30M11-99

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. E. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

From: Foundation Section,
Materials and Testing Office,
Room 107, Lab. Bldg.

Attention: Mr. S. McCombie

Date: June 5, 1970

Our File Ref.

In reply to JUN 18 1970

Subject:

FOUNDATION INVESTIGATION REPORT
For
Proposed Storm Sewer
Lakeshore Boulevard
Q.E.W. Reconstruction Scheme
Borough of Etobicoke - Metro. Toronto
District No. 6 (Toronto)
M.O. 70-11020 -- W.P. 314-65-01

Attached, we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above project.

We believe that the factual data and recommendations contained therein, will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

A. G. Sterman
PRINCIPAL FOUNDATION ENGINEER

AGS/MdeF
Attach.
cc: Messrs. E. R. Davis
H. A. Tregaskes
D. W. Farren
G. K. Hunter (2)
H. Greenland
W. S. Melnyshyn (2)
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Foundations Files
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1. INTRODUCTION:

In connection with the proposed reconstruction of the Q.E.W. complex, in the southern portion of the Township of Etobicoke, Metropolitan Toronto, it is proposed to construct an outfall storm sewer. The sewer, which will run from the Humber River westerly to a point past the existing Lakeshore Ramps Structure, will be located along the south side of Lakeshore Blvd. The Foundation Section was requested verbally, by Mr. W. S. Melinyshyn, Regional Bridge Planning Engineer, Central Region, to carry out a subsurface investigation along the proposed sewer alignment. An investigation was subsequently carried out by this Section to determine the subsoil, bedrock and groundwater conditions.

This report contains all the factual data obtained in this area, together with recommendations pertaining to the excavation for and installation of the outfall storm sewer.

Foundation reports have already been submitted for the structures, as well as the related retaining walls to be constructed in this area. (Reports No. W.J. 69-P-76, 77, 78 and 120).

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2. DESCRIPTION OF THE SITE AND GEOLOGY:

The area under investigation lies along Lakeshore Blvd., south of the Q.E.W. in the Borough of Etobicoke, Metropolitan Toronto: specifically from the Humber River westerly approximately 3,000 feet.

In the area, Lakeshore Blvd., is a four-lane paved roadway. The terrain in the vicinity is gently undulating in relief between elevations 258 and 283. In the eastern section, however, the surficial mantle has been stripped; often fill has been placed in order to level and grade this area.

Physiographically this area is situated in the Iroquois Plain, specifically in the Toronto sub-section. The predominant overburden deposit is composed of a clayey silt stratum some 7 to 22 ft. thick; this deposit is of Pre-Iroquoian age. The cohesive stratum is periodically underlain by a thin basal glacial till deposit. The overburden is underlain by shale bedrock of the Meaford-Dundas formation, Ordovician Period. Based on geological information, it is known that the surface of the bedrock varies from about elevation 260, in the western portion of the area under investigation, to as low as elevation 175 at the Humber River - i.e. decreases in an easterly direction.

3. FIELD AND LABORATORY WORK:

Eighteen sampled boreholes were put down in close proximity to the proposed storm sewer during the course of the most recent investigation. Eight of the borings were put down through the travelled surface of the Lakeshore Blvd. The remaining borings were accompanied by a dynamic cone penetration test.

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These operations were performed using a Penndrill employing power auger techniques.

Samples were obtained at required depths by means of a 2" O.D. split spoon sampler, which was hammered into the soil in accordance with the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests. Wherever possible, 2" I.D. Shelby tube samples were taken, in the cohesive portions of the overburden; the tubes were either pushed manually or hydraulically into the soil. In addition in situ field vane tests were carried out within the softer, more compressible portions of this stratum. The surface of the bedrock was inferred to be at the point where the augers met practical refusal.

The groundwater levels, in the open borings, were measured and recorded daily during the period of the investigation.

Borelog sheets for the borings are contained in this report. The location and elevation of all the borings were surveyed by personnel from The Foundation Engineering Company, Ltd., (FENCO). The aforementioned borings are shown in plan on Drawing No. W.J. 70-110204. An estimated stratigraphical section, along the proposed centre-line of the sewer, is shown on the drawing as well, All elevations given in this report are referenced to a Geodetic datum.

All samples were subjected to visual examination, both in the field and subsequently in the laboratory. Following the visual examination laboratory testing was carried out on selected representative samples to determine the following engineering

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properties:

Atterberg limits

Natural Moisture contents

Bulk densities

Undrained Shear strengths

Grain size distributions

The results of this testing are plotted on the Record of Borelog sheets; in addition they are summarized on Figures #1 to 4, inclusive, all contained in Appendix I of this report.

4. SUBSOIL AND BEDROCK CONDITIONS:

4.1) General:

The predominant subsoil stratum across the site is composed of a firm to hard clayey silt with traces of sand and occasional seams of silt. The thickness of this deposit ranges from 7 to 22 ft. Over the majority of the area under investigation the cohesive stratum is overlain by fill material which ranges from 4 ft. to 16 ft. in thickness. Underlying the cohesive clayey silt stratum is shale bedrock. In certain locations a thin layer of glacial till was sandwiched between the cohesive strata and underlying bedrock.

The general pattern is, however, quite different in the vicinity of the Humber River valley. Here a deposit of loose to compact silty sand with occasional seams of clay and organics was encountered beneath about 7 feet of fill. The silty sand deposit directly overlies shale bedrock.

The boundaries of the various deposits are shown on the accompanying borelog sheets. The stratigraphical section along

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the proposed centre-line of the sewer, which is shown on Drawing No. W.J. 70-11020A, was inferred from this data.

From ground surface downwards, the various soil types encountered are as follows:

4.2) Fill Material:

Fill material covers most of the investigated area; where encountered it ranges from 4 ft. to 16 ft. in thickness. The fill varies randomly from a firm to hard ('N' values 6 to 55 blows/ft.) clayey silt with some sand and a trace of organic matter to a loose to dense ('N' values 4 to 38 blows/ft.) silt to silty sand with traces of clay and organic inclusions. In general the granular fill predominates in the eastern portion of the alignment while the cohesive fill is most prevalent in the western region. Grain-size distribution curves, obtained on representative samples of the fill, are plotted in envelope form on Figure #2.

4.3) Clayey Silt:

This stratum, which is encountered beneath the fill over the majority of the site, varies from 7 ft. (BH #4) to 22 ft. (BH #11) in thickness. The deposit is composed of a clayey silt with a trace of sand. Numerous layers of silt, up to 4 inches thick, are randomly located throughout the stratum. The grain size distribution tests, carried out on representative samples, are plotted in envelope form on Figure #3.

The engineering properties of the stratum, as determined by field and laboratory testing, are presented in tabular form:

| Identity Tests | Range | Average |
|---|---|---|
| Liquid Limit ($W_L$) % : | 20 - 39 | (31) |
| Plastic Limit (Wp) % : | 16 - 26 | (20) |
| Natural Moisture Content (W) % : | 16 - 31 | (22) |
| Liquidity Index ($I_L$) | 0 - 1.1 | (0.3) |
| Bulk Density ($\gamma$) (p.c.f.) : | 117 - 142 | (125) |
| Undrained Shear strength (Cu) (p.s.f.) : | 800 - 7,200 | - |
| Standard Penetration Tests 'N' (Blows/ft.) | 9 ->100 | (32) |

The Atterberg limit tests, the results of which are summarized on Figure #1, indicate that the cohesive stratum has a plasticity in the low to intermediate range. Based on the Standard Penetration tests carried out in the field, as well as the laboratory undrained shear strength testing, the consistency of the stratum is estimated to vary randomly from firm to hard, being typically in the stiff range.

The compressibility characteristics of this cohesive deposit were determined by laboratory testing carried out during the course of the previous investigations. The results of this testing indicate that the clayey silt subsoil, located in the zones which are relatively compressible, is preconsolidated by about 5,000 to 6,000 p.s.f. in excess of the existing overburden pressure. The remainder of the stratum is preconsolidated by a magnitude which would be in excess of the aforementioned value. Typical values for the Initial Void Ratio ($e_o$) and the Recompression Index ($Cc_R$) are 0.7 and 0.05, respectively.

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4.4) Silty Sand, Trace of Gravel:

In the vicinity of the Humber River Valley the superficial fill is underlain by a deposit composed of silty sand with a trace of gravel (refer to BH's #8, 9 and 10). This is a part of the flood plain deposits formed by the Humber River . Where most extensive the thickness of the deposit is probably in excess of 40 feet. At BH #9, for instance, it is 32 feet thick. At different depths throughout the deposit, thin layers of clay with related organic matter were also encountered. The results of the grain size distribution tests carried out are plotted in envelope form on Figure #4.

The Standard Penetration Resistance testing carried out gave 'N' values which range from 4 to 16 blows per foot. Based on these results it is estimated that the relative density of the granular material is in the loose to compact range.

4.5) Clayey Silt with Sand and Gravel - (Glacial Till):

The clayey silt stratum, and the granular deposit encountered in the vicinity of the Humber River, are periodically underlain by a basal glacial till sheet which varies from 2 to 4 feet in thickness. The glacial till is primarily composed of a hard ('N' values 30 to greater than 100 blows/ft.) clayey silt with sand and gravel. Occasional random granular zones are present throughout the glacial till; in these areas the subsoil is composed of silt and sand binding gravel.

4.6) Shale Bedrock:

Throughout the investigated area the overburden is underlain by shale bedrock with occasional limestone interbeds. The

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surface of the bedrock was inferred to be at that point where practical refusal to augering was met. Based on these results it is inferred that the bedrock surface varies from about elevation 262 in the west to 212 in the vicinity of the Humber River. This bedrock pattern was corroborated by the bedrock drilling performed during the previous subsoil investigations carried out for the Q.E.W. Reconstruction.

In general, the upper 1 to 3 feet of the shale is in a weathered condition; below this zone the shale is quite sound.

5. GROUNDWATER CONDITIONS:

Groundwater level observations have been carried out, during the time of the investigation, in the open boreholes. The observations are recorded on the borelog sheets and summarized on Drawing No. W.J. 70-110204. These readings indicate that the groundwater level generally ranges between elevations 240 and 263. There is a natural hydrostatic gradient towards the Humber River; from this it is inferred that the river controls the drainage in the immediate area.

At BH's #1 and 6 the recorded groundwater level was at a higher elevation, specifically elevations 272 and 268, respectively. At these elevations the groundwater is located within the surficial fill deposits. It is inferred that these readings are indicative of a 'perched' level within the fill, which is underlain by the relatively impervious cohesive stratum.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct an outfall storm sewer in conjunction with the proposed reconstruction of the Q.E.W. complex,

in the southern portion of the Township of Etobicoke, Metropolitan Toronto. The sewer, which will be approximately 3,000 feet long, will be located along the south side of Lakeshore Blvd., running from the Humber River westerly to a point past the existing Lakeshore Ramps structure. The diameter of the sewer is variable, ranging from 24 inches in the west increasing to 66 inches where it outfalls into the Humber River.

The proposed profile grade of the sewer was provided by the Foundation of Canada Engineering Corporation Limited, FENCO, (Drawing No. 3552-17-32, dated February 25, 1970). The invert of the sewer, which is shown on Drawing No. W.J.70-110201, will range from elevation 270, at the western extremity, to 244 at its outfall. At this grade the sewer will be located anywhere from 6 to 22 feet below existing ground surface. Over the majority of its length the sewer will be located with the clayey silt stratum. An exception, however, occurs in the extreme eastern portion (Stations 0 to 5+00); here the sewer will be located within either granular fill or the granular flood plain deposits associated with the Humber River valley.

As discussed previously the prevailing groundwater level, at the time of the investigation, ranged from elevation 240 to about 263. In general, therefore, the groundwater level will vary from a few feet below to up to 5 feet above the invert level of the sewer.

At the time of writing this report, it is now known whether the sewer construction will be carried out by open cut methods or tunneling operations. In view of this the two methods of construction will be discussed under separate headings in the sub-sections to follow.

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6.2) Sewer Construction by Open Cut Methods:

From Sta. 5+00 westerly the sewer excavation will extend through the surficial fill down into the cohesive portion of the overburden. Temporary cuts, in this area, will be inherently stable against a deep-seated rotational type of failure, providing the cuts are maintained as follows:-

| Depth of Cut (ft.) | Slope of Cut (horizontal : vertical) |
|---|---|
| 0 - 22 | 1:1 |
| 22 - 35 | 1½:1 |

If, due to space restrictions, slopes steeper than those specified above are desired, the excavations should be sheeted.

In all cases the provisions adopted in the designated working areas should comply with the Trench Excavations Act.

Groundwater level along the sewer alignment, at the time of the investigation, varied from a few feet below to up to 5 feet above the invert level. Since the cohesive stratum is relatively impervious the groundwater seepage into the excavations should be negligible. Random water bearing granular seams and layers are, however, present within the stratum. If such zones are intersected the inflow could readily be handled by conventional means, such as pumping from sumps.

The excavations for the most easterly portion of the sewer (Sta. 0+00 to 5+00) will be located within the relatively

pervious granular soils. Further, the invert will extend between 1 and 2 feet below the groundwater level recorded at the time of the investigation. If the groundwater regime, prevailing during the construction period, is similar, then -

i) excessive groundwater seepage can be expected into the excavations and

ii) a boiling condition may develop at the base of the excavations due to the unbalanced hydrostatic water pressure head existing.

Under such circumstances a dewatering scheme would be required. The scheme adopted should be capable of lowering the groundwater to a level at least 2 feet below the base of the bedding; it will be necessary to maintain this level until backfilling of the trench is completed. This will ensure that the foundation subsoil is not softened by seeping or ponded water prior to installation of the sewer.

It is recommended that the pipe bedding on this project adhere to standards currently being used by the Department, specifically for Class 'B' Bedding on a Yielding Foundation (Standard No. SD-340). As discussed above the bedding must always be placed in a dry trench, and particular attention should be paid to compaction and shaping of the bedding material.

6.3) Sewer Construction by Tunneling Through the Overburden:

Installing the sewer by tunneling methods may be considered for that portion of the alignment to be located beneath the existing Lakeshore Blvd. If this method is adopted it would have the advantage of not disturbing the traffic on this roadway during the construction period. In any event, tunneling might

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have to be used in unfined areas, such as beneath the T.T.C. tracks (approximate Sta. 20+00).

Where sewers are constructed by tunneling through the overburden it will be necessary to lower the groundwater level below the tunnel base; or alternatively to construct the tunnel using air pressure greater than the prevailing hydrostatic pressure in order to achieve safe dry working conditions. Contractors who consider using air pressure, should be advised that they would be responsible for determining the air pressure to be used and also, that they would be responsible for preventing leakage through the boreholes that have been drilled at the site insofar as it affects their operation.

In sinking shafts through the overburden, problems may occur because of the high groundwater level. Recommendations given in the previous paragraph are applicable in this case.

6.4) Dewatering Procedures:

Comments and recommendations relating to dewatering and stability of excavations mentioned in the foregoing paragraphs, are based on the assumption that the conditions, encountered during the period of the investigation (March and April 1970), will apply during the construction. This may or may not be the case. It will be the responsibility of the Contractor to determine the conditions which prevail during construction, and to take such steps as are necessary to ensure dry safe working conditions. It is believed that if the sewer is constructed

continuously from the outfall end westerly, drainage in the critical zones will occur thus alleviating the situation considerably. Permanent drainage of the sewer trenches into the existing manholes should be provided, using at each manhole, a short (20 ft.) length of 6 inch diameter perforated pipe, surrounded with a suitable filter and discharging into the manhole.

7. MISCELLANEOUS:

The field work for this project was carried out during the period of March 24 to April 7, 1970, under the supervision of Mr. V. Korlu, Project Foundation Engineer.

The equipment used was owned and operated by Canadian Longyear Co., Ltd., Toronto.

This report was written by Mr. Korlu. The project was under the general supervision of Mr. K. Devata, Supervising Foundation Engineer, who also reviewed this report.

APPENDIX I

FORM 08-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 183,432 N; 227,542 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE March 26/70 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penndrill CHECKED BY

| ELEV / DEPTH | DESCRIPTION | STRAT. PLOT | SAMPLES NUMBER | TYPE | BLOWS / FOOT | ELEV. SCALE |
|---|---|---|---|---|---|---|
| 277.5 | Ground Level | | | | | |
| 0.0 | Fill Material (Clayey silt with some sand & traces of orgs.) | | 1 | SS | 7 | |
| 270.5 | Firm to very stiff | | 2 | SS | 26 | 270 |
| 7.0 | Clayey silt with trace of sand | | 3 | SS | 50 | |
| | | | 4 | SS | 30 | |
| | Very stiff to hard | | 5 | SS | 28 | |
| 258.3 | Weathered shale | | 6 | SS | 100/2" | 260 |
| 19.2 | End of Borehole (Grey Shale) | | | | | 250 |

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
400 800 1200 1600 2000

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_P$
WATER CONTENT —— $w$
WATER CONTENT %
10 20 30

BULK DENSITY γ P.C.F.

| REMARKS | GR. | SA. | SI. | CL. |
|---|---|---|---|---|
| ▼ | 0 | 2 | 82 | 16 |
| | 0 | 0 | 72 | 28 |

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 183,548 N; 227,679 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE March 30, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV / DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/FOOT | ELEV SCALE |
|---|---|---|---|---|---|---|
| 283.0 | Ground Level | | | | | |
| 0.0 | Fill Material | | | | | 280 |
| | Clayey silt with some sand & tr.of organics. | | 1 | SS | 14 | |
| 276.0 | Stiff to hard. | | 2 | SS | 55 | |
| 7.0 | Clayey silt with occ. seams of silt & trace of sand. | | 3 | SS | 100 | 270 |
| | | | 4 | SS | 65 | |
| | Hard | | 5 | SS | 57 | |
| | | | 6 | SS | 56 | |
| 260.5 | Weathered shale | | 7 | SS | 100/6" | |
| 22.5 | End of Borehole (Grey shale) | | | | | 260 |
| | | | | | | 250 |

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100
SHEAR STRENGTH P.S.F
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_P$
WATER CONTENT —— $w$
WATER CONTENT % — 10 20 30

BULK DENSITY $\gamma$ P.C.F

| REMARKS | GR. | SA. | SI. | CL. |
|---|---|---|---|---|
| | 0 | 5 | 83 | 12 |
| | 0 | 2 | 81 | 17 |

FORM 08-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 183,637 N; 227,803 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE August 30, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| SOIL PROFILE ELEV / DEPTH | DESCRIPTION | STRAT. PLOT | SAMPLES NUMBER | TYPE | BLOWS / FOOT | ELEV SCALE |
|---|---|---|---|---|---|---|
| 268.0 | Ground Level | | | | | |
| 0.0 | Clay silt to silty clay with a trace of sand. | | 1 | SS | 41 | |
| | | | 2 | SS | 45 | 260 |
| | Hard | | 3 | SS | 50 | |
| 255.2 | Weathered shale | | 4 | SS | 100/2" | |
| 12.8 | End of Borehole (Grey Shale) | | | | | 250 |

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT
20 40 60 80 100

SHEAR STRENGTH P.S.F
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_p$
WATER CONTENT —— $w$

$w_p$ $w$ $w_L$

WATER CONTENT %
10 20 30

BULK DENSITY $\gamma$ P.C.F.

REMARKS GR. SA. SI. CL.

0 4 68 28

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 4

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 183,729 N; 227,894 E. ORIGINATED BY VK
W.P. 311-65-01 BORING DATE March 24, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill & Cone Test CHECKED BY

| ELEV / DEPTH | DESCRIPTION | STRAT. PLOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/FOOT | ELEV SCALE |
|---|---|---|---|---|---|---|
| 268.2 | Ground Level | | | | | |
| 0.0 | Fill Material Clayey silt with some sand & tr. of organics | | | | | |
| 263.2 | Stiff | | 1 | SS | 13 | |
| 5.0 | Clayey silt to silty clay with trace of sand. | | 2 | SS | 50 | |
| | Hard | | 3 | SS | 100/6" | 260 |
| 255.7 | Weathered shale | | 4 | SS | 100/5" | |
| 12.5 | End of Borehole (Grey shale) | | | | | 250 |

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_P$
WATER CONTENT —— $w$

WATER CONTENT % 10 20 30

BULK DENSITY $\gamma$ P.C.F

| REMARKS | GR. | SA. | SI. | CL. |
|---|---|---|---|---|
| | 0 | 3 | 58 | 39 |

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 5

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 183,850 N; 227,958 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE March 24, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY VK

| ELEV. / DEPTH | DESCRIPTION | STRAT. PLOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/FOOT |
|---|---|---|---|---|---|
| 269.3 | Ground Level | | | | |
| 0.0 | Fill Material Clayey silt with some sand & organics. | | | | |
| 264.3 | Stiff | | 1 | SS | 9 |
| 5.0 | Clayey silt with trace of sand. | | 2 | SS | 36 |
| | | | 3 | SS | 66 |
| 255.8 | Hard | | 4 | SS | 91 |
| 254.3 | Weathered shale | | | | |
| 15.0 | End of Borehole (Grey shale) | | | | |

ELEV. SCALE: 260, 250

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_P$
WATER CONTENT —— $w$

$w_P$ — $w$ — $w_L$

WATER CONTENT % — 10 20 30

BULK DENSITY $\gamma$ P.C.F.

REMARKS

GR. SA. SI. CL.

0 1 79 20

FORM 08-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 6

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 183,990 N; 228,027 E. ORIGINATED BY VK

W.P. 314-65-01 BORING DATE March 25, 1970 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV / DEPTH | DESCRIPTION | STRATA PLOT | SAMPLES NUMBER | TYPE | BLOWS / FOOT |
|---|---|---|---|---|---|
| 271.2 | Ground Level | | | | |
| 0.0 | Fill material | | | | |
| 266.2 | Silty sand with gravel & traces of clay & organics. Loose | | 1 | SS | 4 |
| 5.0 | Clayey silt with trace of sand - grey | | 2 | SS | 20 |
| | | | 3 | SS | 44 |
| | Very stiff to hard | | 4 | SS | 36 |
| 253.2 | | | 5 | SS | 28 |
| 18.0 | Glac. Till-Wet mix of clayey silt, sand & gr. Hard | | 6 | | 30 |
| 249.3 | weathered shale | | | | |
| 21.9 | End of Borehole (Grey shale) | | | | |

ELEV SCALE: 270, 260, 250, 240

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT: 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_P$
WATER CONTENT —— $w$

WATER CONTENT %: 10 20 30

BULK DENSITY γ P.C.F

REMARKS

GR. SA. SI. CL.

0 1 84 15

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 7

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 185,260 N; 229,146 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE March 31, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| SOIL PROFILE ELEV. DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | TYPE | BLOWS/FOOT | ELEV. SCALE |
|---|---|---|---|---|---|---|
| 254.5 | Ground Level | | | | | |
| 0.0 | Fill Material<br>Silt to silty sand with gravel - occ. seams of organic clay | | 1 | SS | 38 | 250 |
| | | | 2 | SS | 15 | |
| | | | 3 | SS | 8 | |
| | | | 4 | SS | 10 | |
| 238.5 | Loose to compact | | 5 | TW | PM | 240 |
| 16.0 | Clayey silt with trace of sand<br>Firm to very stiff | | 6 | SS | 17 | |
| 231.3 | weathered shale | | 7 | SS | 100/3" | |
| 23.2 | End of Borehole (grey shale) | | | | | 230 |

DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
400 800 1200 1600 2000

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_p$
WATER CONTENT —— $w$

WATER CONTENT % 20 40 60

BULK DENSITY $\gamma$ P.C.F.

127

REMARKS

2 79 (19)

10% orgs.
0 14 76 10

GR. SA. SI. CL.

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 8

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 185,337 N; 229,239 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE March 31, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV. / DEPTH | SOIL PROFILE DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | TYPE | BLOWS / FOOT | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 | LIQUID LIMIT $w_L$ / PLASTIC LIMIT $w_p$ / WATER CONTENT $w$ — WATER CONTENT % 10 20 30 | BULK DENSITY $\gamma$ P.C.F. | REMARKS GR. SA. SI. CL. |
|---|---|---|---|---|---|---|---|---|---|---|
| 253.8 | Ground Level | | | | | | | | | |
| 0.0 | Fill Material Silt to silty sand with traces of clay & organics. | | 1 | SS | 38 | 250 | | | | |
| 246.8 | Loose to dense | | 2 | SS | 6 | | | | | 0 96 ( 4 ) |
| 7.0 | Silty sand with trace of gravel & organics occ. layers of clayey silt. | | 3 | SS | 16 | | | | | |
| | | | 4 | SS | 13 | 240 | | | | |
| | | | 5 | SS | 4 | | | | | |
| | Loose to compact | | 6 | SS | 10 | | | | | |
| 230.8 | | | | | | | | | | |
| 229.3 | Weathered shale | | 7 | SS | 100/6" | 230 | | | | |
| 24.5 | End of Borehole (Grey Shale) | | | | | | | | | |
| | | | | | | 220 | | | | |

SHEAR STRENGTH P.S.F.
○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 9

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 185,394 N; 229,315 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE April 1, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV. / DEPTH | DESCRIPTION | STRAT. PLOT | SAMPLES NUMBER | TYPE | BLOWS/FOOT | ELEV. SCALE |
|---|---|---|---|---|---|---|
| 252.0 | Ground Level | | | | | |
| 0.0 | Fill Material | | | | | |
| | Silt to silty sand with traces of clay and organics. | | 1 | SS | 3 | |
| 245.0 | Loose | | 2 | SS | 8 | |
| 7.0 | Silty sand with trace of gravel - occ. pockets of organics | | 3 | SS | 12 | |
| 240.0 | | | 4 | SS | 9 | |
| 237.5 | organic material | | 5 | SS | 8 | |
| 14.5 | | | 6 | SS | 9 | |
| | Loose to compact | | 7 | SS | 8 | |
| 213.0 | | | | | | |
| 39.0 | Clayey silt with some sand. Hard. | | 8 | SS | 67 | |
| 211.0 | | | | | | |
| 41.0 | End of Borehole (Grey shale) | | | | | |

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — 20 40 60 80 100

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_p$
WATER CONTENT —— $w$

WATER CONTENT % — 20 60 90

BULK DENSITY $\gamma$ P.C.F.

REMARKS GR. SA. SI. CL.

0.13 org.
0 97 (3)
19.3% org.
0 87 (13)

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 10

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 185,434 N; 229,366 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE April 1, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV. / DEPTH | DESCRIPTION | STRAT. PLOT | SAMPLES NUMBER | TYPE | BLOWS / FOOT | ELEV. SCALE |
|---|---|---|---|---|---|---|
| 251.5 | Ground Level | | | | | |
| 0.0 | Fill material Clayey silt with some sand and organics. | | 1 | SS | 5 | 250 |
| 245.0 | Firm | | 2 | SS | 6 | |
| 6.5 | Silty sand with traces of clay and pockets of organics. | | 3 | SS | 13 | |
| | | | 4 | SS | 11 | 240 |
| | | | 5 | SS | 4 | |
| | | | 6 | SS | 4 | |
| | Loose to compact | | 7 | SS | 10 | 230 |
| 216.0 | | | 8 | SS | 8 | 220 |
| 35.5 | End of Borehole | | | | | |
| 201.5 | | | | | | |
| 50.0 | End of Cone Test | | | | | |

DYNAMIC PENETRATION RESISTANCE
BLOWS / FOOT 20 40 60 80 100
SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_P$
WATER CONTENT —— $w$
$w_P$ $w$ $w_L$
WATER CONTENT % 10 20 30

BULK DENSITY $\gamma$ P.C.F.

REMARKS GR. SA. SI. CL.

2 3 4% org. ( 7 )
12 86 ( 2 )
3.4% org.
17 79 ( 4 )

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 11

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 185,120 N; 228,971 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE April 3, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| SOIL PROFILE ELEV / DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | TYPE | BLOWS/FOOT | ELEV SCALE |
|---|---|---|---|---|---|---|
| 256.9 | **Ground Level** | | | | | |
| 0.0 | Fill Material | | | | | |
| 252.9 | Silt to silty sand & tr.of clay & orgs.V.Soft | | 1 | SS | 20 | |
| 4.0 | | | 2 | SS | 20 | 250 |
| | Clayey silt Brown | | 3 | SS | 14 | |
| | Grey with trace of sand. | | 4 | SS | 20 | |
| | | | 5 | SS | 33 | 240 |
| | Stiff to hard | | 6 | SS | 20 | |
| 231.4 | weathered shale | | 7 | | 100/1" | |
| 25.5 | End of Borehole (grey shale) | | | | | 230 |

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
o UNCONFINED + FIELD VANE
● QUICK TRIAXIAL x LAB. VANE

LIQUID LIMIT $w_L$
PLASTIC LIMIT $w_p$
WATER CONTENT $w$
WATER CONTENT % 10 20 30

BULK DENSITY γ P.C.F.

| REMARKS | GR | SA | SI | CL |
|---|---|---|---|---|
| | 0 | 1 | 80 | 19 |
| ▼ | 0 | 1 | 90 | 9 |

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
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# RECORD OF BOREHOLE No. 12

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 184,993 N; 228,900 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE April 3, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV. DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | TYPE | BLOWS/FOOT | ELEV. SCALE |
|---|---|---|---|---|---|---|
| 257.2 | Ground Level | | | | | |
| 0.0 | Silt to silty sand & traces of clay & orgs. | | | | | |
| 253.2 | Soft | | 1 | SS | 4 | |
| 4.0 | | | 2 | SS | 20 | 250 |
| | Clayey silt with trace of sand | | 3 | SS | 33 | |
| | | | 4 | SS | 20 | |
| | Brown | | 5 | SS | 21 | |
| | Grey | | | | | 240 |
| | | | 6 | SS | 24 | |
| | Stiff to hard | | | | | |
| 231.5 | Weathered shale | | 7 | SS | 100/2" | |
| 25.7 | End of Borehole (Grey Shale) | | | | | 230 |
| | | | | | | 220 |

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB VANE

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_p$
WATER CONTENT —— $w$

WATER CONTENT %
10 20 30

BULK DENSITY $\gamma$ P.C.F. 130

REMARKS

GR. SA. SI. CL.
0 1 80 19

OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 13

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 184,873 N; 228,834 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE April 6, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV. / DEPTH | DESCRIPTION | STRATA PLOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS / FOOT | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE 400 800 1200 1600 2000 | LIQUID LIMIT $w_L$ PLASTIC LIMIT $w_p$ WATER CONTENT $w$ — WATER CONTENT % 10 20 30 | BULK DENSITY γ P.C.F. | REMARKS GR. SA. SI. CL. |
|---|---|---|---|---|---|---|---|---|---|---|
| 258.0 | Ground Level | | | | | | | | | |
| 0.0 | Clayey silt with trace of sand, occ. seams of silt | | 1 | SS | 9 | | | | | |
| | | | 2 | SS | 16 | 250 | | | 141 | |
| | | | 3 | SS | 19 | | | | | |
| | | | 4 | SS | 11 | | | | | 0 1 87 12 |
| | | | 5 | SS | 11 | | | | | |
| | | | 6 | TW | PM | 250 | | | 126 | |
| 237.0 | Stiff to very stiff | | 7 | SS | 9 | | | | | |
| 21.0 | Glacial Till Het.mix.of clay, sand & gravel. Hard | | | | | | | | | |
| 233.2 | | | 8 | SS | 100/3" | | | | | |
| 24.8 | End of Borehole (Grey shale) | | | | | 230 | | | | |

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# RECORD OF BOREHOLE No. 14

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 184,771 N; 228,735 E. ORIGINATED BY VK

W.P. 314-65-01 BORING DATE April 6, 1970 COMPILED BY VK

DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| SOIL PROFILE ELEV / DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | TYPE | BLOWS/FOOT | ELEV SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE (400 800 1200 1600 2000) | LIQUID LIMIT $w_L$ — PLASTIC LIMIT $w_p$ — WATER CONTENT $w$ — WATER CONTENT % (10 20 30) | BULK DENSITY γ P.C.F. | REMARKS GR SA SI CL |
|---|---|---|---|---|---|---|---|---|---|---|
| 259.1 | Ground Level | | | | | | | | | |
| 0.0 | Clayey silt Brown — Grey with trace of sand. Stiff to very stiff | | 1 | SS | 11 | | | | | |
| | | | 2 | SS | 17 | | | | 138.5 | |
| | | | 3 | SS | 24 | 250 | | | | |
| | | | 4 | SS | 25 | | | | | |
| | | | 5 | TW | PM | | | | 127 | 0 0 80 20 |
| | | | 6 | TW | PM | 240 | | | 124 | |
| 237.1 | | | | | | | | | | |
| 22.0 | End of Borehole (Grey Shale) | | | | | 230 | | | | |

FORM OB-MT-126 (REV. 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 15

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 184,670 N; 228,626 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE April 6, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV / DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/FOOT | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT — SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB. VANE | LIQUID LIMIT $w_L$ — PLASTIC LIMIT $w_P$ — WATER CONTENT $w$ — WATER CONTENT % 10 20 30 | BULK DENSITY γ P.C.F. | REMARKS GR. SA. SI. CL. |
|---|---|---|---|---|---|---|---|---|---|---|
| 259.6 | Ground Level | | | | | | | | | |
| 0.0 | Fill Material<br>Clayey silt with some sand and traces of gravel and organics. | | 1 | SS | 8 | | | | | |
| | | | 2 | SS | 14 | | | | | |
| 248.6 | Stiff | | 3 | SS | 8 | 250 | | | | 0 5 85 10 |
| 11.0 | Clayey silt with trace of sand | | 4 | SS | 11 | | | | | |
| | | | 5 | SS | 16 | | | | 127.5 | 0 2 72 26 |
| | Stiff to very stiff | | | | | 240 | | | | |
| 237.9 | | | 6 | SS | 14 | | | | | |
| 21.7 | End of Borehole (Grey shale) | | | | | 230 | | | | |

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

# RECORD OF BOREHOLE No. 16

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 184,571 N; 228,515 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE April 7, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV. / DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/FOOT |
|---|---|---|---|---|---|
| 259.5 | Ground Level | | | | |
| 0.0 | Fill material Silt to sandy silt and some organics. | | 1 | SS | 33 |
| | Clayey silt with some sand and trace of organics. Firm to hard | | 2 | SS | 6 |
| 250.0 | | | 3 | TW | PM |
| 9.5 | Clayey silt with trace of sand. | | 4 | TW | PM |
| | | | 5 | SS | 10 |
| 240.5 | Firm | | | | |
| 239.0 | Weathered shale | | 6 | SS | 154 |
| 20.5 | End of Borehole (Grey shale) | | | | |

ELEV. SCALE: 250, 240, 230

DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT

SHEAR STRENGTH P.S.F.
○ UNCONFINED + FIELD VANE
● QUICK TRIAXIAL × LAB. VANE
400 800 1200 1600 2000

LIQUID LIMIT —— $w_L$
PLASTIC LIMIT —— $w_p$
WATER CONTENT —— $w$
$w_p$ $w$ $w_L$
WATER CONTENT %
10 20 30

| BULK DENSITY γ P.C.F. | REMARKS GR. SA. SI. CL. |
|---|---|
| 124.5 ▼ | |
| 116.5 | 0 2 85 13 |

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS- ONTARIO
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# RECORD OF BOREHOLE No. 17

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 184,352 N; 228,341 E. ORIGINATED BY VK
W.P 314-65-01 BORING DATE April 7, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| ELEV / DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | SAMPLES TYPE | SAMPLES BLOWS/FOOT | ELEV SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT / SHEAR STRENGTH P.S.F. (O UNCONFINED, ● QUICK TRIAXIAL, + FIELD VANE, × LAB VANE) | LIQUID LIMIT $w_L$ / PLASTIC LIMIT $w_p$ / WATER CONTENT $w$ (WATER CONTENT % 10 20 30) | BULK DENSITY $\gamma$ P.C.F. | REMARKS GR. SA. SI. CL. |
|---|---|---|---|---|---|---|---|---|---|---|
| 259.8 | Ground Level | | | | | | | | | |
| 0.0 | Clayey silt with trace of sand Brown Grey | | 1 | SS | 32 | | | | | |
| | | | 2 | SS | 31 | | | | 135.5 | |
| | | | 3 | SS | 11 | 250 | | | 142.5 | 0 2 78 20 |
| 245.8 | Stiff to Hard | | 4 | SS | 10 | | | | | |
| 244.3 | Weathered shale | | 5 | SS | 100/3" | | | | | |
| 15.5 | End of Borehole (Grey Shale) | | | | | 240 | | | | |

FORM OB-MT-126 (REV 1969) OFFICE REPORT ON SOIL EXPLORATION

DEPARTMENT OF HIGHWAYS - ONTARIO
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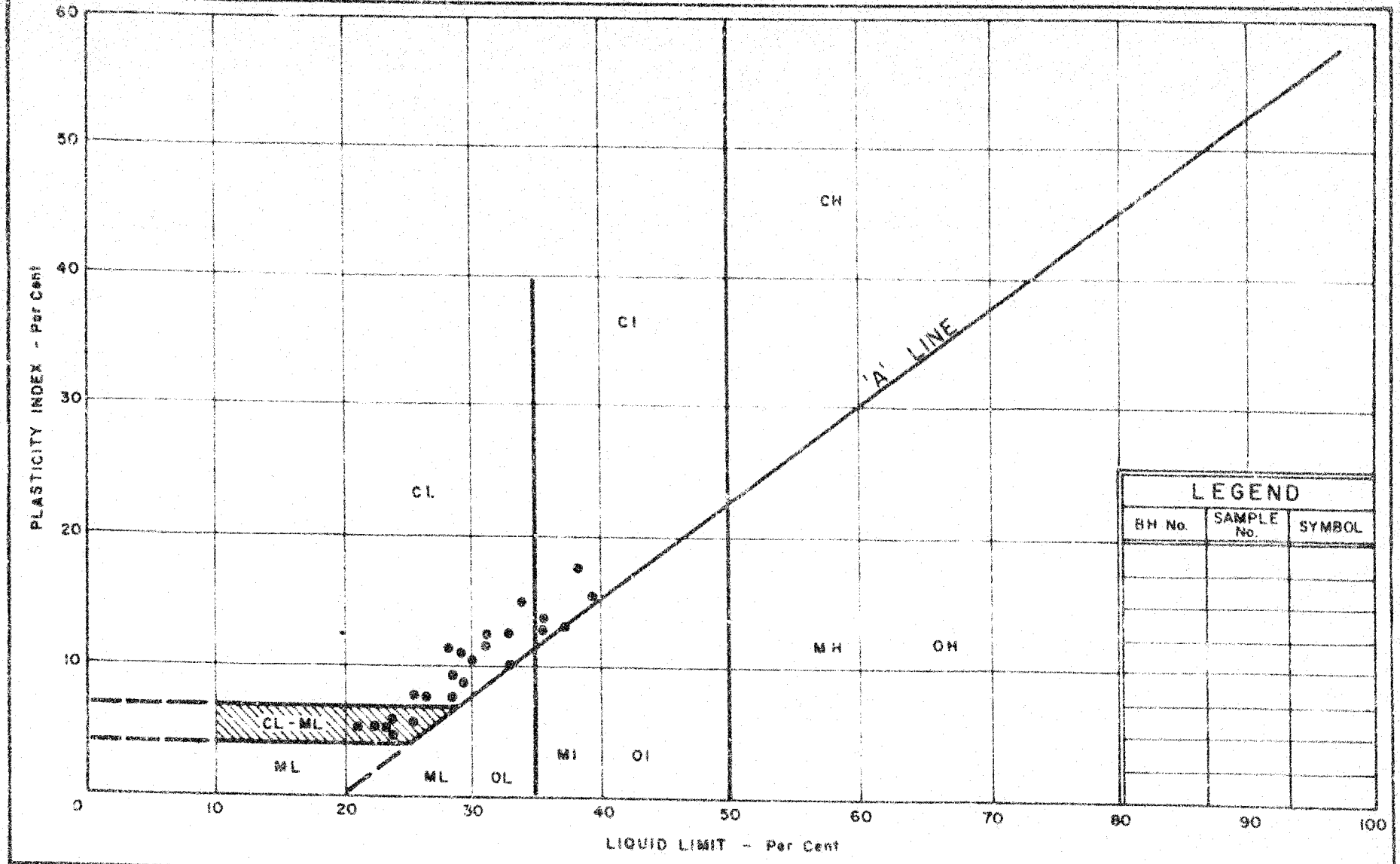
# RECORD OF BOREHOLE No. 18

FOUNDATION SECTION

JOB 70-F-20 LOCATION Co-ords. 184,162 N; 228,210 E. ORIGINATED BY VK
W.P. 314-65-01 BORING DATE April 7, 1970 COMPILED BY VK
DATUM Geodetic BOREHOLE TYPE Penn Drill CHECKED BY

| SOIL PROFILE ELEV / DEPTH | DESCRIPTION | STRAT PLOT | SAMPLES NUMBER | TYPE | BLOWS/FOOT | ELEV. SCALE | DYNAMIC PENETRATION RESISTANCE BLOWS/FOOT 20 40 60 80 100 / SHEAR STRENGTH PSF ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE | LIQUID LIMIT $w_L$ / PLASTIC LIMIT $w_P$ / WATER CONTENT $w$ — WATER CONTENT % 10 20 30 | BULK DENSITY γ PCF | REMARKS GR SA SI CL |
|---|---|---|---|---|---|---|---|---|---|---|
| 265.0 | Ground Level | | | | | | | | | |
| | Clayey silt with trace of sand | | 1 | SS | 10 | 260 | | | | |
| | | | 2 | SS | 19 | | | | 141.5 | |
| | | | 3 | SS | 13 | | | | | |
| | (Brown) / (Grey) | | 4 | SS | 35 | | | | | ○ 3 86 11 |
| | Stiff to hard | | 5 | SS | 16 | 250 | | | | |
| 245.3 | Weathered shale | | 6 | SS | 100/8" | | | | | |
| 19.7 | End of Borehole (Grey Shale) | | | | | 240 | | | | |

FORM 08-MT-252
REVISED JULY [illegible] 66

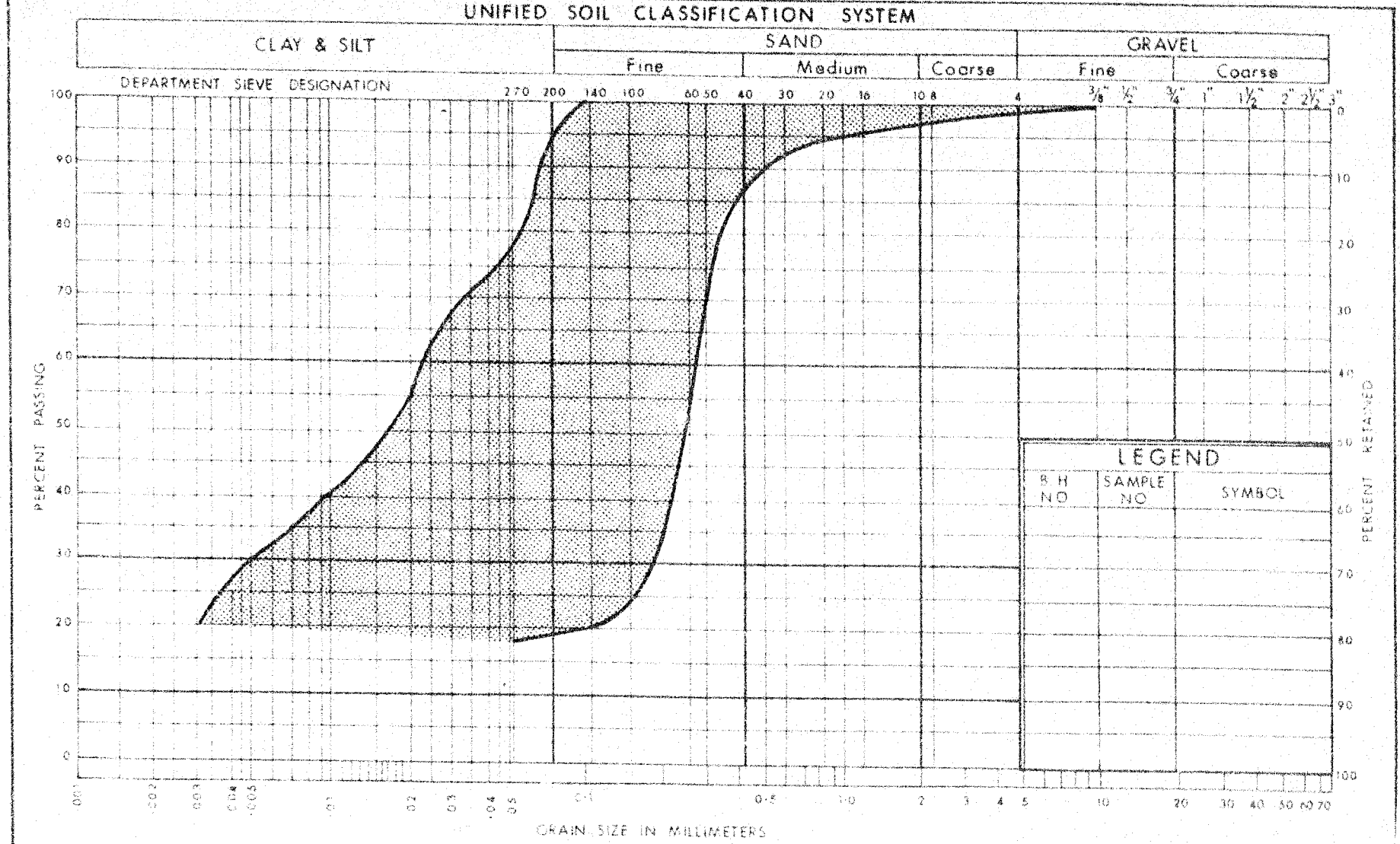



DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

# PLASTICITY CHART
## CLAYEY SILT
With Traces of Sand and Occasional Layers of Silt

W.P. No. 314-65-01
JOB No. 70-F-20
FIG. NO. 1

FORM DB MT-17
REV. APR. 1965



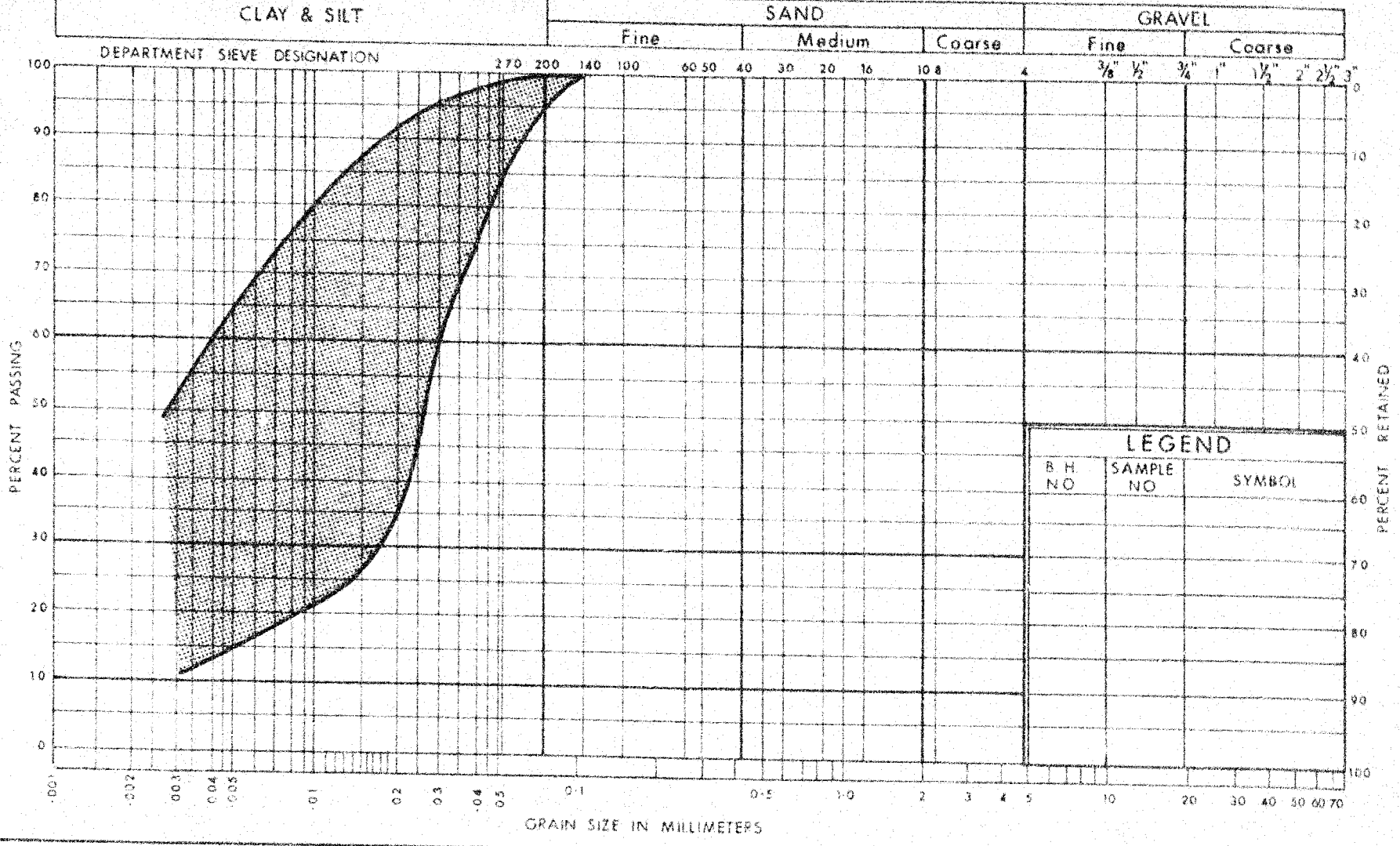

DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

# GRAIN SIZE DISTRIBUTION
## FILL MATERIAL

W.P. No. 314-65-01
JOB No. 70-F-20
FIG. NO. 2

REV. APR. 1965

UNIFIED SOIL CLASSIFICATION SYSTEM




DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

# GRAIN SIZE DISTRIBUTION

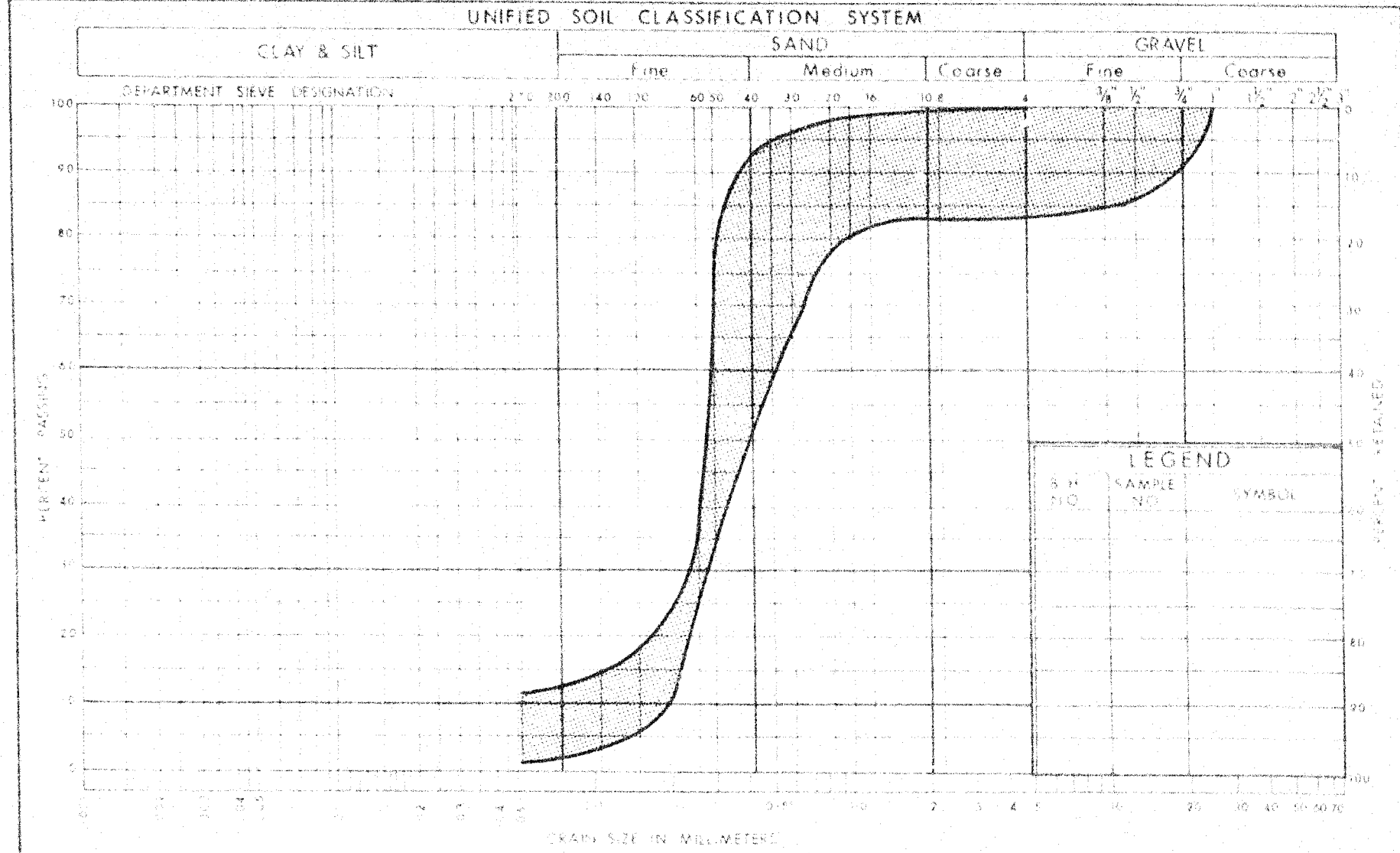
## CLAYEY SILT

W.P. No. 314-65-01

JOB No. 70-F-20

FIG. NO. 3

FORM OB MT-17
REV. APR 1965




DEPARTMENT OF HIGHWAYS
MATERIALS and TESTING DIVISION

# GRAIN SIZE DISTRIBUTION

## SILTY SAND

WITH TRACES OF GRAVEL

W.P. No. 314-65-01

JOB No. 70-F-20

FIG NO 4

# ABBREVIATIONS USED IN THIS REPORT

## PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' :- 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 :-

| CONSISTENCY | 'N' BLOWS / FT | c LB. / SQ FT. | DENSENESS | 'N' BLOWS / FT. |
|---|---|---|---|---|
| VERY SOFT | 0 - 2 | 0 - 250 | VERY LOOSE | 0 - 4 |
| SOFT | 2 - 4 | 250 - 500 | LOOSE | 4 - 10 |
| FIRM | 4 - 8 | 500 - 1000 | COMPACT | 10 - 30 |
| STIFF | 8 - 15 | 1000 - 2000 | DENSE | 30 - 50 |
| VERY STIFF | 15 - 30 | 2000 - 4000 | VERY DENSE | > 50 |
| HARD | > 30 | > 4000 | | |

## TYPE OF SAMPLE

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

P.H SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

## SOIL TESTS

| | | | |
|---|---|---|---|
| Qu | UNCONFINED COMPRESSION | L.V. | LABORATORY VANE |
| Q | UNDRAINED TRIAXIAL | F.V. | FIELD VANE |
| Qcu | CONSOLIDATED UNDRAINED TRIAXIAL | C | CONSOLIDATION |
| Qd | DRAINED TRIAXIAL | S | SENSITIVITY |

# ABBREVIATIONS USED IN THIS REPORT

## SOIL PROPERTIES

| | |
|---|---|
| $\gamma$ | UNIT WEIGHT OF SOIL (BULK DENSITY) |
| $\gamma_s$ | UNIT WEIGHT OF SOLID PARTICLES |
| $\gamma_w$ | UNIT WEIGHT OF WATER |
| $\gamma_d$ | UNIT DRY WEIGHT OF SOIL (DRY DENSITY) |
| $\gamma'$ | 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 |
| 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 |
| $\tau_f$ | SHEAR STRENGTH |
| $c'$ | EFFECTIVE COHESION INTERCEPT |
| $\phi'$ | EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION |
| | IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$ |
| $c_u$ | APPARENT COHESION |
| $\phi_u$ | APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION |
| | IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$ |
| $\mu$ | COEFFICIENT OF FRICTION |
| $S_t$ | SENSITIVITY |

## GENERAL

| | |
|---|---|
| $\pi$ | = 3·1416 |
| e | BASE OF NATURAL LOGARITHMS 2·7183 |
| $\log_e \sigma$ OR $\ln \sigma$ | NATURAL LOGARITHM OF $\sigma$ |
| $\log_{10} \sigma$ OR $\log \sigma$ | LOGARITHM OF $\sigma$ 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 |
| $\sigma$ | NORMAL STRESS |
| $\sigma'$ | NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED) |
| $\tau$ | SHEAR STRESS |
| $\epsilon$ | LINEAR STRAIN |
| $\gamma$ | SHEAR STRAIN |
| $\nu$ | POISSON'S RATIO ($\mu$ IS ALSO USED) |
| E | MODULUS OF LINEAR DEFORMATION (YOUNGS MODULUS) |
| G | MODULUS OF SHEAR DEFORMATION |
| K | MODULUS OF COMPRESSIBILITY |
| $\eta$ | COEFFICIENT OF VISCOSITY |

## EARTH PRESSURE

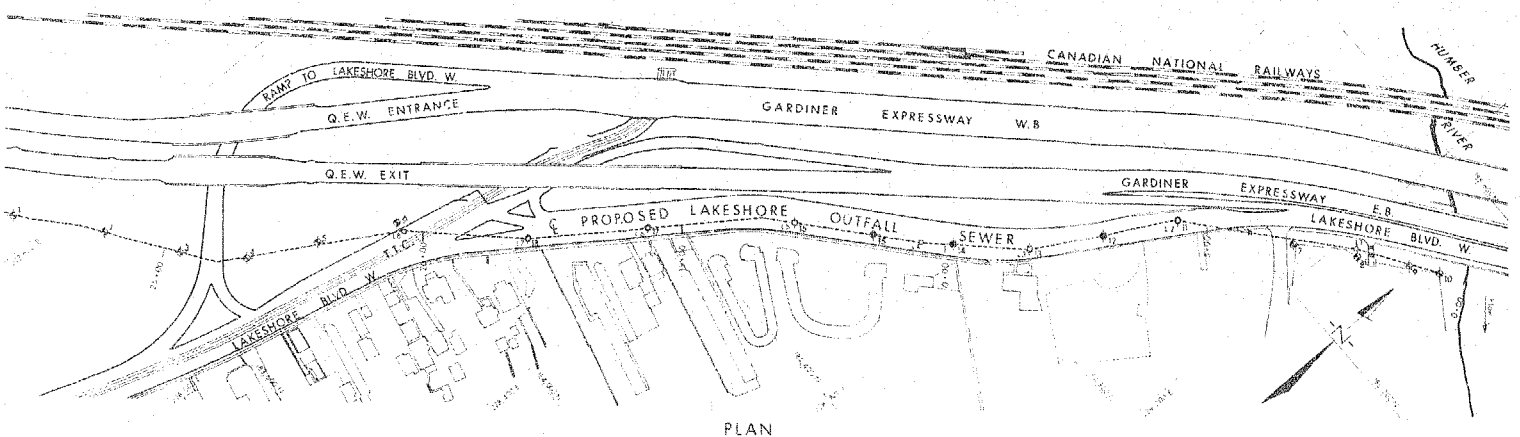
| | |
|---|---|
| d | DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE |
| $\delta$ | ANGLE OF WALL FRICTION |
| K | DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS |
| $K_o$ | COEFFICIENT OF EARTH PRESSURE AT REST |

## 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 |

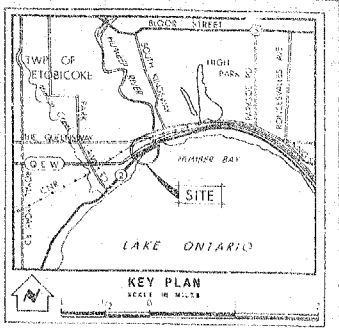
## SLOPES

| | |
|---|---|
| H | VERTICAL HEIGHT OF SLOPE |
| D | DEPTH BELOW TOE OF SLOPE TO HARD STRATUM |
| $\beta$ | ANGLE OF SLOPE TO HORIZONTAL |




PLAN

SCALE




KEY PLAN

SCALE IN MILES

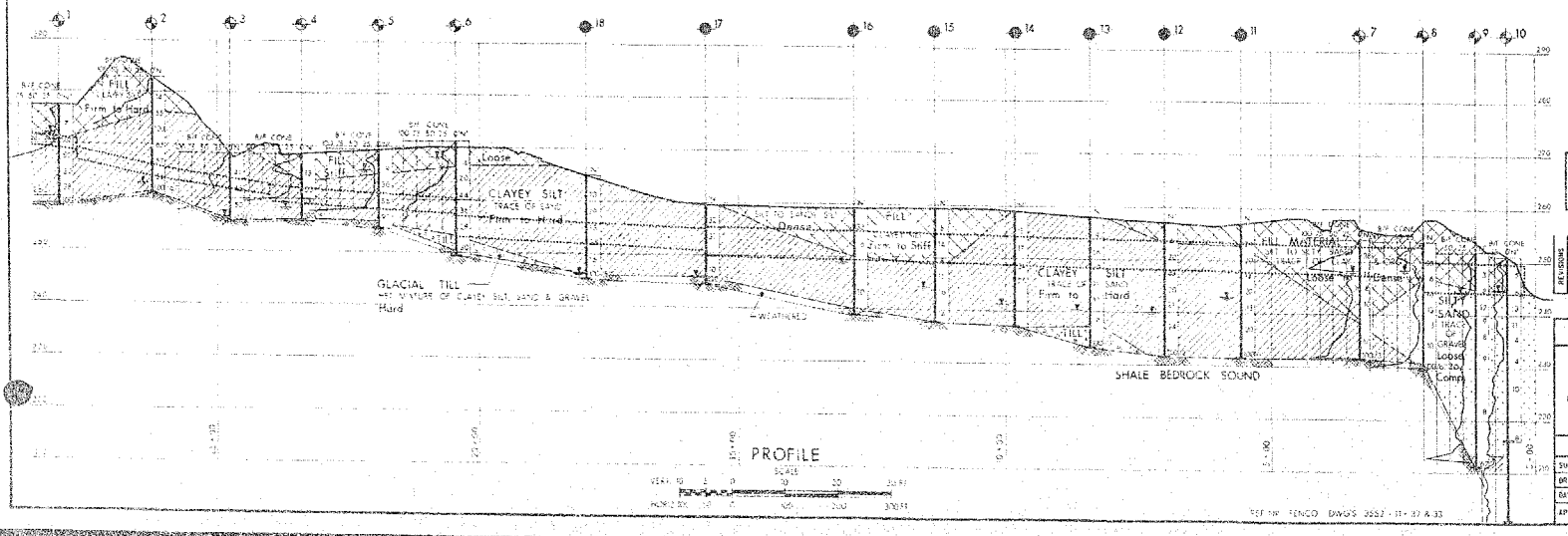
## LEGEND

- Bore Hole
- Cone Penetration Hole
- Bore & Cone Penetration Hole
- Water Levels established at time of field investigation, MARCH & APRIL 1970

| NO. | ELEVATION | CO-ORDINATES NORTH | EASTING |
|---|---|---|---|
| 1 | 272.3 | 183,432 | 227,542 |
| 2 | 253.0 | 183,348 | 227,679 |
| 3 | 268.0 | 183,027 | 227,803 |
| 4 | 268.2 | 182,729 | 227,994 |
| 5 | 269.3 | 182,550 | 227,868 |
| 6 | 271.2 | 183,990 | 228,027 |
| 7 | 254.5 | 185,260 | 228,144 |
| 8 | 252.8 | 185,337 | 228,249 |
| 9 | 254.9 | 185,394 | 228,445 |
| 10 | 251.5 | 185,434 | 228,565 |
| 11 | 256.9 | 185,120 | 228,911 |
| 12 | 257.2 | 184,493 | 228,900 |
| 13 | 258.0 | 184,892 | 228,834 |
| 14 | 259.1 | 184,771 | 228,735 |
| 15 | 259.6 | 184,670 | 228,608 |
| 16 | 260.1 | 184,521 | 228,505 |
| 17 | 259.8 | 184,352 | 228,361 |
| 18 | 265.0 | 184,262 | 228,210 |

## NOTE

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.




PROFILE

SCALES

SEE DWG. FENCO DWGS 3552 - 11 - 32 & 33

| REVISIONS | | |
|---|---|---|
| DATE | BY | DESCRIPTION |

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & TESTING OFFICE - FOUNDATION SECTION

# LAKESHORE OUTFALL SEWER

KING'S HIGHWAY NO. DIST. NO. 6
CO. YORK METRO TORONTO
TWP. ETOBICOKE LOT CON.

## BORE HOLE LOCATIONS & SOIL STRATA

| | | | |
|---|---|---|---|
| SUBM'D S.K. | CHECKED | W.P. NO. 356-71-01 | H.D.T. DRAWING NO. 70-11020A |
| DRAWN S.K. | CHECKED JJE | JOB NO. 70-11020 | |
| DATE 5 MAY 1970 | | SITE NO. | DRAWING NO. |
| APPROVED | | CONT. NO. | |

FENCO

**Foundation of Canada Engineering Corporation Limited**

2200 Yonge St.
Toronto, Canada
416-481-4481
Cable 'Foundaneng'
Telex 02 2814

March 26, 1971

70-F-20

Mr. A. G. Stermac, P.Eng.
Principal Foundation Engineer
Department of Highways
Downsview, Ontario

Attention Mr. M. Devata, P.Eng.
Supervising Foundation Engineer

Dear Sirs,

OUTFALL STRUCTURE
HUMBER RIVER AT Q.E.W.
W.P. 314-65-01

This is to confirm your verbal recommendation of March 9, 1971, of an allowable bearing pressure of 500 P.S.F. for the above structure.

We have designed a monolithic U-type of structure and have found the 500 P.S.F. bearing pressure is sufficient. Under the base slab there will be a 3 foot thick layer of granular material as a protection against frost.

Yours very truly,
FOUNDATION OF CANADA ENGINEERING
CORPORATION LIMITED

R. Temple
BRIDGE ENGINEER

BTP/sm
3552

cc: Mr. W. Lin, P.Eng.

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30M11-99

DIST. 6 REGION Central

W.P. No. 314-65-01 (2 of 2)

CONT. No. 72-097

W. O. No. 70-110-20

STR. SITE No.

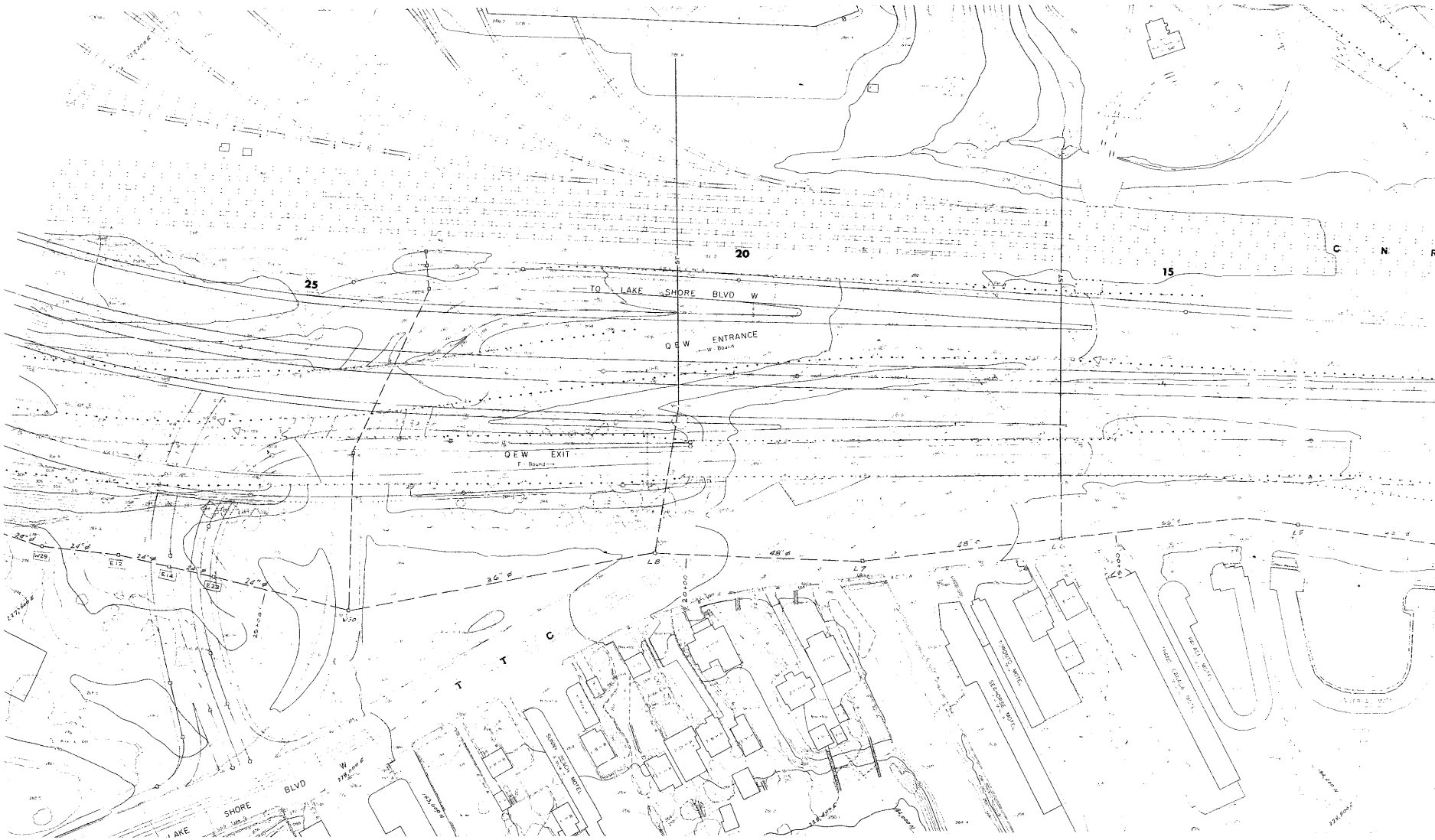
HWY. No. Q.E.W.

LOCATION Humber River to Royal York Rd.

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 1

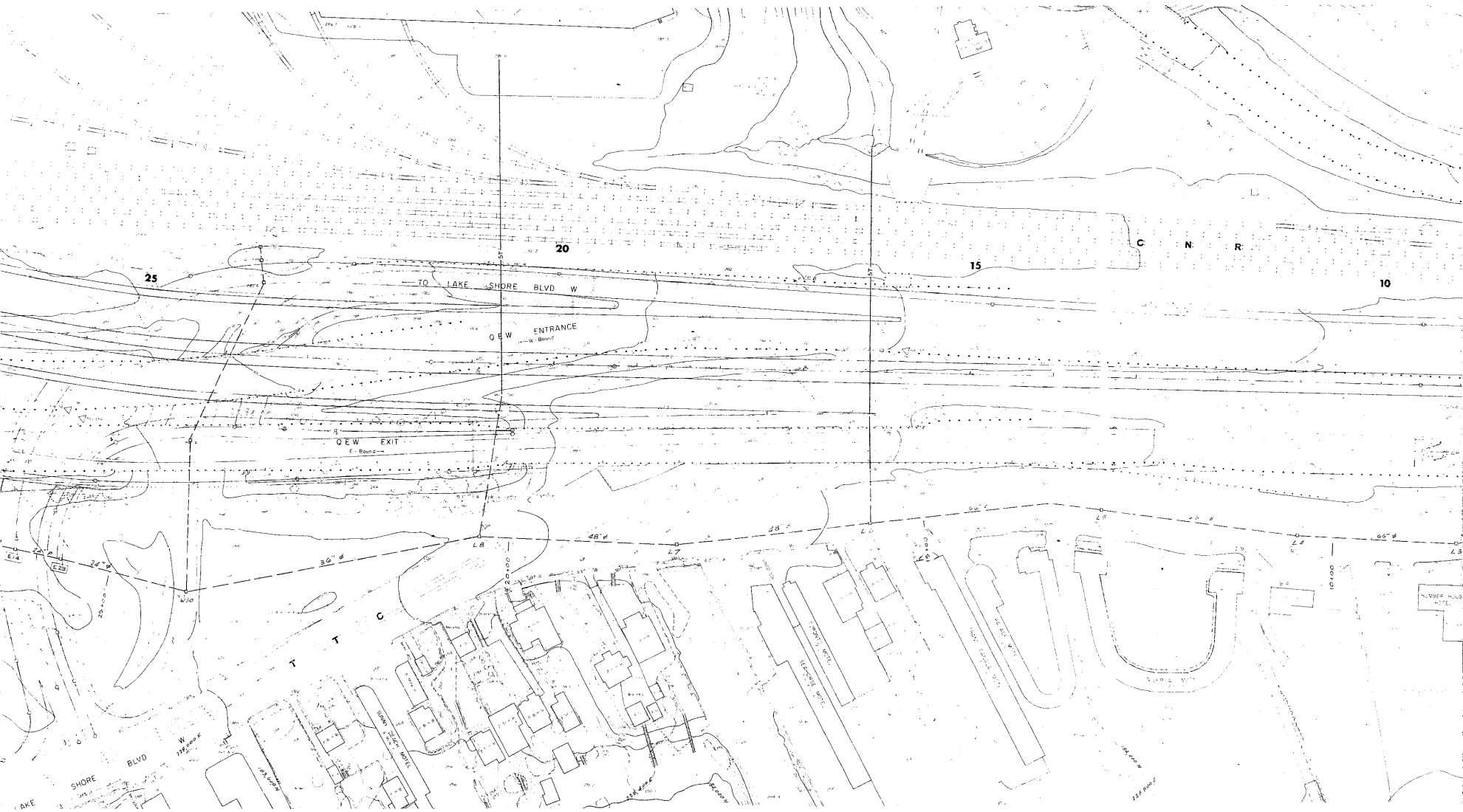
REMARKS: DOCUMENT TO BE UNFOLDED BEFORE MICROFILM

0-1-36 SEPT. 1975




SOME DEFECTS IN NEGATIVE DUE

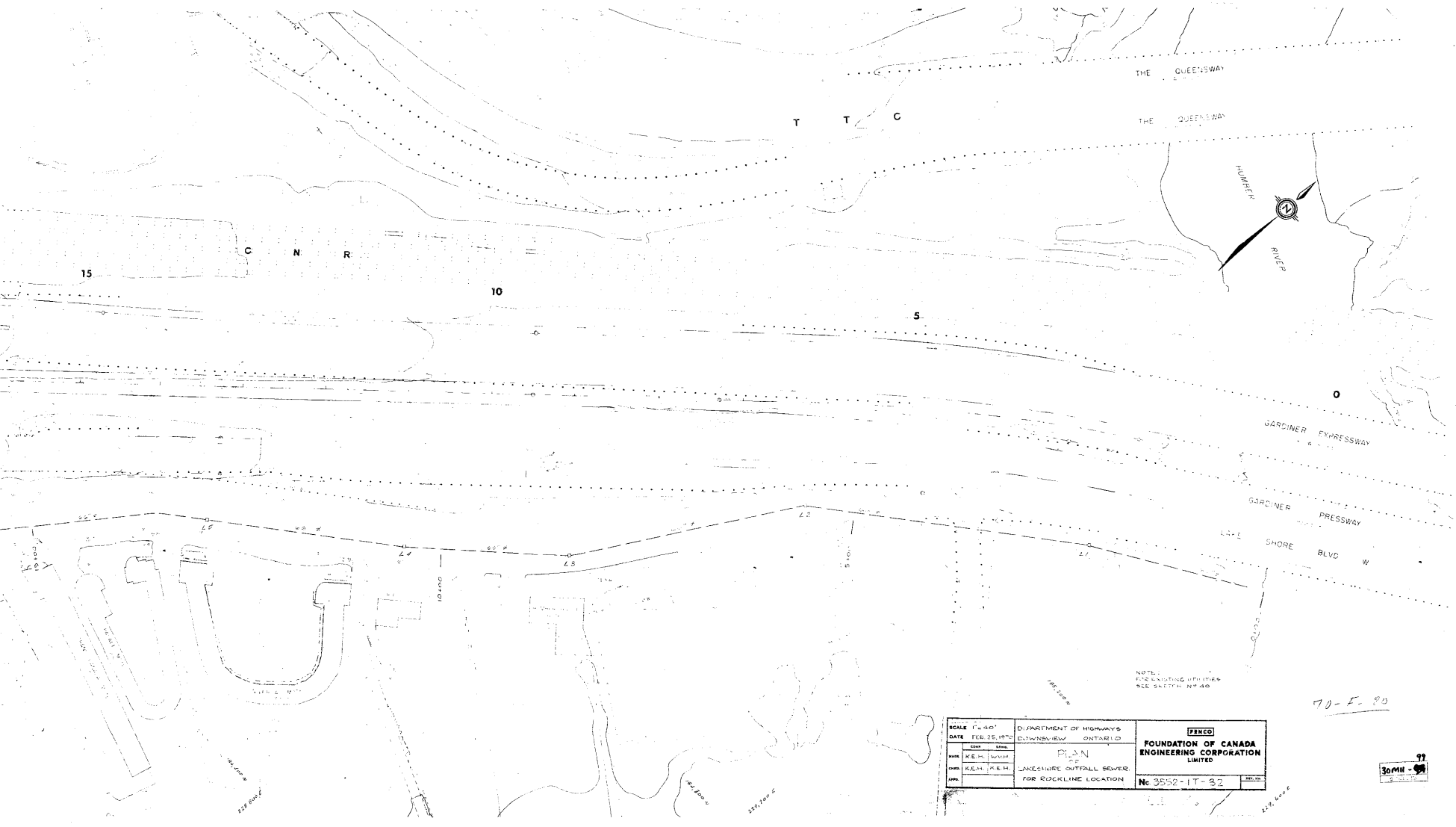
TO CONDITION OF ORIGINAL DOCUMENTS


25
20
15
10
C N R
TO LAKE SHORE BLVD W
QEW ENTRANCE
W - Bound
QEW EXIT
E - Bound
T T C
SUNNY BEACH MOTEL
SEAGRAVE MOTEL
LAKE SHORE BLVD W


| | | | |
|---|---|---|---|
| SCALE 1"=40' | DEPARTMENT OF HIGHWAYS | FENCO FOUNDATION OF CANADA ENGINEERING CORPORATION LIMITED |
| DATE FEB. 25, 1970 | DOWNSVIEW ONTARIO | |
| | PLAN OF LAKESHORE OUTFALL SEWER FOR ROCKLINE LOCATION | |
| DRAWN K.E.H. | W.W.H. | |
| CHKD. K.E.H. | K.E.H. | |
| APPD. | | No 3552-1T-32 |

SOME DEFECTS IN NEGATIVE DUE

TO CONDITION OF ORIGINAL DOCUMENTS




| | | | |
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| CHKD. K.E.H. | | | |
| APPD. | | | |

70-F-80

30 MH - 99