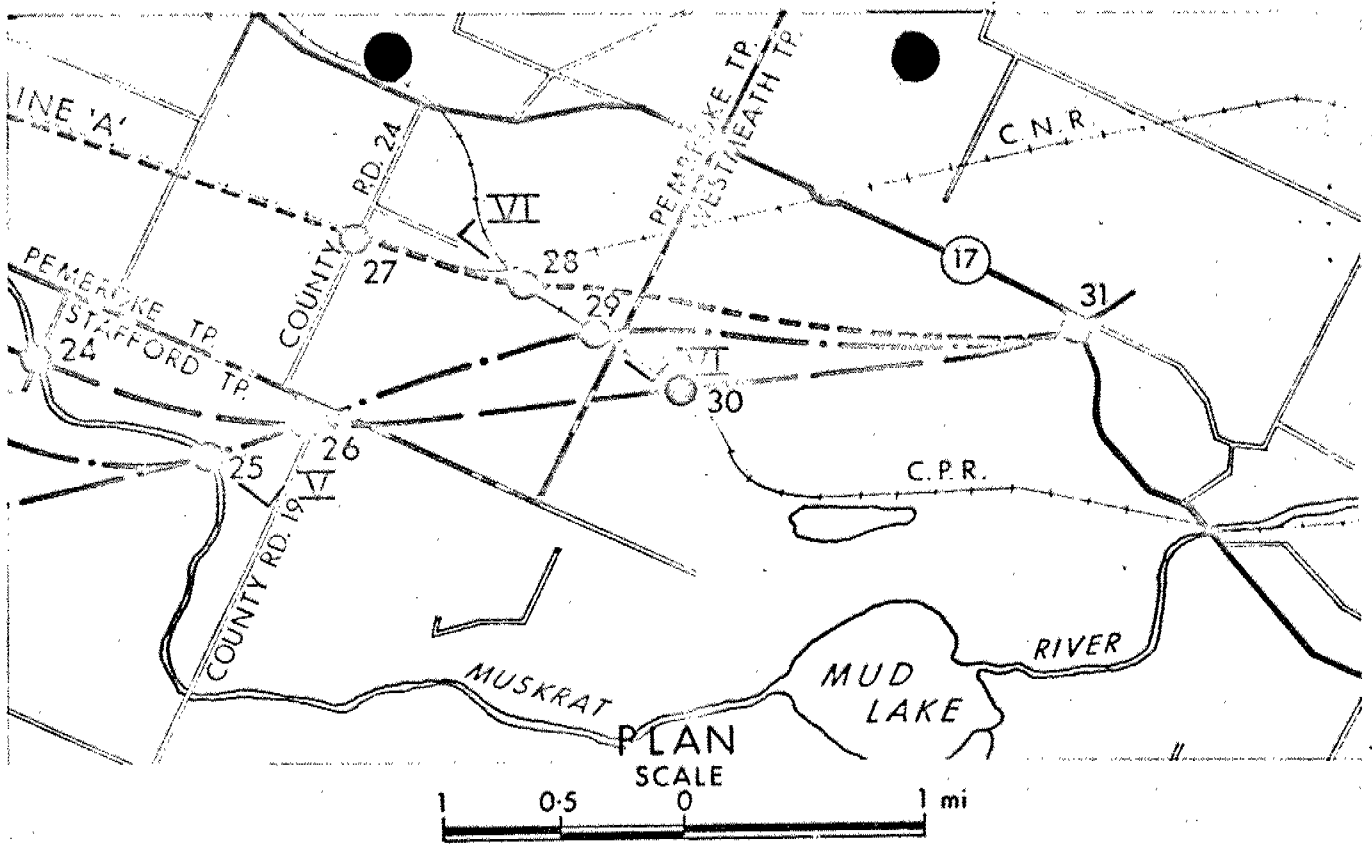
FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 30-2

JOB 73-11042 LOCATION CPR & Hwy. #17N(Line B) ORIGINATED BY JB
 W.P. 10-67-01 BORING DATE October 24, 1973 COMPILED BY JB
 DATUM Geodetic BOREHOLE TYPE Wash Borehole CHECKED BY el

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % W_P W W_L					
454.0	Ground Level					450									39 56 (5)	
0.0	Sand and gravel trace of silt															
445.9	Fill Material loose black		1	SS	5											
448.1	Org. silt, woodchips															
448.0	reddish brown		2	SS	2									460.5		
10.0	End of Borehole					440										

OFFICE REPORT ON SOIL EXPLORATION



W.P. 10-67-01
 W.O. 73-11042
 DWG. 73-11042D

OVERSIZE DRAWING

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. T.C. Kingsland, (2)
Reg. Structural Planning
Engineer,
Eastern Region, Kingston.

FROM: Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

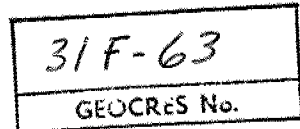
ATTENTION:

DATE: June 26th, 1974.

OUR FILE REF.

IN REPLY TO *July 8/74*

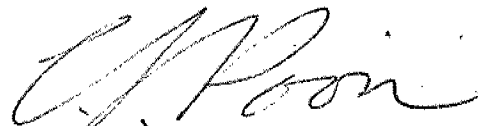
SUBJECT: RE: Additional Boreholes,
Pembroke By-Pass,
Highway #17N,
W.O. 73-11042, W.P. 1-67-01.



Preliminary Foundation Investigation Report for the abovementioned project was submitted on September 24th, 1973. Since the submission of this Report, additional alignments were being considered by the Ministry. In order to obtain sufficient subsoil information along these new (or revised) alignments, the Soil Mechanics Section carried out an additional subsurface investigation as per a request from Mr. T.C. Kingsland (March 22nd, 1974).

Attached to this memo are individual Record of Borehole Sheets and Drawing #73-11042-E showing boring locations. In addition, preliminary recommendations pertaining to foundation design of structures as well as the stability and settlement considerations for the approach embankments are presented in tabular form. Please append the foregoing additional information to your copy of the original foundation report (W.O. 73-11042).

Should you have any queries, please contact this Office.



C.S. Poon
Project Engineer

For: M. Devata
Supervising Engineer

CSP/mj
Attach*

C.C. E.J. Orr
B.R. Davis
A.J. Percy
J.M. Childs
B.J. Giroux
E.R. Saint
G.A. Wrong
P. Lewycky
Files ✓
Documents

FOUNDATION RECOMMENDATIONS

11042

LOCATION Hwy. 17N Crossing Hales Creek (Lines 'B', 'C', 'D' & 'E')

SITE No. 34

BOREROLE (S) No.

	SUBSOIL CONDITIONS (BOREROLE THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
482.1	<p>0.0-10.5 Compact to very dense, silty, fine sand (10.5')</p> <p>10.5 - 42.0 Firm to stiff silty clay with some sand. (31.5')</p> <p>42.0 - 67.7 Dense to very dense sand and gravel with some silt (25.7')</p> <p>Probably bedrock at elev. 414.4</p> <p>Water level: elev. 477.6</p>	<p><u>Pier(s) and Abutments</u></p> <p>Supported on end-bearing piles driven to bedrock, (Est. elev. 414). Designed for the maximum capacity of the pile section chosen.</p>	<p><u>Stability</u></p> <p>Fills up to 22 feet high in the transverse direction will be stable with 2:1 slope. In the longitudinal direction the safe fill height will depend on the configuration of existing river banks.</p> <p><u>Probable Consolidation Settlement</u></p> <p>Estimated maximum settlement for 22' fill with 2:1 slopes is approx. 4 inches. 2 inches of settlement will be realized 4 months after the completion of the approaches.</p>	

FOUNDATION RECOMMENDATIONS

11042

LOCATION Hwy. 17 N. (Rev. Line 'C') Crossing C.N.R. _____
 SITE NO. 35 BOREHOLE(S) 11a.

SOIL CONDITIONS
 QUANTITY (THICKNESS FT.)

STRUCTURE

APPROACHES

REMARKS

0.0 - 23.0
 510.5 Loose to dense silty sand to sand with some silt (23.0')
 23.0 - 38.5
 Firm to stiff clayey silt to silty clay, traces of sand. (15.5')
 38.5 - 70.1
 Compact to very dense silty sand to sand with some silt (31.6')
 Probable bedrock at elev. 440.4
 Water Level: elev. 507.6

Pier(s)

Supported on spread footing within the granular deposit high will be stable at approximately elev. 506 with 2:1 slopes. using allowable bearing pressure of up to 2.5 t.s.f. Embankments over 27 ft. will require counter-balancing berm at mid-height.

Abutments:

- 1) Perched within the approaches and founded on compacted Granular 'A'. Allowable bearing pressure 2.5 t.s.f.
- 2) End-bearing piles driven to bedrock. Designed for the maximum capacity of the pile section chosen. (est. tip elev. 440+).

Stability:

Fills up to 27 feet high will be stable with 2:1 slopes. Embankments over 27 ft. will require counter-balancing berm at mid-height.

Fill Ht. Berm Length

27 ft.	0
31 ft.	5 ft.
35 ft.	10 ft.

Probable Consolidation Settlement:

For 35 feet high fill with 10 ft. berm max. settlement = 6 inches 3 inches in two (2) months.

A dewatering scheme will be required for the excavation for the pier footing(s).

FOUNDATION RECOMMENDATIONS

7-11042

LOCATION Hwy. 17N (Line 'D' & 'E') Crossing C.N.R.

SITE No. 36

BOREHOLE(S) No.

SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)

STRUCTURE

APPROACHES

REMARKS

502.2

0.0 - 29.5

Firm to stiff silty
clay to clayey silt,
traces of sand.
(29.5')

29.5 - 49.1

Loose to dense sand
with some silt and
gravel.
(19.6)

Probable bedrock at
elev. 453.1

Water Level: elev. 502.2

Pier(s) and Abutments:

Supported on end-bearing
piles driven to bedrock
at approximately elev. 453.
Designed for maximum
capacity of the pile section
chosen.

Stability:

Fills up to 25 feet will
be stable with 2:1
slopes. Embankment
over 25 feet will
require mid-height
berm.

Fill Ht. Berm Length

25 ft.	0
30 ft.	30 ft.
35 ft.	45 ft.

Probable Consolidation Settlement

Total settlement for
35 feet fill with 45ft.
berm is approximately
10 inches, 50% of which
will be realized in one
year.

- 1) Approach fills
should be
constructed and
left in place
for as long a
period as
possible prior
to the
construction of
the structure.
This would
minimize the
post construction
maintenance
problems.
- 2) Considerations
should be given
to using light-
weight fill at
this structure
site. This might
eliminate the
use of counter
balancing berm.

FOUNDATION RECOMMENDATIONS

701042.

LOCATION Hwy. 17N (Rev. Line 'C') Crossing Hwy. 62

SITE No. 37

BOREHOLE (S) No.

ELEVATION	SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
506.8	<p>0.0 - 28.4 Compact to very dense sand with some silt, changing to silt with some sand @ elev. 490 (28.4')</p> <p>Probable bedrock at elev. 478.4</p> <p>Waterlevel not established.</p>	<p><u>Pier(s)</u></p> <p>Supported on spread footings founded at approx. elev. 502, using allowable bearing pressure of up to 3.5 t.s.f.</p> <p><u>Abutments:</u></p> <p>i) Closed-type abutments may be founded within the granular deposit. Recommendations for the piers will be applicable here.</p> <p>ii) Perched type abutments may be supported on granular 'A' using an allowable bearing pressure of up to 2.5 t.s.f. Alternately, may be supported on end-bearing piles driven to bedrock (elev. 478±). Design for maximum capacity of pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills with 2:1 slope up to 30 ft. high will be stable.</p>	<p>If the bottom of the excavation for the pier footing(s) is below the groundwater, a dewatering scheme will be required.</p>

FOUNDATION RECOMMENDATIONS

11042

LOCATION Hwy. 17N (Rev. Line 'C') crossing Co. Rd. #15

SITE NO. 38 BOREHOLE(S) No.

SUBSOIL CONDITIONS (STRATUM THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
<p>496.4 0.0 - 86.0</p> <p>Firm to stiff silty clay to clayey silt, traces of sand (86.0')</p> <p>86.0 - 100.0 Very dense sand with some silt (14' +)</p> <p>Waterlevel: not established</p>	<p><u>Pier(s)</u></p> <p>i) supported on spread footing within the silty clay stratum at approx. elev. 491, using allowable bearing pressure of up to 1.5 t.s.f.</p> <p>ii) should higher bearing value be required, the pier(s) may be supported on end-bearing piles driven to bedrock (below elev. 396). Designed for the maximum capacity of the pile section chosen.</p> <p><u>Abutments</u></p> <p>i) perched within the approaches and supported on compacted granular 'A' using an allowable bearing pressure of 2.5 t.s.f.</p> <p>ii) supported on end bearing piles driven to bedrock as discussed for pier(s).</p>	<p><u>Stability</u></p> <p>Fills up to 22 feet with 2:1 slopes will be stable.</p> <p>Probable consolidation settlement: Maximum 11 inches 5 inches in 2 years.</p>	<p>Approach fills should be left in place for as long a period as possible prior to construction of the structure. This would minimize post-construction maintenance problems.</p>

FOUNDATION RECOMMENDATIONS

7-11042

LOCATION Hwy. 17 N (Line 'D') Crossing Indian River

SITE No. 39

DOBBINLE (S) 75.

Pier No.	SUBSOIL CONDITIONS (NOTATION - THICKNESS FT.)	STRUCTURE	APPROACHES	REMARKS
440.8	<p>0.0 - 6.5 Compact silty sand (6.5')</p> <p>6.5 - 49.0 Stiff to very stiff silty clay to clayey silt, occ. silt layers (42.5')</p> <p>49.0 - 79.0 Stiff to very stiff clayey silt to silt, occ. silty sand layers. (30.0'+)</p> <p>Water level - elev. 410.8</p>	<p><u>Pier(s) and Abutments:</u></p> <p>Supported on end-bearing piles driven to bedrock (est. elev. 350) Designed for the maximum capacity of the pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills with 2:1 slopes up to 25 feet high will be stable*</p> <p><u>Probable Consolidation Settlement:</u></p> <p>Max. Settlement: 4-6 inches 2-3 inches in 15 months</p>	<p>*Transverse only. The stability of the forward slope will depend on the geometry of existing river bank.</p>

FOUNDATION RECOMMENDATIONS

11042

LOCATION Hwy. 17 N (Line 'D') crossing Highway 41

SITE No. 40

SOREHOLE (S) No.

SUBSOIL CONDITIONS BORING DEPTH (FEET)	STRUCTURE	APPROACHES	REMARKS
<p>483.0 0.0 - 8.8 Loose to compact sand, traces of silt (8.8')</p> <p>8.8 - 25.5 Firm silty clay to clayey silt (16.7')</p> <p>Probable bedrock at elev. 457.5 Waterlevel: elev. 481.0</p>	<p><u>Pier(s) and Abutments)</u></p> <p>Supported on end-bearing piles driven to bedrock (Est. elev. 457). Designed for the maximum capacity of the pile section chosen.</p>	<p><u>Stability:</u></p> <p>Fills up to 22 feet high with 2:1 slopes will be stable.</p> <p><u>Probable Consolidation settlement.</u></p> <p>Maximum settlement: 3 inches. 1½ inches in two months.</p>	

FOUNDATION RECOMMENDATIONS

11042

LOCATION Hwy. 17N (Line 'D') crossing C.N.R.

SITE NO. 41

BOREHOLE (S) No.

SUBSOIL CONDITIONS (PERCENT THICKNESS FT.)		STRUCTURE	APPROACHES	REMARKS								
442.1	0.0 - 5.5 Dense silty fine sand (5.5) 5.5'- 27.3 Firm to stiff silty clay to clayey silt (21.8') Probable Bedrock at elev. 414.8 Waterlevel:elev. 438.1	<u>Pier(s) and Abutments</u> Supported on end-bearing piles driven to bedrock (est. elev. 415). Designed for the maximum capacity of the pile section chosen.	<u>Stability:</u> Fills up to 25 feet high with 2:1 slope will be stable. Embankments higher will require mid- height berms. <table><thead><tr><th>Fill Ht.</th><th>Berm Length</th></tr></thead><tbody><tr><td>25 ft.</td><td>0</td></tr><tr><td>30 ft.</td><td>10 ft.</td></tr><tr><td>35 ft.</td><td>25 ft.</td></tr></tbody></table> <u>Probable Consolidation Settlement</u> For 35 ft. high embankment with 25 ft. berm, total settlement is approx. 22 inches, of which 50% will take place in 6 months.	Fill Ht.	Berm Length	25 ft.	0	30 ft.	10 ft.	35 ft.	25 ft.	1) Approach fills should be constructed and left in place for as long a period as possible prior to the construction of the structure. This would minimize post- construction mainte- nance problems. 2) Consideration should be given to using light- weight fill at this structure site. This might eliminate the use of counter-balance berms and alleviate settlement problems.
Fill Ht.	Berm Length											
25 ft.	0											
30 ft.	10 ft.											
35 ft.	25 ft.											

FOUNDATIONS OFFICE

ORIGINATED BY JB

COMPILED BY PP

CHECKED BY

20
15 ϕ 5 % STRAIN AT FAILURE
10

RECORD OF SITE NO 35

FOUNDATIONS OFFICE

LOCATION Hwy. 17N (Line C) & C.N.R.

ORIGINATED BY JB

BORING DATE April 3, 1974

COMPILED BY PP

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE			SAMPLES		ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m) 20 40 60 80 100	LIQUID LIMIT — W _L PLASTIC LIMIT — W _P WATER CONTENT — W W _P — W — W _L WATER CONTENT %	BULK DENSITY γ	REMARKS
m. ELEV. DEPTH ft.	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
155.6 0.0	510.5 0.0	Ground Level							GR. SA. SI. CL.
148.6 7.0	487.5 23.0	Silty sand to sand with some silt Loose to dense	Brown Grey	1	SS	22			WL
				2	SS	33			EL: 507.6 (154.7)
				3	SS	35			
				4	SS	9			
				5	SS	12			
143.9 11.7	472.0 38.5	Clayey silt to silty clay, traces of sand grey firm to stiff		6	SS	14			0 74 (26)
				7	SS	10			0 5 65 30
				8	SS	31			
				9	SS	14			0 72 (28)
				10	SS	25			
134.2 21.4	440.4 70.1	Silty sand to sand with some silt, traces of gravel grey compact to very dense		11	SS	36			
				12	SS	83			
				13	SS	131			
				14	SS	100/5"			0 76 (24)
				15	SS	100/7"			
End of Borehole (Refusal) Probable Bedrock									

15 ϕ 5 % STRAIN AT FAILURE
20
10

ORIGINATED BY JB

COMPILED BY PP

CHECKED BY

15 ϕ 5 % STRAIN AT FAILURE

FOUNDATIONS OFFICE

ORIGINATED BY JB

COMPILED BY PP

CHECKED BY

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

FOUNDATIONS OFFICE

ORIGINATED BY JB

COMPILED BY PP

CHECKED BY

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

DESIGN SERVICES, BRANCH

FOUNDATIONS OFFICE

RECORD OF SITE NO 39

JOB 73-11042

LOCATION Hwy. #17N (line D) & Indian River

ORIGINATED BY JB

W.P. 1-67-01

BORING DATE April 9 & 10, 1974

COMPILED BY PP

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY

SOIL PROFILE			SAMPLES			ft/m ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT (0.3 m)					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT (0.3 m)		20	40	60	80	100	w_p	w	w_L		
m. 134.4 ft. 440.8	Ground Level					134.1										
0.0 0.0	Silty sand		1	SS	19	134.1										0 45 49 6
132.4 434.3 2.0 6.5	brown compact		2	SS	11	430										
			3	TW	PH	131.1										
	Clayey silt to silty clay, traces of sand		4	SS	7	420										
	(with occasional thin layers of silt)		5	SS	6	128.0										
			6	TW	PH	410										
	grey		7	SS	10	125.0										WL 410.8 (125.2)
			8	SS	9	400										
	stiff to very stiff		9	TW	PH	121.9										
119.5 391.8 14.9 49.0			10	SS	7	390										0 12 70 18
	Clayey silt to silt, with layers of silty sand		11	SS	8	118.9										0 21 63 16
			12	SS	12	380										
			13	SS	18	115.8										
110.3 361.8 24.1 79.0	End of Borehole		14	SS	27	370										
107.5 352.4 26.9 88.4	End of Cone Test					109.7										

ORIGINATED BY JB

COMPILED BY PP

COMPILED BY PP

CHECKED BY

CHECKED BY

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

FOUNDATIONS OFFICE

ORIGINATED BY JB

COMPILED BY PP

CHECKED BY

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

DESIGN SERVICES BRANCH

SITE
RECORD OF BOREHOLE NO 26

FOUNDATIONS OFFICE

JOB 73-11042

LOCATION Hwy. 17N (Lines 'B', 'C' & 'D') & Co.

ORIGINATED BY J.B.

W.P. 1-67-01

BORING DATE June 22, 1973

Rd. 19

COMPILED BY J.B.

DATUM Geodetic

BOREHOLE TYPE CME - Hollow Stem Auger

CHECKED BY S.C.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	w_p	w	w_L		
422.5	Ground Level															
0.0	Sand															
418.5			1	SS	2	420										
4.0	Silty clay to clayey silt. Some sand.		2	SS	1 1/2											
			3	TM	TM	410									101	
			4	SS	*											
			5	TM	PM	400										
397.5			6	SS	*											
25.0	(Frequent layers of silt)		7	SS	*	390										
	Soft to firm.		8	SS	*											
			9	TM	PM	380									103	
			10	SS	*											
			11	TM	PM	370									107.50	16 52 32
368.5			12	SS	*											
54.0	Silty sand. Very loose to compact.		13	SS	28	360										
360.2			14	RC	100											
62.3	Granite - sound bedrock.															
65.9	End of Borehole.															

* Sampler penetrated into the soil by the weight of hammer (140 lbs)

20
15 ϕ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

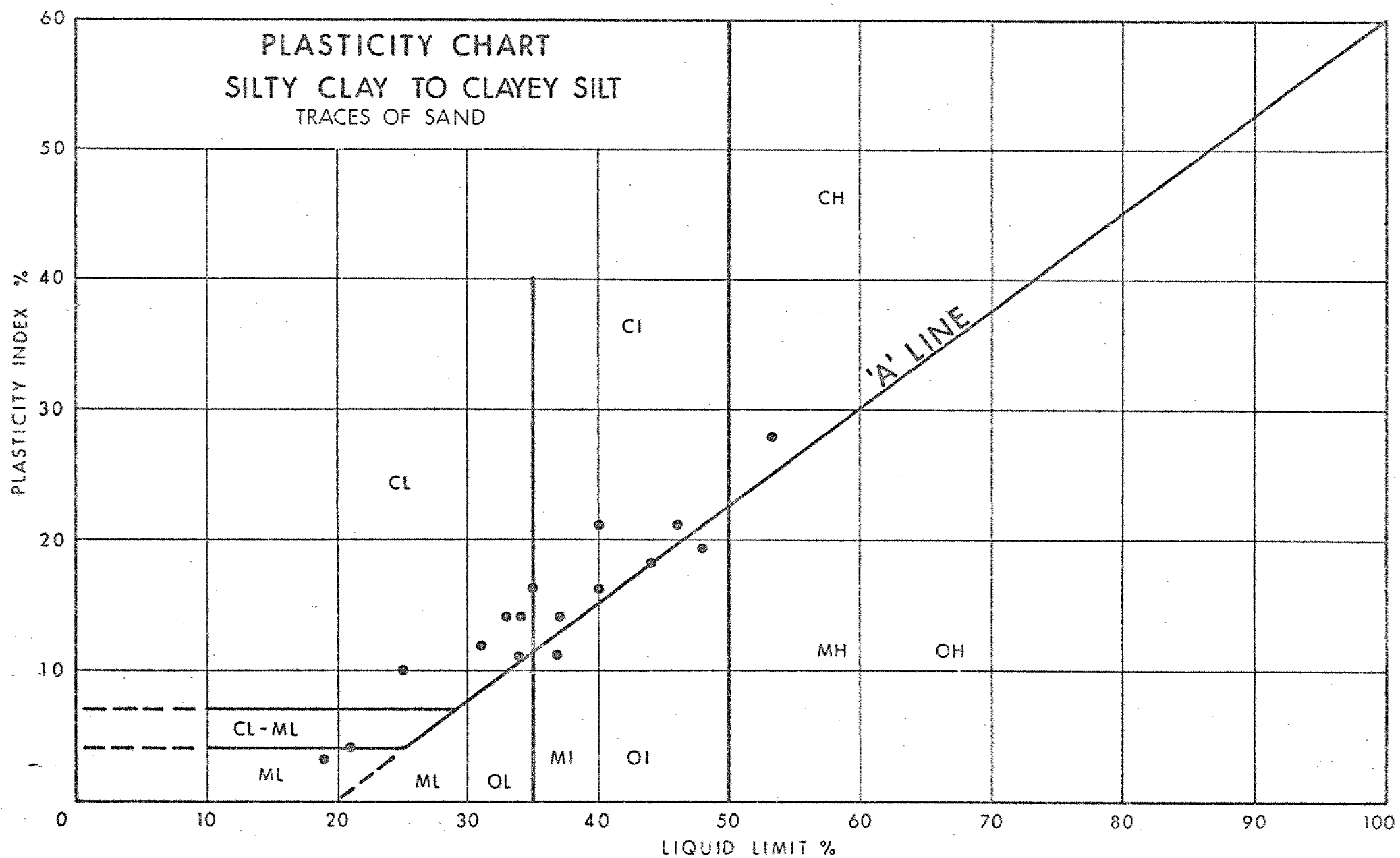


FIG. 8

W.O. 73-11042

GRAIN SIZE DISTRIBUTION

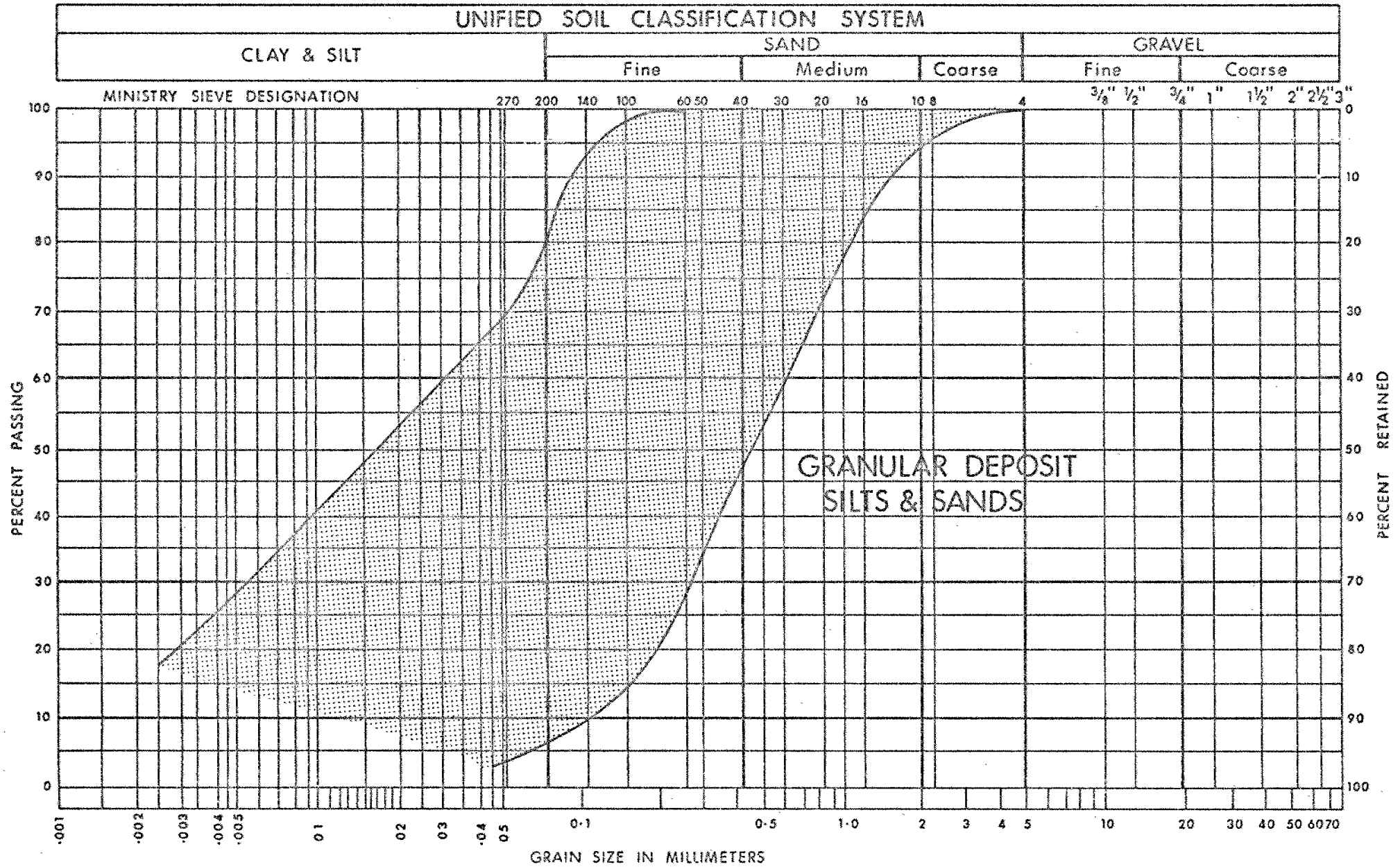


FIG. 9

W.O. 73-11042

GRAIN SIZE DISTRIBUTION

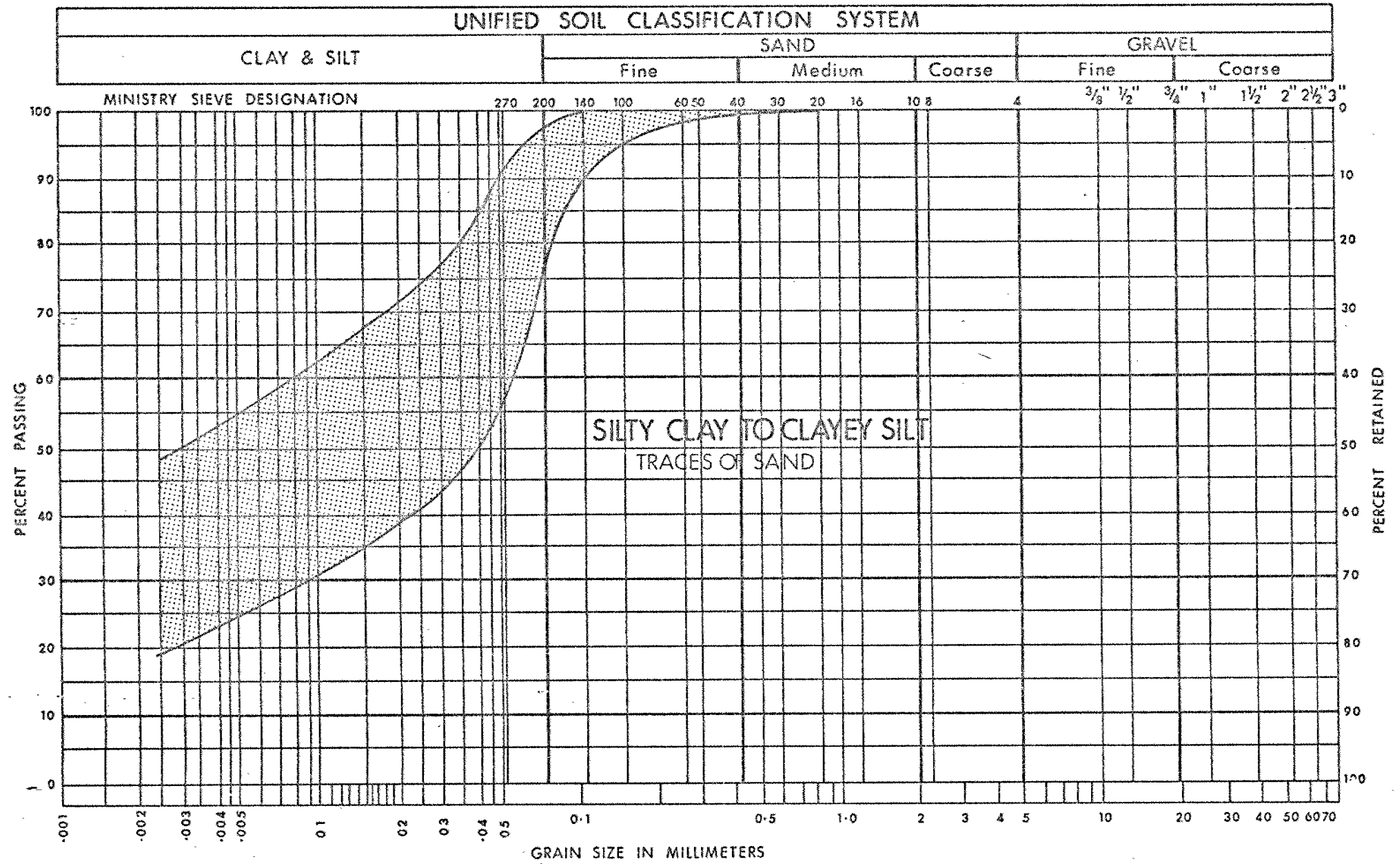


FIG. 10

VOID RATIO-PRESSURE CURVES

JOB NO. 73-11042

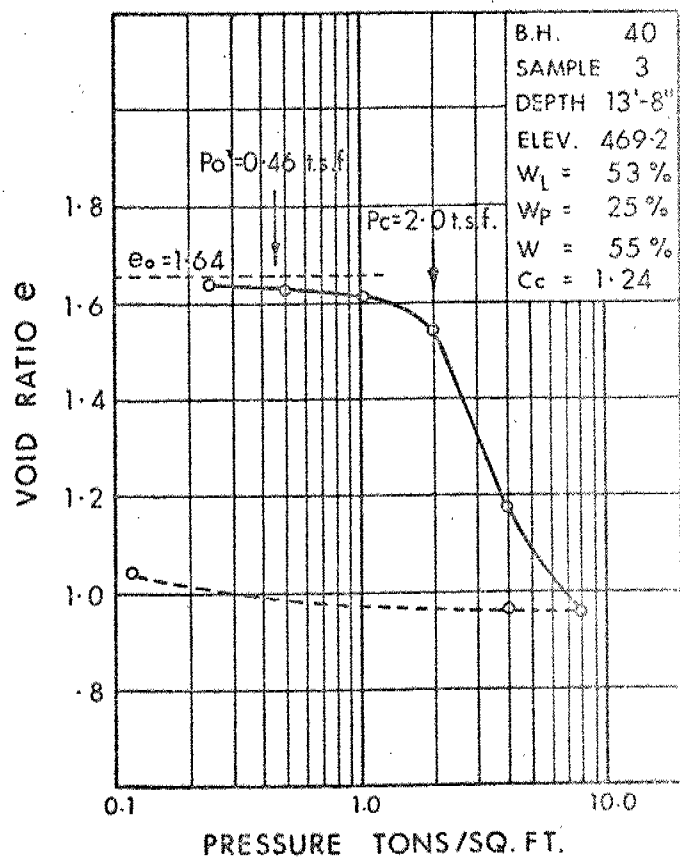
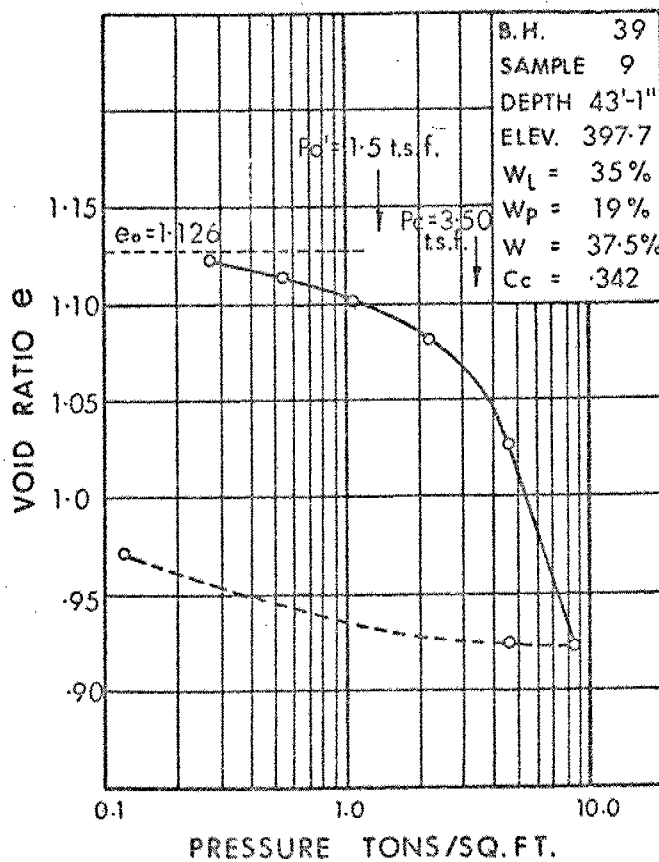
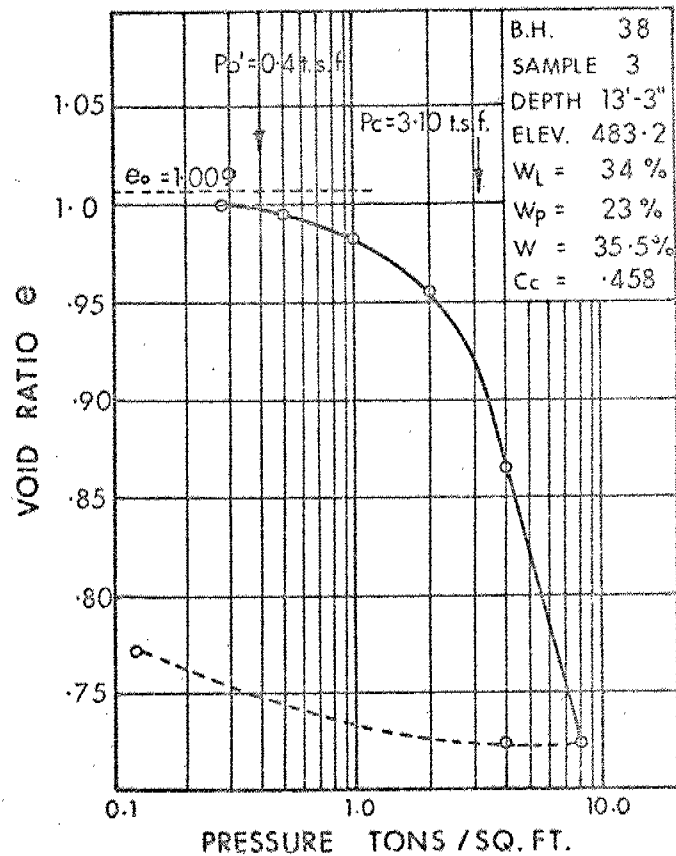
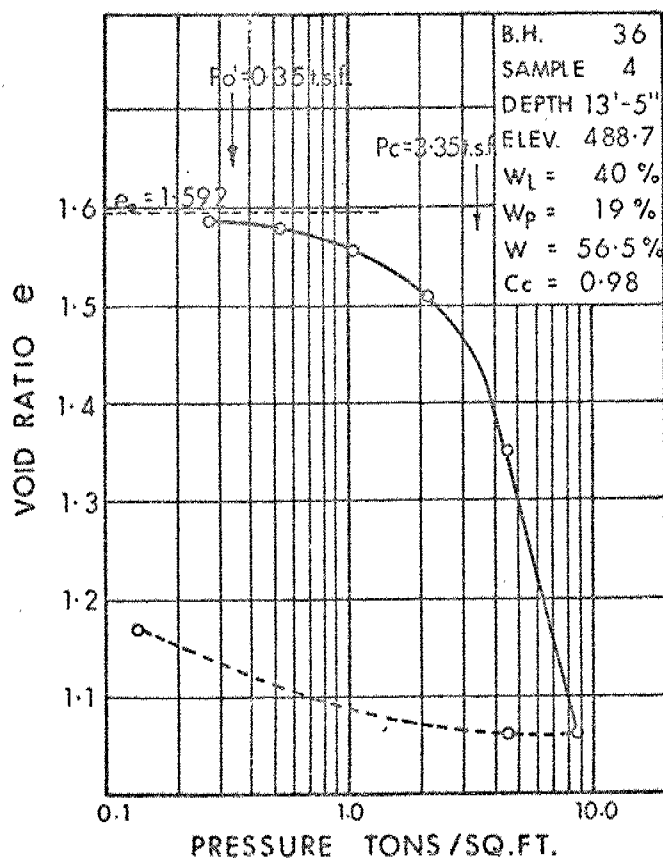


FIG. 11

OVERSIZE DRAWING

MAR 29 4 04 PM '74

CC261

OK

MX DOWN MARCH 29/74 3.31 PM VR

OTTA 4 W A STEWART D M E

KINR 3 CC T C KINGSLAND

E R SAINT

RE WP-1-67-01, WO-73-11042, DIST. 9 OTTAWA HWY. 17N.

THIS IS TO ADVISE THAT THE FIELD INVESTIGATION WORK FOR THE
ABOVE MENTIONED PROJECT WILL COMMENCE ON APRIL 1/74 UNDER
THE SUPERVISION OF MR J T BANGS PROJECT ENGR.
THE ESTIMATED DURATION OF THE FIELD WORK WILL BE 5 DAYS.
M DEVATA SOIL MECHANICS WEST BLDG



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MEMORANDUM

M.D.
File Please
P

TO: Mr. T. C. Kingsland
Regional Structural Planning Engineer
KINGSTON, Ontario

FROM: Systems Design Office
KINGSTON, Ontario

ATTENTION:

DATE: May 9th, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 1-67-00 - Highway 17N - Pembroke
By-Pass - District #9, Ottawa

73-11-042

As discussed with you this morning, would you please advise the Foundations Office that a request for Preliminary Foundations Investigations for about 30 sites will be forthcoming shortly.

H. Eimers

H. Eimers
Design Group Engineer

HE/dal

c.c. - E. Saint

Copy made for: (TCK: 10/5/73)

✓ A. G. Stermac - Att. M. Devata

10/5/73
BRIDGE
C C



73-11042

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 4 June 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 1-67-01 - Pembroke By-pass
Highway 17N, District 9 - Ottawa

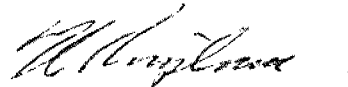
With reference to previous discussions regarding the above-mentioned project, please find enclosed 2 copies of a 1000' : 1" photo mosaic with locations for proposed preliminary foundation investigations marked in green. We shall be glad if you will arrange to carry out these investigations at your earliest convenience.

You will note that we have outlined in green an area in the vicinity of the Indian River crossings where past slump activity may require your particular attention.

The locations of previous preliminary investigations carried out by you in the area are marked in blue on the mosaic. The relevant Foundation Investigation Reports are numbered W.P. 71-11056 dated January 17, 1973, and W.O. 71-11048 dated September 28, 1971.

Regional Property Section have been asked to obtain the required property clearances and they are putting this work in hand forthwith.

Engineering Surveys Section will be available when required to take out bore holes. There would appear to be sufficient of the proposed bore hole sites located within rights-of-way (Township Roads, etc.) to enable you to commence work without waiting for the private property clearances.



T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.

c. c. P. D. Billings
J. Percy
A. E. Lodge
A. G. Boucher
E. Saint
L. G. Timson
R. Forrest
H. Chyc
C. S. Grebski

73-11042

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 4 June 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 1-67-01 - Pembroke By-pass
Highway 17N, District 9 - Ottawa

With reference to previous discussions regarding the above-mentioned project, please find enclosed 2 copies of a 1000' : 1" photo mosaic with locations for proposed preliminary foundation investigations marked in green. We shall be glad if you will arrange to carry out these investigations at your earliest convenience.

You will note that we have outlined in green an area in the vicinity of the Indian River crossings where past slump activity may require your particular attention.

The locations of previous preliminary investigations carried out by you in the area are marked in blue on the mosaic. The relevant Foundation Investigation Reports are numbered W.P. 71-11056 dated January 17, 1973, and W.O. 71-11048 dated September 28, 1971.

Regional Property Section have been asked to obtain the required property clearances and they are putting this work in hand forthwith.

Engineering Surveys Section will be available when required to take out bore holes. There would appear to be sufficient of the proposed bore hole sites located within rights-of-way (Township Roads, etc.) to enable you to commence work without waiting for the private property clearances.



T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl
encls.

c.c. P. D. Billings
J. Percy
A. E. Lodge
A. G. Boucher
E. Saint
L. G. Timson
R. Forrest
H. Chyc
C. S. Grebski



MEMORANDUM

TO: Mr. A. E. Lodge,
Right-of-Way Manager,
Kingston, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. R. Kilpatrick

DATE: 4 June 1973.

OUR FILE REF.

IN REPLY TO

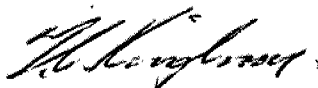
SUBJECT: W.P. 1-67-01 - Pembroke By-pass
Highway 17N, District 9 - Ottawa

As agreed at the meeting held on May 31st to review the above-mentioned project, I now request you to obtain property clearances for the purposes of preliminary survey, soil sampling, and foundation investigations for this project.

In particular, the foundation investigations are expected to commence on Monday, June 11th, so that entry to properties for this purpose and for Engineering Surveys Section to locate the bore holes is our first priority.

A 1000': 1" photo mosaic is enclosed showing marked in green the proposed bore hole locations. A larger area bounded in green in the vicinity of the possible Indian River crossings marks an area within which further bore holes may be required. Bore holes already carried out are marked in blue on the mosaic.

When property clearances at the above locations have been obtained for the purposes of foundation investigations, I shall be glad if you will notify the Principal Foundation Engineer, Mr. A. G. Stermac, Foundations Office, West Building, Downsview, with a copy to me. From the date of notifying Mr. Stermac and myself that entry may be made into a particular property, I shall be glad if any further change in status with regard to entry permission can also be notified to Mr. Stermac, with copies of correspondence to this office.

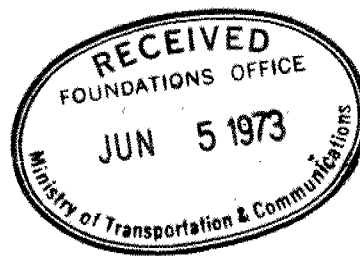


T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl

encl.

c . c. P. D. Billings
 ✓ A. G. Stermac
 A. G. Boucher
 E. R. Saint
 L. G. Timson
 R. Forrest
 A. J. Percy
 H. Chyc
 C. S. Grebski



Design Services Branch,
1201 Wilson Avenue,
Downsview, Ontario.
M3M 1J8

June 12, 1973.

Telephone: 248-3282.

Master Soil Investigation Ltd.,
104 Kenhar Drive,
Weston, Ontario.
M9L 1W4

Dear Sirs:

This letter confirms our request of June 7, 1973,
for the supply of a C.M.E. 45 together with all necessary
equipment, as specified under the terms of our Contract
Agreement, at Pembroke, Ontario, on June 12, 1973.

Mobilization will be from Ottawa.

Our Project Number is M.O. 73-11042. ✓

Yours truly,

ND/ao

c.c. W. W. Fry
(Attn: Mrs. J. McLaren)

Foundations Files
Documents

For:

M. Devata
M. Devata,
Supervising Foundations Eng.,
A. G. Stermac,
Principal Foundations Eng.

Design Services Branch,
1261 Wilson Avenue,
Downsview, Ontario.
M3M 1J8

June 12, 1973.

Telephone: 248-3282.

F. E. Johnston Drilling Co. Ltd.,
P.O. Box 4134,
Postal Station 'E',
Ottawa, Ontario.
K1S 5B2

Dear Sirs:

This letter confirms our request of June 6, 1973,
for the supply of a diamond drill and C.M.E. 45 together
with all necessary equipment, as specified under the terms
of our Contract Agreement, at Pembroke, Ontario, on June 12,
1973.

Mobilization will be from Ottawa.

Our Project Number is W.O. 73-11042. ✓

Yours truly,

M. Davata

M. Davata,
Supervising Foundations Eng.,
For: A. G. Stermac,
Principal Foundations Eng.

MD/ao

C.C. W. W. Fry
(Attn: Mrs. J. McLaren)

Foundations Files
Documents

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundations Engineer,
Downsview, Ontario.

FROM: Structural Planning Office,
Kingston, Ontario.

ATTENTION: Mr. M. Devata

DATE: 20 September 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 1-67-01, Highway 17N,
Pembroke Bypass,
District 9 - Ottawa

With reference to the recent preliminary foundation investigation which you had carried out for us at the above location (your reference W.O. 73-11042), it was difficult at the time of the investigation to obtain a borehole at Site 30 because of the swampy ground conditions. However, after studying the preliminary borehole results, it would seem to be important to obtain information, if not at Site 30, at least somewhere along Line 'B' within a reasonable distance of the site.

As discussed with Mr. Devata this afternoon, we should therefore be glad if you would arrange to obtain the additional information required in this area. There would appear to be a road allowance running in an east/west direction approximately 1000 ft. north of Site 30 which may be suitable for entry. We will try to obtain more information about possible means of entry.



T. C. Kingsland
Regional Structural Planning Engineer

TCK/hl

c.c. A. J. Percy - Att. H. McIntyre
E. R. Saint
C. S. Grebski - Att. K. Bassi





Ontario

ACTION REQUEST

7540-1037 (2-72)

DATE

Sept 19

TO

M Devata

FROM

George Duncan

TELEPHONE NO.

923-6641

☐ - PLEASE CALL

☐ - WISHES
APPOINTMENT

☐ - RETURNED
YOUR CALL

☐ - WILL
CALL BACK

☐ - NOTE AND
FILE

☐ - PROVIDE
MORE DETAILS

☐ - PLEASE
ANSWER

☐ - NOTE AND
FORWARD

☐ - FOR YOUR
INFORMATION

☐ - DRAFT REPLY FOR
MY SIGNATURE

☐ - NOTE AND
RETURN

☐ - FOR YOUR
APPROVAL

☐ - INVESTIGATE AND
REPORT

☐ - NOTE AND
SEE ME

☐ - FOR YOUR
SIGNATURE

☐ - TAKE APPRO-
PRIATE ACTION

☐ - RETURN
WITH COMMENTS

☐ - PER YOUR
REQUEST

☐ - _____

COMMENTS:

CALL TAKEN BY:

TIME

1:00 pm

Bob Lingwood
(Mutual Resources)
(M. Dwata)

Brain Training
Senior Planning
Brain Workshop

Trumb

9:44 A.M.
Rudue Street
2nd Floor
p.m.

Fisher Ave
Entry 16
at 2:30 p.m.
244

Munity.

Reservation at

Butler Motel

Montreal Rd.

Ottawa

Take Russel Rd - then left
to Ridge Rd (Hydro sub station)
Follow Ridge Rd to 1st side
Rd to left. Baseline.

Ministry of Treasury
Economics and
Intergovernmental
Affairs
TEL: 965-6404

Queen's Park
Toronto Ontario

September 21, 1973.

MEMO TO: All agencies attending.

FROM: B.H. Manning,
Senior Planner,
Subdivisions Section,
Plans Administration Branch.

RE: Meeting September 26, 1973
O.H.C. Proposal (06T-20769)
Nepean Township, Lot 31, Etc.,
Con. A & B, R.F.,

Mr. McGregor of the Ontario Housing Corporation, and Mr. Lingwood of Natural Resources, have requested our Ministry to arrange a meeting concerning the above subdivision proposal.

The Ontario Housing Corporation wants verification that, if certain work is done, permission will be forthcoming from all agencies involved. Mr. McGregor wanted a meeting, rather than more correspondence, since Ontario Housing Corporation is anxious to get this problem resolved for only then can they determine whether it is worthwhile proceeding further.

Arrangements

Attending:

Ontario Housing Corporation (Mr. McGregor)
Ministry of Treasury, Economics and Intergovernmental
Affairs (Mr. Manning, Mr. Williamson, plus
regional representative)
Ministry of Transportation and Communications
(Mr. Devata)
Ministry of Natural Resources (Mr. Lingwood)
National Capital Commission (to be named)
Rideau Canal (to be named) *Mr. Lortie*
Golder and Associates (Mr. Hefferman)
J.R. Richards & Associates (to be named)

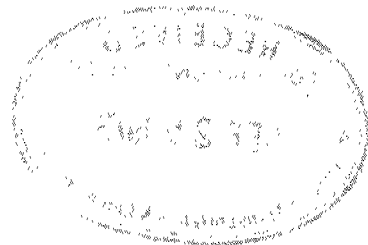
To all agencies attending -2-

September 21, 1973.

Time and Locations: 2:30 pm Wednesday, September 26, 1973
Junction Fisher Ave., Highway 16 for
on site visit

3:30 pm Regional Office of Treasury,
Economics and Intergovernmental Affairs
for further discussion.

BJ Manning



Design Services Branch,
1201 Wilson Avenue,
Downsview, Ontario.
M3M 1J8

Telephone: 248-3282.

October 17, 1973.

Master Soil Investigation Ltd.,
104 Kenhar Drive,
Weston, Ontario.
M9L 1N4

Dear Sirs:

This letter confirms our request of October 12, 1973,
for the supply of a "Mini" Boring Rig together with all
necessary equipment, as specified under the terms of our
Contract Agreement, at Pembroke, on October 22, 1973.

Mobilization will be from Ottawa, Ontario.

Our Project Number is W.O. 73-11042. ✓

Yours truly,

ORIGINAL SIGNED BY
A. G. STERMAC

MD/ao

c.c. W. W. Fry
(Attn: Mrs. M. Porter)

Foundations Files
Documents

A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

SELECTION OF BORING CONTRACTORW.O. 73-11042W.P. § 1-67-01

('Mini' Boring Rig)

- 1) Type of Drill Required Special portable Drill which can auger and obtain samples
- 2) Starting Date 22nd Oct/73
- 3) Estimated Total Footage of Drilling Required 60 ft

- 4) Qualified Drilling Companies and
Estimated Costs Including
Mobilization

1	<u>Master Soils</u>	<u>The only company has that</u>
2	_____	<u>equipment (\$690)</u>
3	_____	_____
4	_____	_____
5	_____	_____
6	_____	_____
7	_____	_____

Mobilization Ottawa to Pembroke and return
 $200 \times 0.75 = 150.00$
 $20 \text{ hrs} \times 24.50 = 490.00$
640.00

- 5) Lowest Cost Company Able to
Supply Equipment on Required
Starting Date

Master Soils

- 6) Additional Information No other company with portable mobile equipment
except Master Soils. In addition this equipment proved
very satisfactory for 60 transit foundation projects at Port Credit
Ref N.O.

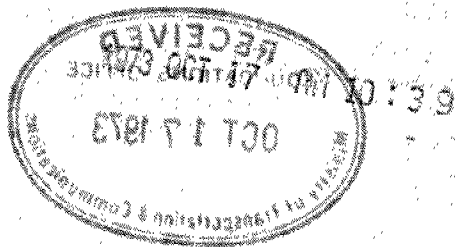
Date 12th Oct/73

Signed

M. Devada
 Supervising Foundation Engineer

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OK

MX DOWN OCT 17/73 9:58A VR

OTIA 2 - W A STUART - DIST MTCE ENGR

COPIES TO : KINR 1 - T C KINGSLAND - REGN'L STRUCT PLANNING ENGR
- R SAINT - REGN'L MTL'S ENGR

RE : W.P.1-67-01, W.O.73-11042 DISTRICT NO.9 OTTAWA, HWY 17.

THIS IS TO ADVISE THAT THE FIELD INVESTIGATION WORK FOR THE ABOVE
MENTIONED PROJECT WILL COMMENCE ON OCTOBER 22, 1973 UNDER THE
SUPERVISION OF MR. JIM BANGS, PROJECT FOUNDATIONS ENGINEER.

THE ESTIMATED DURATION OF THE FIELD WORK WILL BE 2 1/2 DAYS.

P PAYER - SR FOUNDATIONS ENGR, FOUNDATIONS OFFC.

HCA

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1013 OCT 23 PM 3:27

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KINR DOWN 5 OCT 23/73 3.02 PM VR

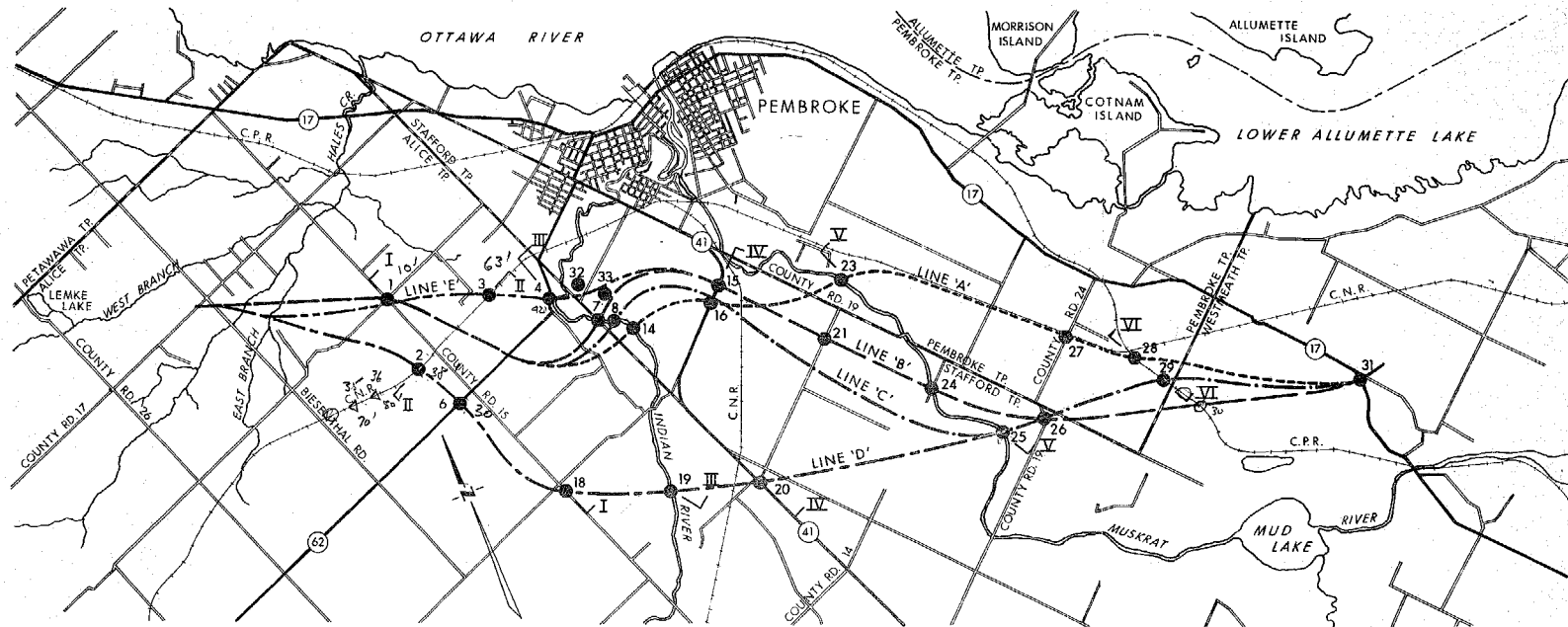
E R SAINT REG MATLS ENGR

ATT A BATTEN

RE LOCATION OF BORE HOLE NO. 29 W.O.73-11042, WP-1-67-01
RECENTLY WE HAVE RE-ESTABLISHED THE LOCATION OF BORE HOLE
NO. 29 AT THE ABOVE MENTIONED LOCATION AND CONFIRM OUR
ORIGINAL FINDINGS AND ALSO THE LOCATION,.

P PAYER SR FOUNDATIONS ENGR

ROB

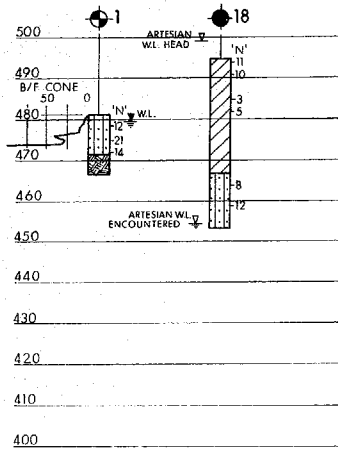


PLAN



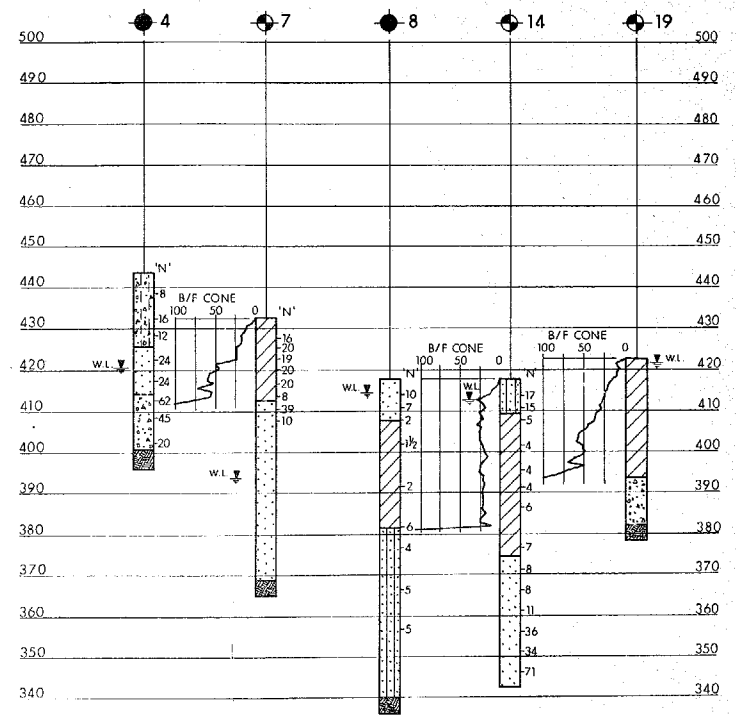
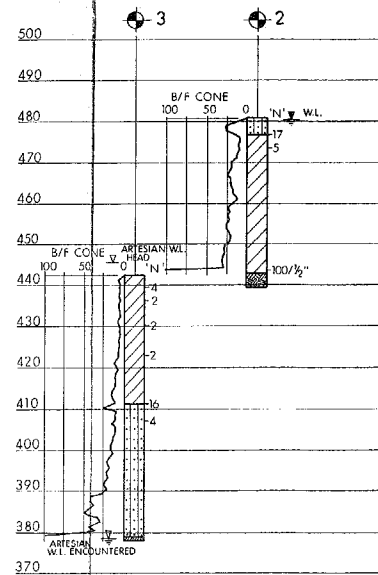
● SITE LOCATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS DESIGN SERVICES BRANCH FOUNDATIONS OFFICE	PRELIMINARY INVESTIGATION HWY. 17N - PEMBROKE BY-PASS
DATE AUGUST 24, 1973	W.P. NO. 1-67- pro 1 DRAWING NO. 73-H042

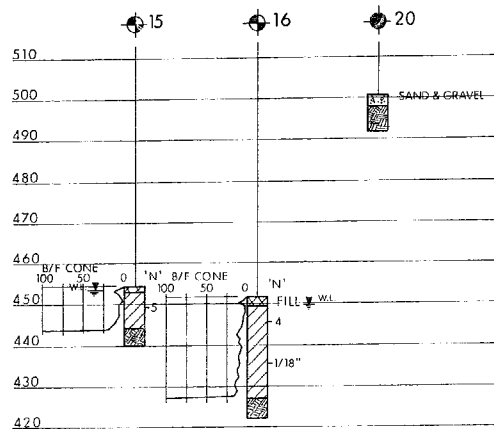


LEGEND

- GLACIAL TILL
HET. MIXTURE OF GRAVEL, SAND
SILT & CLAY
Loose to Comp.
- SILTY CLAY TO CLAYEY SILT
SOME SAND, TRACE OF GRAVEL
Firm to V. Stiff
- SANDY SILT TO SILTY SAND
TRACE OF GRAVEL & CLAY
Loose to V. Dense
- SAND & GRAVEL
Comp. to V. Dense
- GRANITE BEDROCK Sound



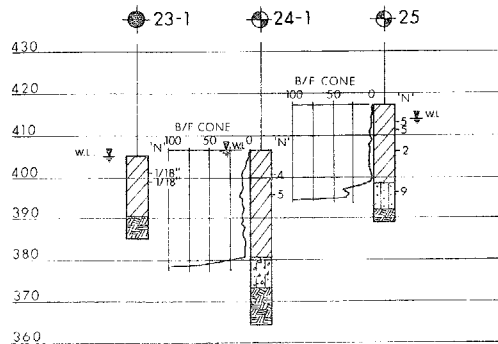
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS DESIGN SERVICES BRANCH FOUNDATIONS OFFICE		PRELIMINARY INVESTIGATION HWY. 17N - PEMBROKE BY-PASS	
DATE	SEPT. 18, 1973.	W.P. NO.	1-67-0201
		DRAWING NO. 73-11042B	



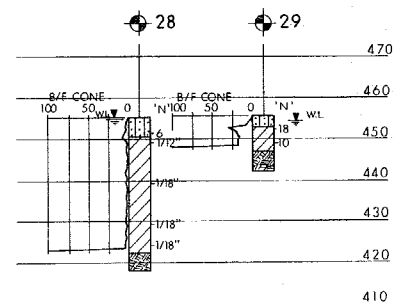
SECTION IV
LINE 'A', 'B' & 'D' CROSSING HWY. 41

LEGEND

- GLACIAL TILL
HET MIXTURE OF CLAYEY SILT
SAND & GRAVEL, OCC. BOULDERS
- SILTY CLAY TO CLAYEY SILT
SOME SAND, TRACE OF GRAVEL
Firm to V. stiff
- SANDY SILT &/or SILTY SAND
SOME GRAVEL
Loose
- GRANITE BEDROCK Sound



SECTION V
LINE 'A', 'B' & 'D' CROSSING MUSKRAT RIVER



SECTION VI
LINE 'A' & 'D' CROSSING C.P.R.

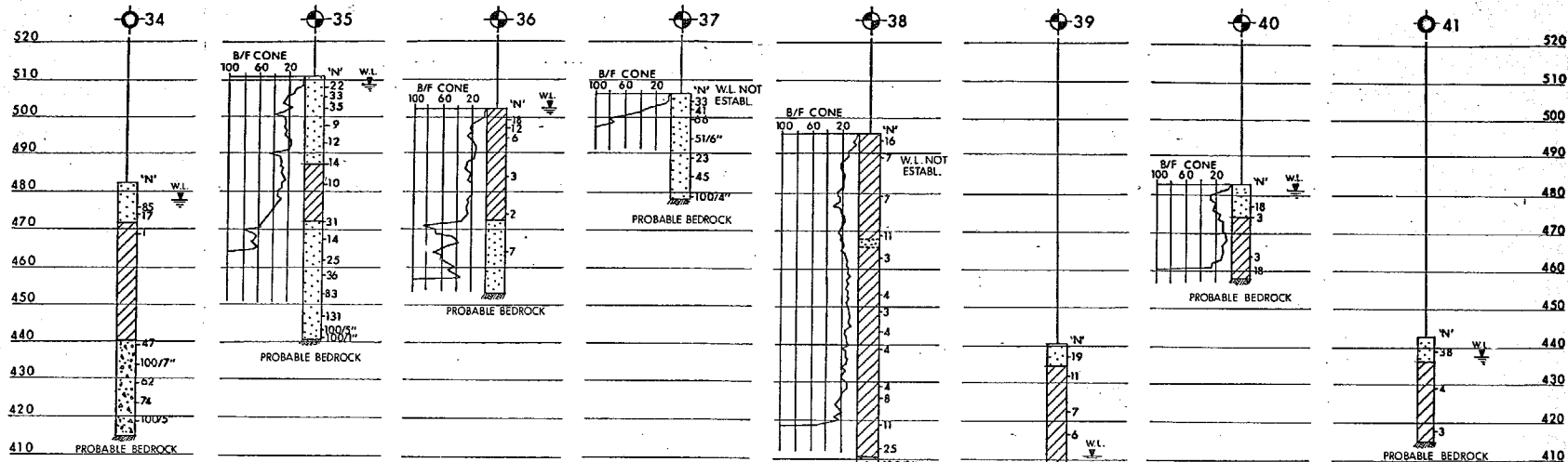
MINISTRY
OF
TRANSPORTATION AND COMMUNICATIONS
DESIGN SERVICES BRANCH
FOUNDATIONS OFFICE

DATE SEPT 19, 1973

PRELIMINARY INVESTIGATION
HWY. 17N - PEMBROKE BY-PASS

W.P. NO 1-67-0201

DRAWING NO. 73-11042 C



SITE 34
REV. LINE 'B' 'C' 'D' & 'E'
CROSSING HALES CR.

SITE 35
REV. LINE 'C' CROSSING
C.N.R.




SITE 36
REV. LINE 'E' & 'D'
CROSSING C.N.R.

SITE 37
REV. LINE 'C'
CROSSING HWY. 62

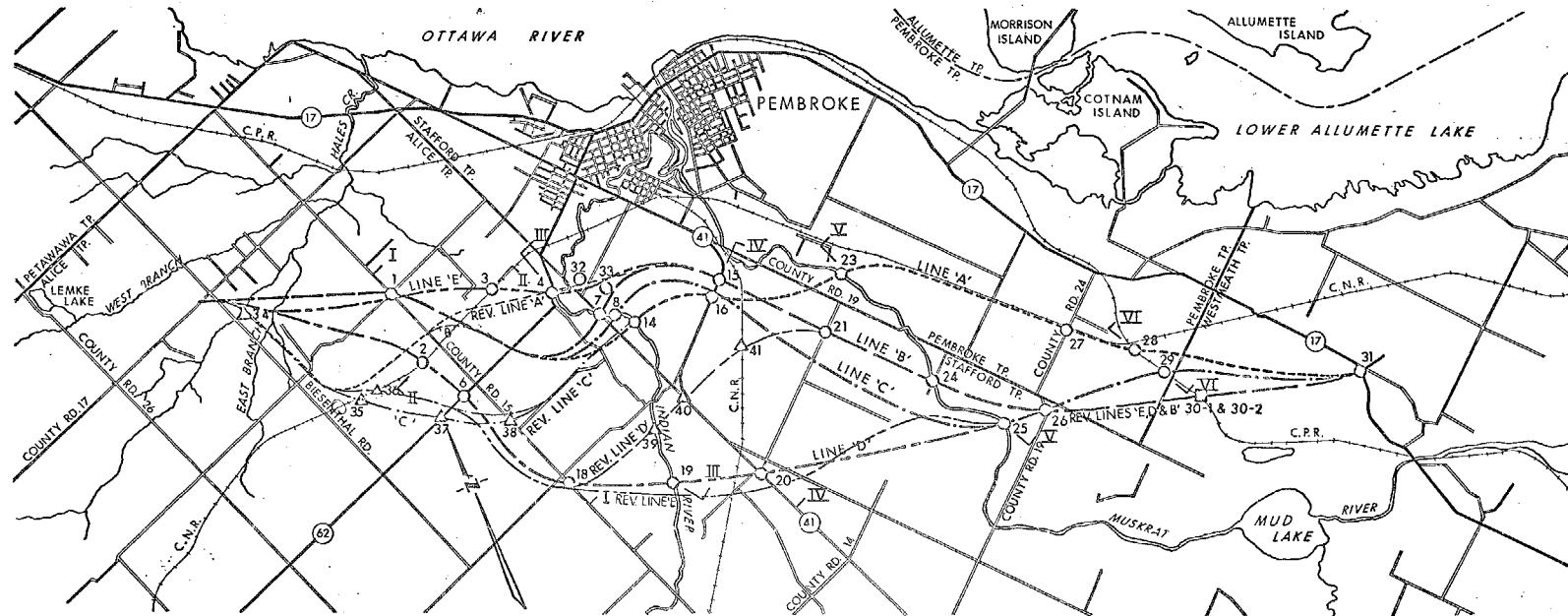
SITE 38
REV. LINE 'C'
CROSSING CO. RD. 15

SITE 40
REV. LINE 'D'
CROSSING HWY. 41

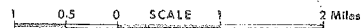
SITE 41
REV. LINE 'D'
CROSSING C.N.R.

-  **SILTY SAND TO SAND**
Loose to V. Dense
-  **SILTY CLAY TO CLAYEY SILT**
TRACES OF SAND
Firm to V. Stiff
-  **SAND & GRAVEL**
SOME SILT
Dense to V. Dense

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS		PRELIMINARY INVESTIGATION	
ENGINEERING SERVICES BRANCH		HWY. 17N - PEMBROKE BY-PASS	
SOIL MECHANICS SECTION			
DATE MAY 27, 1974	WP. NO. 1-67-01	DRAWING NO. 73-11042 E	

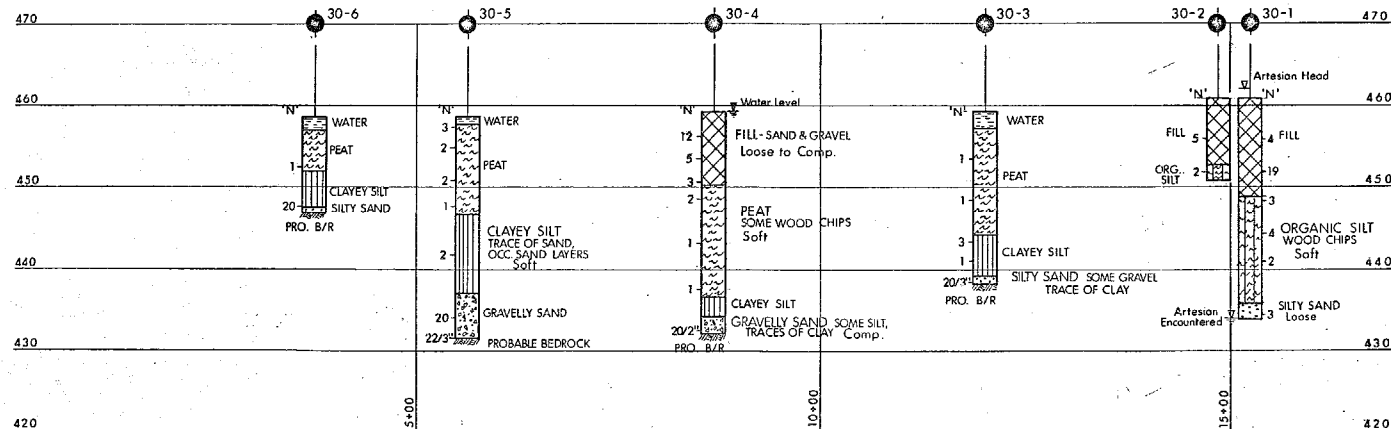
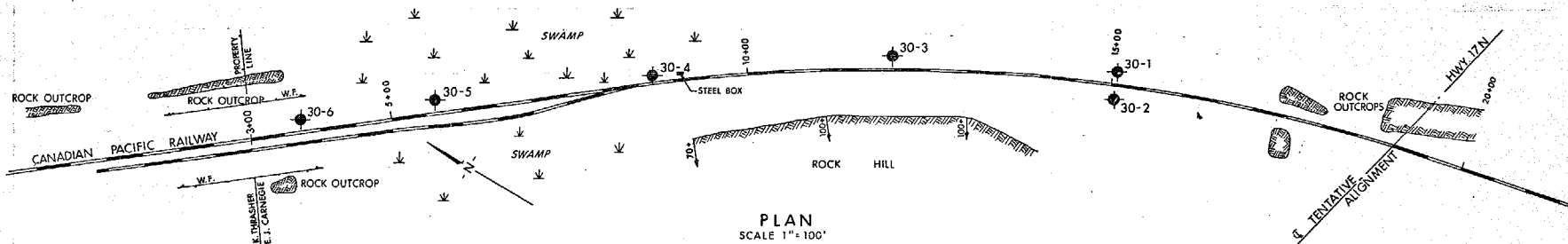


PLAN



- SITE LOCATION JUNE 1973
- SITE LOCATION OCT. 1973
- △ SITE LOCATION APR. 1974

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS DESIGN SERVICES BRANCH FOUNDATIONS OFFICE	PRELIMINARY INVESTIGATION HWY. 17N - PEMBROKE BY-PASS	
	DATE AUGUST 24, 1973	W.P. NO. 1-67-01 DRAWING NO. 73-11042 A



B.H. NO.	ELEV.	STA.	OFFSET
30-1	460.8	15+0.8	15' Lt. of north rail
30-2	460.8	15+0.8	19' Rt. " "
30-3	459.2	12+0.0	15.5' Lt. " "
30-4	459.2	8+7.1	9' " " "
30-5	458.8	5+6.5	14' " " "
30-6	458.8	3+7.3	13.5' " " "

NOTE
B.H.'S 30-1 & 30-2 DONE IN OCT. 1973
B.H.'S 30-3 TO 30-6 DONE IN NOV. & DEC. 1974

BORE HOLES ALONG C.P.R.

SCALE
VERT. 1" = 10'
HORIZ. 1" = 100'

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ENGINEERING
SERVICES BRANCH
SOIL MECHANICS SECTION

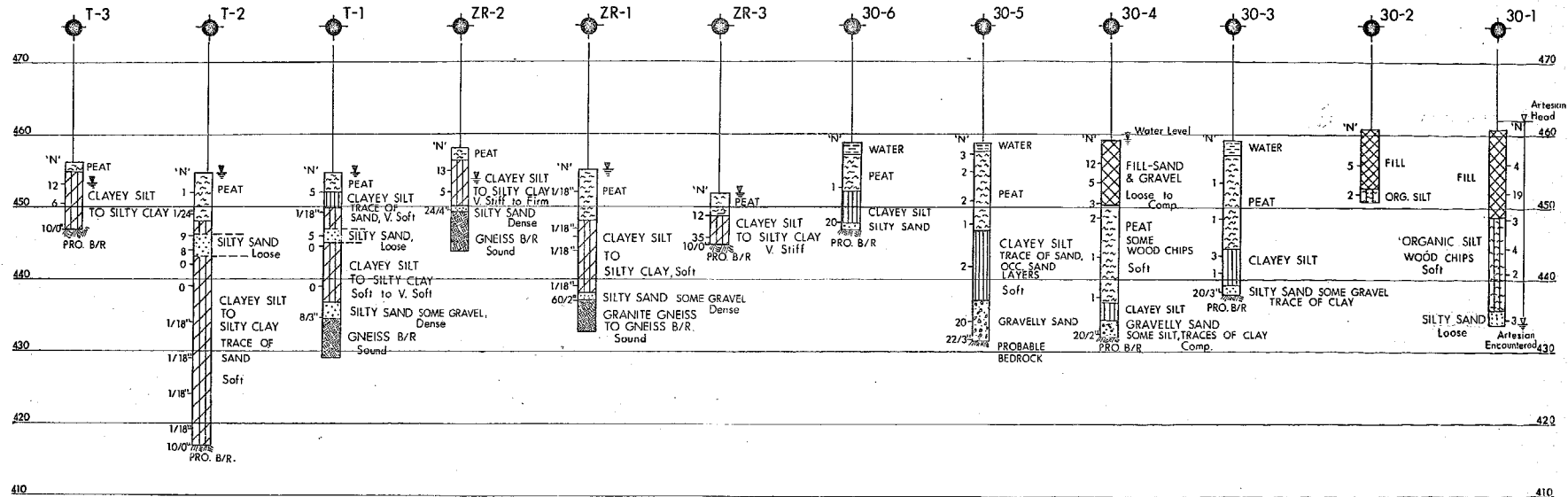
PRELIMINARY INVESTIGATION
HWY. 17N & C.P.R. OVERHEAD STRUCTURE
(PEMBROKE BYPASS)

DIST. 9

DATE 30 DEC. 1974

W.P. NO. 1-67-01

DRAWING NO. 73-11042 E



BORE HOLES
SCALE 1" = 10'

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ENGINEERING
SERVICES BRANCH
SOIL MECHANICS SECTION

PRELIMINARY INVESTIGATION
HWY. 17N & C.P.R. OVERHEAD STRUCTURE
(PEMBROKE BYPASS)

DATE 15 AUG, 1975

W.P. NO. 1-67-01

DRAWING NO. 73-11042G