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63-F-2

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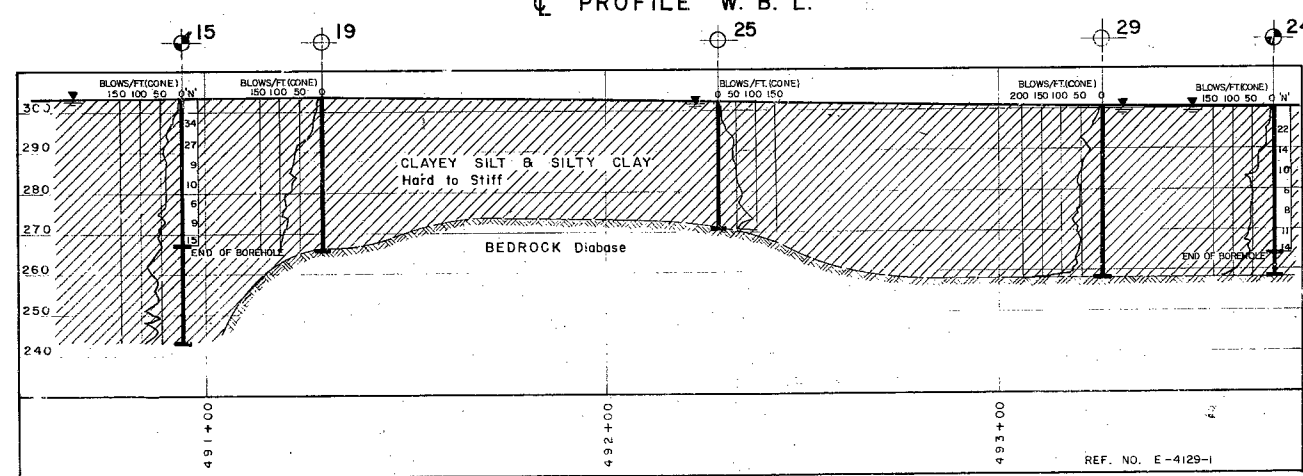
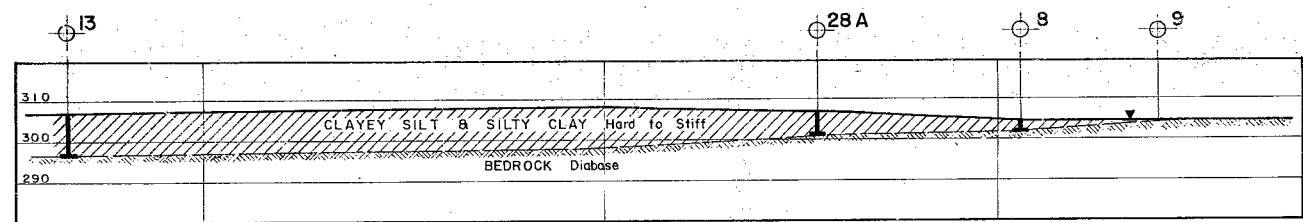
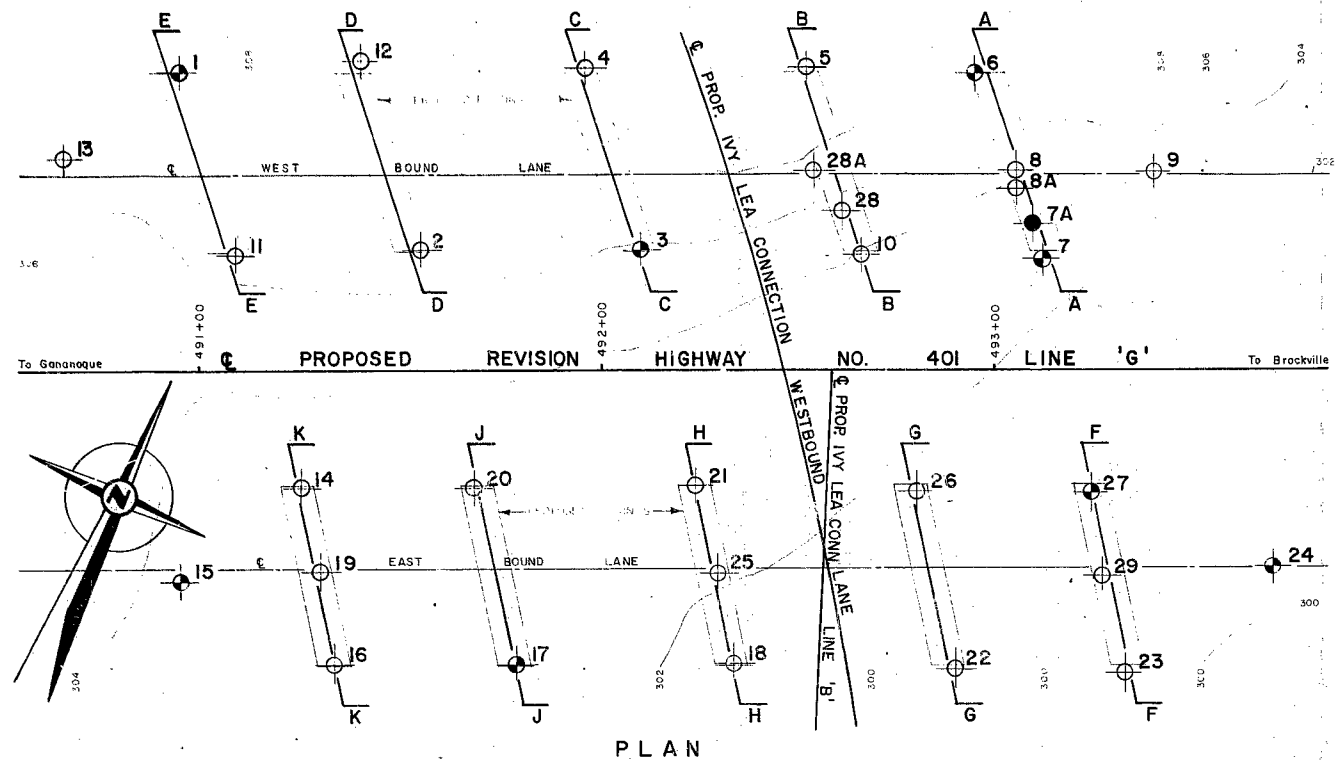
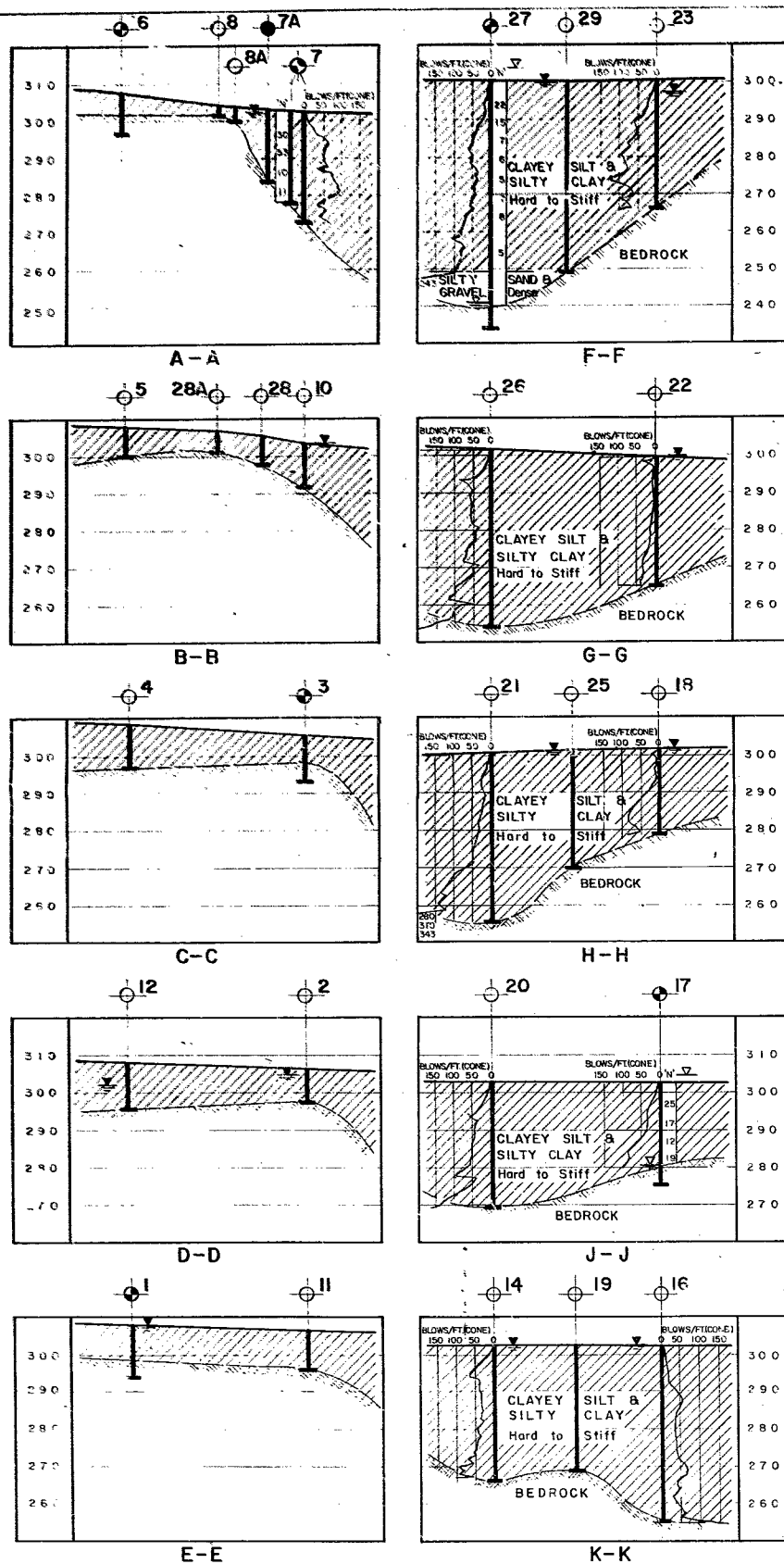
W.P. 172-61

#

HWY 401

IVY LEA

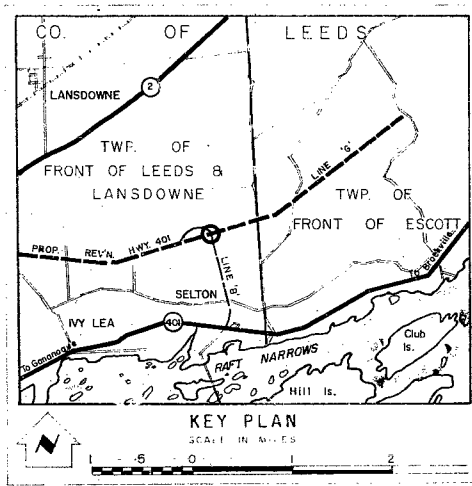
CONNECTION



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

NOTE
The complete soil investigation report for this structure may be examined at the Bridge Office and Foundation Office, Downsview, and at the KINGSTON District Office. The Department does not guarantee the accuracy of this report or the abridged version shown on these plans.

SCALE FOR PLAN, PROFILES & SECTIONS
20 10 0 20 40 FEET



- LEGEND**
- Bore Hole
 - Cone Penetration Hole
 - Bore & Cone Penetration Hole
 - Water Levels established at time of field investigation (Jan. 1963)
 - HEAD
 - ARTESIAN WATER ENCOUNTERED

NO.	ELEVATION	STATION	OFFSET
1	3 0 8.7	490+95	74' LT.
2	3 0 6.6	491+55	30' LT.
3	3 0 5.6	492+10	30' LT.
4	3 0 9.0	491+96	75' LT.
5	3 0 8.9	492+51	75' LT.
6	3 0 8.1	492+96	74' LT.
7	3 0 2.6	493+12	31' LT.
7A	3 0 3.0	493+10	37' LT.
8	3 0 4.5	493+07	50' LT.
8A	3 0 4.0	493+06	45' LT.
9	3 0 4.5	493+40	50' LT.
10	3 0 3.9	492+65	29' LT.
11	3 0 6.6	491+09	29' LT.
12	3 0 8.0	491+40	77' LT.
13	3 0 7.0	490+66	53' LT.
14	3 0 2.8	491+25	29' RT.
15	3 0 3.5	490+95	52' RT.
16	3 0 2.6	491+33	73' RT.
17	3 0 2.3	491+78	73' RT.
18	3 0 1.3	492+32	73' RT.
19	3 0 3.0	491+30	50' RT.
20	3 0 3.0	491+68	29' RT.
21	3 0 0.8	492+23	28' RT.
22	2 9 9.5	492+88	74' RT.
23	3 0 0.4	493+32	75' RT.
24	3 0 0.0	493+69	49' RT.
25	3 0 2.0	492+28	50' RT.
26	3 0 1.7	492+78	30' RT.
27	3 0 0.8	493+24	30' RT.
28	3 0 5.5	492+60	40' LT.
28A	3 0 7.0	492+53	50' LT.
29	3 0 0.5	493+27	51' RT.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

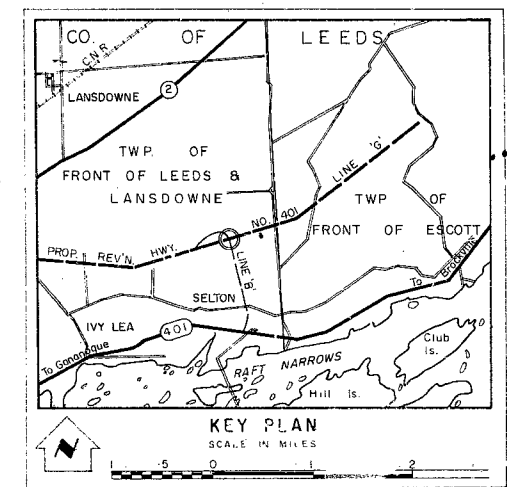
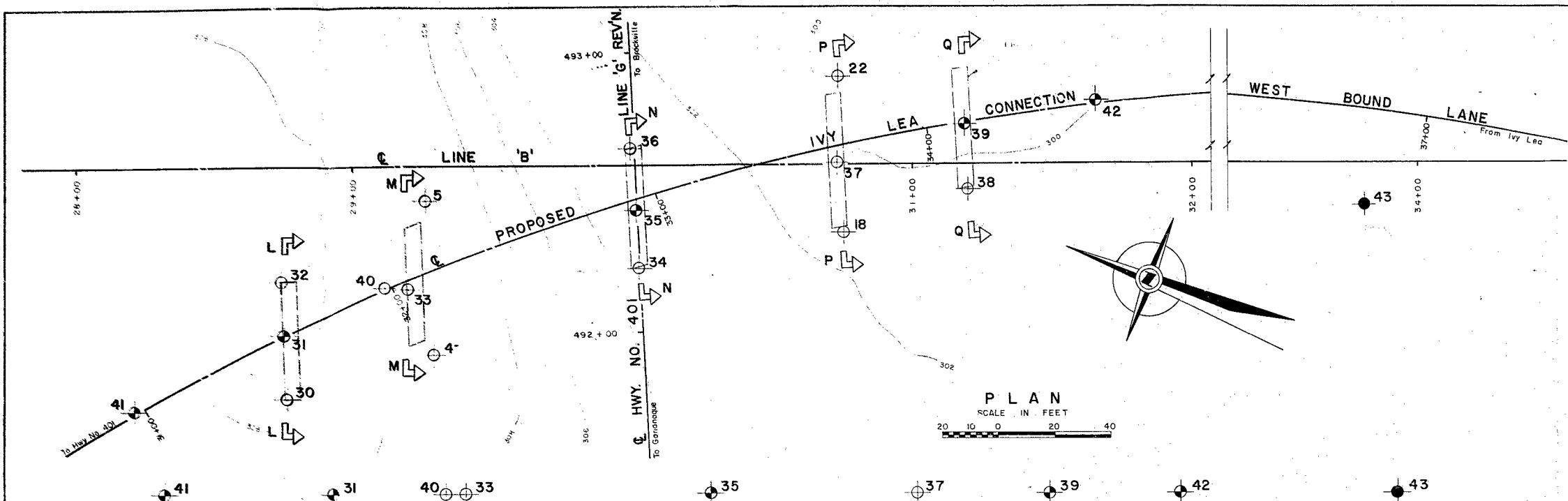
IVY LEA CONNECTION
LINE 'B'

KING'S HIGHWAY NO. 401 LINE 'G' REVISION DIST NO. 8
CO. LEEDS
FRONT OF LEEDS
TWP. B. LANSDOWNE LOT 23 CON I

BORE HOLE LOCATIONS & SOIL STRATA

DESIGN. B.G. CHECKED	SP. N. 172-61	63-F-2A
DRAWN. D.M. CHECKED	CB. N. 63-F-2	
DATE 20 FEBRUARY 1963		

APPROVED: *[Signature]*



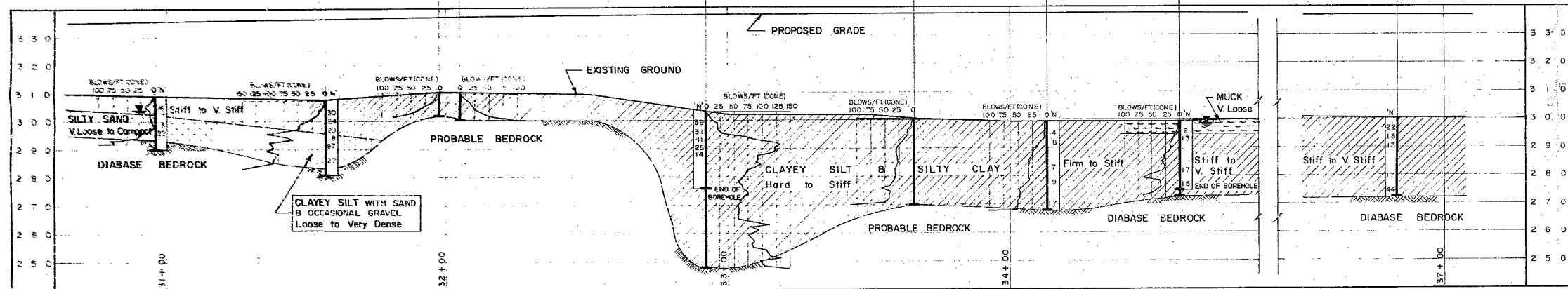
LEGEND

- Bore Hole
- ⊕ Cone Penetration Hole
- ⊙ Bore & Cone Penetration Hole
- Water Levels established at time of field investigation (Dec. 1963)

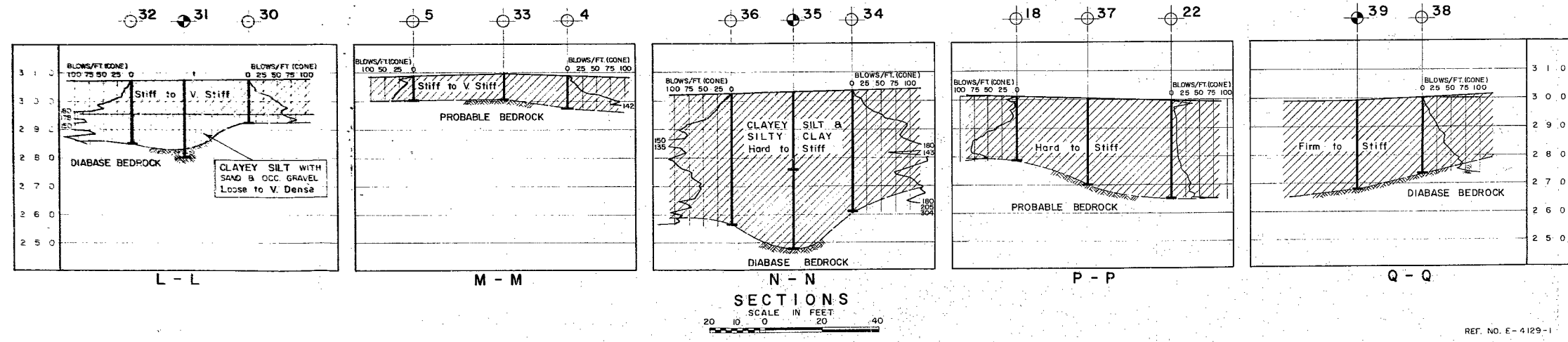
Note: Bore Holes No. 4, 5, 18 & 22 taken from Dwg. 63-F-2A
Line 'B' stations used.

NO.	ELEVATION	STATION	OFFSET
30	307.9	28+76	83' RT.
31	307.8	28+75	60' RT.
32	307.6	28+74	41' RT.
33	309.7	29+20	44' RT.
34	303.7	30+02	37' RT.
35	303.1	30+01	16' RT.
36	302.9	29+99	6' LT.
37	300.6	30+73	1' LT.
38	300.5	31+20	9' RT.
39	299.6	31+19	14' LT.
40	310.2	29+12	43' RT.
41	308.8	28+17	94' RT.
42	299.3	31+65	22' LT.
43	300.6	33+81	15' RT.

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 IVY LEA CONNECTION



SECTIONS

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & RESEARCH DIVISION - FOUNDATION SECTION			
IVY LEA CONNECTION			
WEST BOUND LANE			
KING'S HIGHWAY NO. 401 LINE 'G' REVISION		DIST. NO. 8	
CO. LEEDS		TWP. OF LEEDS & LANSDOWNE	
LOT 23		CON. I	
BORE HOLE LOCATIONS & SOIL STRATA			
SUB'D. P.P.	CHECKED	W.P. NO. 172-61	M.B.R. DRAWING NO.
DRAWN D.M.	CHECKED	JOB NO. 63-F-2	63-F-2B
DATE 15 JAN. 1964	SITE NO.	BRIDGE DRAWING NO.	
APPROVED <i>[Signature]</i>	CONT NO.		

REF. NO. E-4129-1

June 4th, 1963.

Mr. R.B. Allison,
County & Suburban Road Engr.,
Court House,
Kingston, Ontario.

Dear Sir:

Re: Sand Hill Road, Frontenac Co. Rd. #15,
Hwy. #15 E'ly.. County Contr. #63-F-2.

We are forwarding herewith the Soils design report and soils profile (#K808C-6). Since this is the only soils profile available, would you please return it to Mr. J.E. Gruspier after you have obtained all the necessary information from it.

This project crosses an old beach deposit wherein granular materials are readily available. Borrow materials are also quite plentiful. However, both cut and borrow may be quite bouldery and therefore a "Special" has been suggested to warn the Contractor that scraper operations may be difficult in certain instances.

Only one minor grade change has been proposed. This is to ensure adequate cover over a poorly drained area.

Yours truly,



T.J. Kovich,
Mun. Mat. & Res. Liaison Engr.

TJK/hl
c.c. G.E. French,
J.E. Gruspier,
T.J. Kovich,
Files.

This is a detailed map of the Kingston District in Ontario, Canada. The map shows the city of Kingston at the bottom center, situated on the north shore of Lake Ontario. To the north of Kingston are other major towns such as Smiths Falls, Belleville, and Trenton. The map illustrates the extensive Kingston Canal system, which includes the Rideau Canal and the Cataraugus Canal, connecting the city to the Ottawa River and Lake Ontario. Major roads, including the 401 and 402 highways, are shown. The international border with the United States is clearly marked to the east and south. A compass rose is located in the upper left corner, and a scale bar is in the bottom right corner. The map is labeled with various geographical features, including lakes, rivers, and numerous smaller towns and villages.

KINGSTON DISTRICT

SOILS DESIGN REPORT

Cty. Rd. 13

Hwy. 15 Easterly

2.65 Mi.

Proposed County Road Contract 63-F-2

Proposed Grading, Drainage & Granular Base

<u>Soils Plan and Profile</u>	<u>Station to Station</u>	<u>Township</u>
K808C-6	0+00 - 140+00	Pittsburgh

GENERAL DATA

This project is located in Frontenac County approximately 2 1/2 miles north of the village of Joyceville and east of Hwy. 15. The proposed county road contract is being set up to improve alignment and grades on steep hill sections and to provide adequate cover in low poorly drained areas.

The design and pre-engineering estimate are being prepared by Humphries and Burgham, Consulting Engineers. The advertising date is tentatively set for May 31, 1963.

PHYSIOGRAPHY

This project lies in the physiographic region known as "Leeds Knobs and Flats", an area consisting of knobs of granite and other Pre-Cambrian rocks surrounded by clay flats left by the Champlain Sea.

The western half of this proposed contract lies within an old beach deposit where gravel and sand pits are found adjacent to the present roadway. The low areas contain stiff light to heavy clays in the eastern portion of the job.

INVESTIGATIONS

A soils investigation was carried out within this

project during May, 1963, using a 12" truck-mounted power auger and hand equipment for locations inaccessible to the power auger.

Borings were placed along the edge of the existing gravel surface at 50' - 100' intervals in cuts and 200' intervals in fills. These were generally carried out to a minimum depth of 4' in fills and to 4' below profile in cuts unless stopped by boulders or bedrock. When bedrock was encountered, additional borings left and right of centre line were taken to give an indication of the bedrock profile.

Representative samples of the soils encountered were taken for laboratory testing and analysis. The results of the laboratory samples and all borings have been plotted on the profile for this project.

BORROW MATERIALS

The cut and fill quantities appear to balance fairly well for the first portion of the project east from Hwy. 15. From Sta. 78+00 easterly, the fill quantity required is almost 10 times that available from earth cuts.

Since the topography is very flat with low poorly drained areas it is expected that borrow materials will have to be hauled up to 1½ miles. This material will be a medium sand to sandy loam with large boulders.

A suggested special provision for inclusion in the contract is being placed in the recommendations for this project to indicate the presence of these boulders to the prospective contractors.

GRANULAR MATERIALS

Materials suitable for sand cushion are available in the cuts at the following stations or in the same formations to the south of the road.

Sta. 33 $\frac{1}{2}$ - medium sand with few large boulders (adjacent to Keys Pit).

Sta. 66 $\frac{1}{2}$ - medium to coarse gravel with many large boulders and a few medium sand pockets (opposite Doyle Pit #1).

Sta. 76 $\frac{1}{2}$ - medium sand to fine gravel with some boulders and sandy loam (opposite Glen Lawrence or Doyle pit #2).

Materials suitable for crushing purposes are available in the Doyle pits at an average haul distance of less than one mile.

GRADE LINE

The grade line shown on the soils profile appears satisfactory from a soils viewpoint with the exception of one poorly drained area. The grade from Sta. 121 $\frac{1}{2}$ to Sta. 133 $\frac{1}{2}$ has been raised a maximum of 8" to provide a minimum cover of 3.5' $\frac{1}{2}$ and the vertical curve at Sta. 123 $\frac{1}{2}$ 00 has been changed from a 600' to an 800' V.C.

RECOMMENDATIONS

1. Type of Granular Contract

It is recommended that this project be called as "GBC Class 'A' and Sand Cushion Contract".

2. Depths and Widths of Granular Materials

Granular materials need only be placed 3' beyond the proposed edge of pavement with earth shoulders since most fill materials

are free draining. The following total depths should consist of 4" GBC "A" over Sand Cushion unless otherwise noted:

(a) New Construction

Earth cuts	----	21" Granular
Granular cuts	----	6" GBC "A" only
Rock cuts & fills	---	12" Granular
Earth fills	----	15" Granular
Granular fills	----	4" GBC "A" only

(b) Over Existing Gravel Surfaces

Fills less than 15" -- subexcavate to provide for 21".
Fills up to 30" -- all granular material.
Fills greater than 30" -- earth or rock fill with granular as per (a) above.

3. Culvert Backfill

All culverts to be treated for frost penetration will require treatment with sand cushion material to a depth of 5' below profile grade.

4. "Special Provisions" re Granular Materials

The "Special Provisions" currently used by the Department for the compaction of sand cushion to 100% of Proctor density and for the stockpiling of crushed aggregates, should be included in the contract documents.

5. Treatment of Grade Points

All transverse and longitudinal transitions between cut and fill sections should be treated to a depth of 36" as described in the Department standards. At earth cut sections backfill

to transitions should consist of earth similar to that placed in the adjacent fills. Where rock transitions occur, backfill will be sand cushion or fine blasted rock as per the Department standards. Grade point treatments have been plotted on the soils profile.

6. Culvert Types

All culverts required can be of flexible CIP or standard open footing concrete type. No foundation problems are anticipated.

7. Topsoil

The average depth of topsoil through revision areas have been noted on the soils profile for design estimating purposes. The proposed new centre line crosses or follows the existing ditchline in some areas. Where this occurs all topsoil in the ditches, regardless of the depth of fill to be placed, should be removed to avoid any differential settlement of the future roadbed.

8. Bouldery Cut Materials

There are several bouldery cuts within the limits of this project which are expected to cause some excavation difficulties if scraper equipment is used. These locations are indicated on the soils profile.

It is recommended that the following item be included in the "Special Provisions to the Contract".

"The Contractor is hereby advised that several cuts and some of the borrow sources within the vicinity of this contract are expected to consist of bouldery materials. Some difficulty

is expected if scraper operations are to be carried out. Many boulders are expected to be over one cubic yard in size and will require drilling and shattering before removal."

9. Treatment of Bouldery Subgrades in Cut Sections

It is expected that the subgrade in some cut sections will require special treatment due to a high boulder content. This may fall into ^{two} categories.

- (a) isolated large boulders within an otherwise boulder-free cut.
- (b) cut material contains a high percentage of smaller boulders generally up to 12" - 18" maximum size.

The following treatments should be applied as required during construction for these conditions. Since the type and extent of treatment cannot be definitely determined at this time, no quantity is suggested for inclusion in the pre-engineering estimate. Payment should be as bid for earth and rock excavation.

- (a) A special standard, "Treatment for Boulders in the Subgrade of Cut Sections", is included with this report. While it will not be necessary to use this standard for estimating purposes, it should be included in the contract drawings for the use of the constructing personnel in treating these areas as they occur. In applying this standard the normal depth of excavation would be 21". Any further excavation required to remove isolated boulders that occur within 3' of profile grade should be back-filled with boulder-free material similar to that in the remainder of the cut.

- (b) When the entire cut contains numerous boulders of various sizes up to 12" - 18" maximum a different type of treatment should be considered. In this case the entire cut should be excavated to 36" below profile grade and back-filled to sugrade elevation with boulder-free earth.

The above is for the information of the construction personnel only and is not to be included in the tender documents as a special provision.

10. French Drains

In those sections where the shoulders will be constructed with impervious soils rather than granular type materials, it is recommended that french drains be placed alternatively on either side of the highway at 100' intervals (i.e., 200' apart on the same side). These drains will be constructed to a minimum width of 4' after the earth shoulders have been built to avoid possible contamination. The inner ends must form a junction with the granular base course and the outer ends must terminate at the slope line of the embankment (DHO Spec. Form #214-08). French drains should be placed where necessary at the low ends of cuts and in the bottom of the sag in fills. This treatment is to be applied at the following locations - Sta. 0/70 to Sta. 8/50, Sta. 92/00 to Sta. 98/00, and Sta. 107/00 to Sta. 109/00.

11. Organic Deposits

Two shallow muskeg deposits occur at Sta. 15/ and at Sta. 22/. The deposit from Sta. 14/20 to Sta. 15/50 has a maximum depth of 4' of black muck over fine medium sand. The maximum depth

of fill to be placed in this area is 6'.

The other deposit from Sta. 21/60 to 22/10 is mainly 3' of black mucky topsoil over a stiff medium clay. Nine feet of fill is to be placed in this area. A culvert location at Sta. 22/00 will require excavation of a small portion of this material to provide a firm foundation. The remainder of the organic materials need not be excavated. Both muskeg deposits are to be ridden with a rock or sandy type fill.

Submitted by:

R. D. Gerow

R. D. Gerow
Project Soils Supervisor

Checked by:

T. G. Smith

T. G. Smith
Senior Soils Engineer

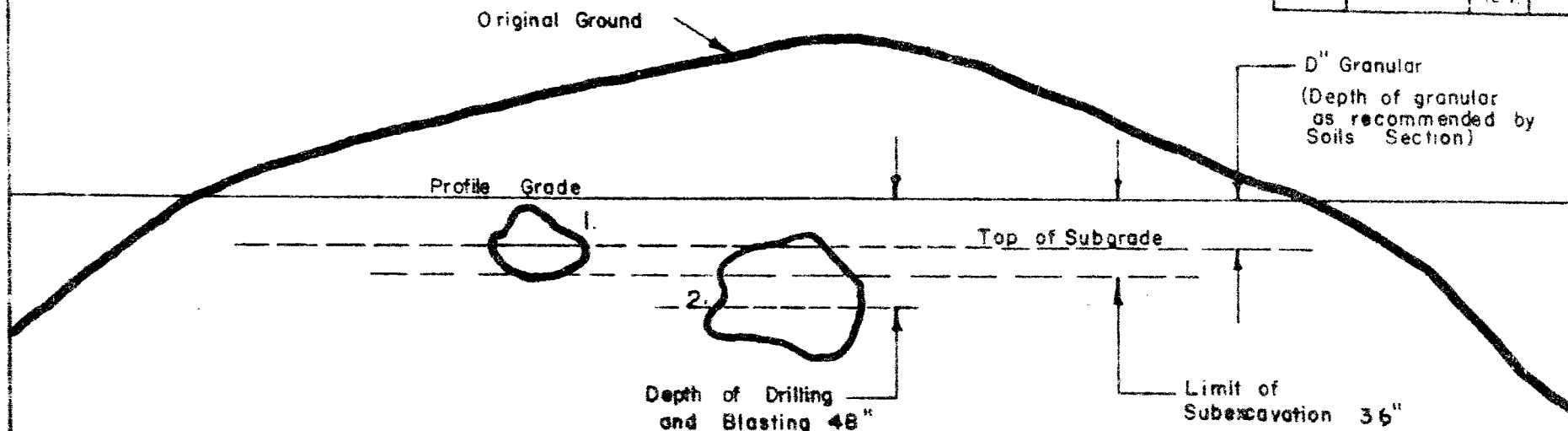
May 27, 1963

RDG/jfj

No. DD-

DATE

REV.

**NOTES:**

MATERIAL TO 0" BELOW PROFILE GRADE TO BE EXCAVATED FULL WIDTH AFTER TREATMENT OF BOULDERS HAS BEEN CARRIED OUT AS INDICATED HERE UNDER. EXCAVATIONS ARE TO BE BACKFILLED TO SUB-GRADE ELEVATION WITH SIMILAR BOULDER FREE MATERIAL FROM ADJACENT AREAS.

1. Boulders partially within 0" of profile grade but no deeper than 36"- REMOVE COMPLETELY
2. Boulders partially within 0" of profile grade but deeper than 36" below profile grade- DRILL AND SHATTER TO A DEPTH OF 48"

CONSTRUCTION STANDARD-NOT TO BE USED FOR DESIGN

Profile grade is the top of the granular base course at the C of the pavement, prior to the placing of the 3/8 in. crushed gravel, or pavement driving surface

W. P. or CONTRACT Nos. _____

DEPARTMENT OF HIGHWAYS-ONTARIO

**TREATMENT FOR BOULDERS
IN THE SUBGRADE OF
CUT SECTIONS.**

APPROVED:

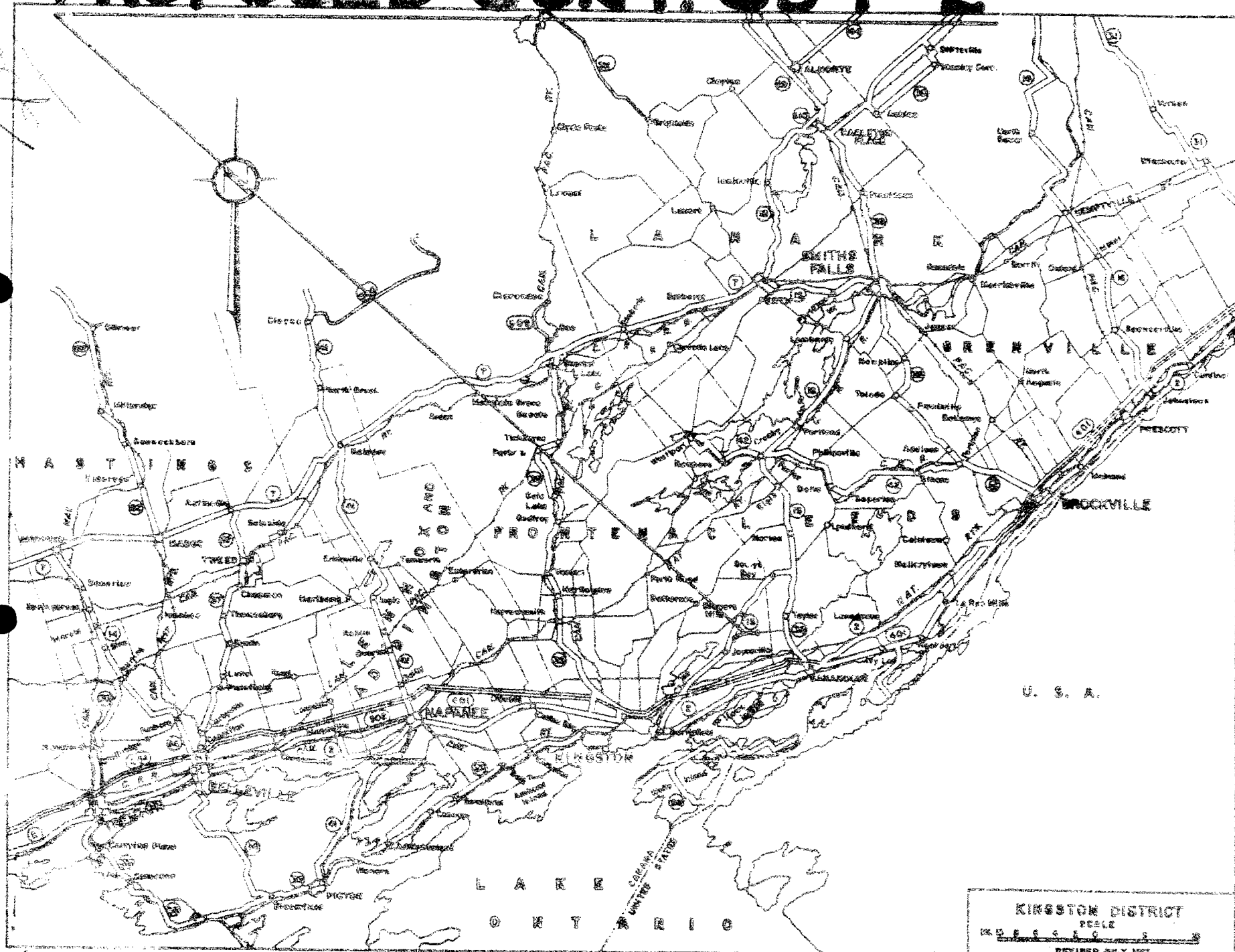
Sr. Project Design Engineer

Date

Road Design Engineer

Date

PROPOSED CONT. 63-F-2



SOILS DESIGN REPORT

Cty. Rd. 13

Hwy. 15 Easterly

2.65 Mi.

Proposed County Road Contract 63-F-2

Proposed Grading, Drainage & Granular Base

<u>Soils Plan and Profile</u>	<u>Station to Station</u>	<u>Township</u>
K808C-6	0+00 - 1+00	Pittsburgh

GENERAL DATA

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The western half of this proposed contract lies within an old beach deposit where gravel and sand pits are found adjacent to the present roadway. The low areas contain stiff light to heavy clays in the eastern portion of the job.

INVESTIGATIONS

A soils investigation was carried out within this

project during May, 1963, using a 12" truck-mounted power auger and hand equipment for locations inaccessible to the power auger.

Borings were placed along the edge of the existing gravel surface at 50' - 100' intervals in cuts and 200' intervals in fills. These were generally carried out to a minimum depth of 4' in fills and to 4' below profile in cuts unless stopped by boulders or bedrock. When bedrock was encountered, additional borings left and right of centre line were taken to give an indication of the bedrock profile.

Representative samples of the soils encountered were taken for laboratory testing and analysis. The results of the laboratory samples and all borings have been plotted on the profile for this project.

BORROW MATERIALS

The cut and fill quantities appear to balance fairly well for the first portion of the project east from Hwy. 15. From Sta. 78+00 easterly, the fill quantity required is almost 10 times that available from earth cuts.

Since the topography is very flat with low poorly drained areas it is expected that borrow materials will have to be hauled up to 1½ miles. This material will be a medium sand to sandy loam with large boulders.

A suggested special provision for inclusion in the contract is being placed in the recommendations for this project to indicate the presence of these boulders to the prospective contractors.

GRANULAR MATERIALS

Materials suitable for sand cushion are available in the cuts at the following stations or in the same formations to the south of the road.

Sta. 33½ - medium sand with few large boulders (adjacent to Keys Pit).

Sta. 66½ - medium to coarse gravel with many large boulders and a few medium sand pockets (opposite Doyle Pit #1).

Sta. 76½ - medium sand to fine gravel with some boulders and sandy loam (opposite Glen Lawrence or Doyle pit #2).

Materials suitable for crushing purposes are available in the Doyle pits at an average haul distance of less than one mile.

GRADE LINE

The grade line shown on the soils profile appears satisfactory from a soils viewpoint with the exception of one poorly drained area. The grade from Sta. 121½ to Sta. 133½ has been raised a maximum of 8" to provide a minimum cover of 3.5" and the vertical curve at Sta. 123/00 has been changed from a 600' to an 800' V.C.

RECOMMENDATIONS

1. Type of Granular Contract

It is recommended that this project be called as "GBC Class 'A' and Sand Cushion Contract".

2. Depths and Widths of Granular Materials

Granular materials need only be placed 3' beyond the proposed edge of pavement with earth shoulders since most fill materials

are free draining. The following total depths should consist of 4" GBC "A" over Sand Cushion unless otherwise noted:

(a) New Construction

Earth cuts	----	21" Granular
Granular cuts	----	6" GBC "A" only
Rock cuts & fills	---	12" Granular
Earth fills	----	15" Granular
Granular fills	----	4" GBC "A" only

(b) Over Existing Gravel Surfaces

- Fills less than 15" -- subexcavate to provide for 21".
Fills up to 30" -- all granular material.
Fills greater than 30" -- earth or rock fill with granular as per (a) above.

3. Culvert Backfill

All culverts to be treated for frost penetration will require treatment with sand cushion material to a depth of 5' below profile grade.

4. "Special Provisions" re Granular Materials

The "Special Provisions" currently used by the Department for the compaction of sand cushion to 100% of Proctor density and for the stockpiling of crushed aggregates, should be included in the contract documents.

5. Treatment of Grade Points

All transverse and longitudinal transitions between cut and fill sections should be treated to a depth of 36" as described in the Department standards. At earth cut sections backfill

to transitions should consist of earth similar to that placed in the adjacent fills. Where rock transitions occur, backfill will be sand cushion or fine blasted rock as per the Department standards. Grade point treatments have been plotted on the soils profile.

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9. Treatment of Boulder Subgrades in Cut Sections

It is expected that the subgrade in some cut sections will require special treatment due to a high boulder content. This may fall into ^{two} categories.

- (a) isolated large boulders within an otherwise boulder-free cut.
- (b) cut material contains a high percentage of smaller boulders generally up to 12" - 18" maximum size.

The following treatments should be applied as required during construction for these conditions. Since the type and extent of treatment cannot be definitely determined at this time, no quantity is suggested for inclusion in the pre-engineering estimate. Payment should be as bid for earth and rock excavation.

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Submitted by:

R. D. Gerow

R. D. Gerow
Project Soils Supervisor

Checked by:

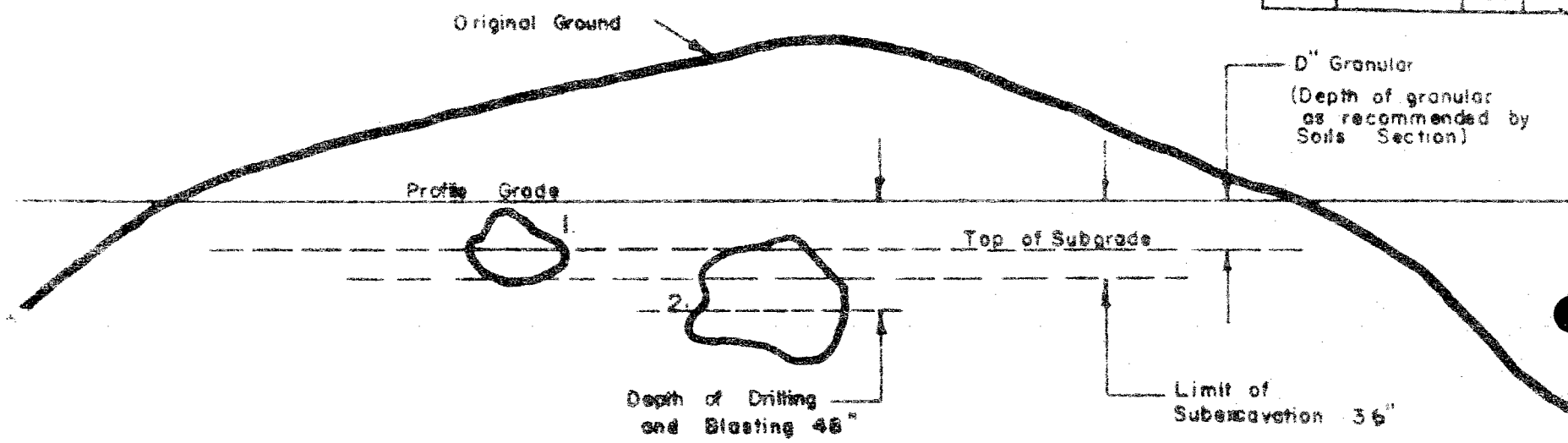
T. G. Smith

T. G. Smith
Senior Soils Engineer

May 27, 1963

RDG/jfj

No. DD-		
DATE		RE /



NOTES:

MATERIAL TO D" BELOW PROFILE GRADE TO BE EXCAVATED FULL WIDTH AFTER TREATMENT OF BOULDERS HAS BEEN CARRIED OUT AS INDICATED HERE UNDER. EXCAVATIONS ARE TO BE BACKFILLED TO SUB-GRADE ELEVATION WITH SIMILAR BOULDER FREE MATERIAL FROM ADJACENT AREAS

1. Boulders partially within D" of profile grade but no deeper than 36"- REMOVE COMPLETELY
2. Boulders partially within D" of profile grade but deeper than 36" below profile grade- DRILL AND SHATTER TO A DEPTH OF 48"

CONSTRUCTION STANDARD-NOT TO BE USED FOR DESIGN

Profile grade is the top of the granular base course at the C of the pavement, prior to placing of the 7/11 in crushed gravel or pavement driving surface

CONTRACT NOS

DEPARTMENT OF HIGHWAYS-ONTARIO	
TREATMENT FOR BOULDERS IN THE SUBGRADE OF CUT SECTIONS.	
APPROVED	
Sr Project Design Engineer	Date
Good Design Engineer	Date

Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

Attention: Mr. S. McCombie

Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials & Research Division.
March 1, 1963.

D.H.O. FOUNDATION INVESTIGATION REPORT -
Proposed Structure at Proposed Connection of
Ivy Lea Road (Line B) and Revision Hwy. 401,
W.J. 63-F-2 -- Dist. No. 8 -- W.P. 172-61.

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

We believe that you will find the factual data
and recommendations contained therein, adequate for your
future design work. Should there be any queries with
respect to this project, please feel free to contact
our Office.

AGS/MdeF
Attach.

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
J. Ford
E. A. Cash
J. E. Gruspier
A. Watt

Foundations Office
Gen. Files.✓

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGR.

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-

FOUNDATION INVESTIGATION

For

Proposed Structure at Proposed Connection of
Ivy Lea Road (Line B) and Revision Hwy. 401,
W.J. 63-F-2 -- Dist. No. 8 -- W.P. 172-61.

1. INTRODUCTION:

A foundation investigation for the proposed structure at the proposed connection of Ivy Lea Road (Line B) and revised Hwy. 401 (Line G) Station 492+00, was requested by the Bridge Location Engineer in a memorandum dated December 27, 1962.

This report contains the field and laboratory findings, together with the recommendations for the foundations of the proposed structure.

2. DESCRIPTION OF SITE AND GEOLOGY:

The proposed site is located approximately one mile north of the International Bridge near Ivy Lea, in the Township Front of Leeds and Lansdowne and County of Leeds. The area of the bridge location is entirely bush country and part of it is a swamp. It was heavily covered with snow at the time of this investigation. Rock outcrops or knobs, are visible in the area at a few points.

Geologically, the site is located in the area known as Leeds Knobs and Flats. This region consists primarily of scattered knobs of rock between which lie clay deposits laid down by the Champlain Sea. The clay plains are typically gently undulating farmland. The clay is grey in colour and very slightly calcareous.

2. DESCRIPTION OF SITE AND GEOLOGY: (cont'd.) ...

Bedrock in the area consists of various types of altered sedimentary rocks, crystalline limestones and dolomites, gneisses and quartzites of Precambrian age, which are intruded, metamorphosed and deformed by bodies of diabase, granite and other igneous rocks. The surface elevation of bedrock can vary appreciably within small distances.

3. DESCRIPTION OF FIELD AND LABORATORY WORK:

Field work consisted of nine sampled boreholes and thirty-one dynamic Cone Penetration Tests. The location of these holes was chosen from the given Plan No. E-4129-1.

The exploration programme was carried out by standard core drill machines adapted for soil sampling. Conventional wash boring procedures were followed. Samples were recovered at required depths by means of a 2-inch O.D. split-spoon sampler. The dimension of this spoon sampler and the energy used in driving it, conform to the requirements of the Standard Penetration Test. Wherever possible, in-situ vane tests were carried out to determine the shear strength of the subsoil deposits. Rock samples were obtained by the use of AXT core barrel.

Samples were visually examined and identified in the field before transportation to the laboratory. Tests were carried out in the laboratory on a selection of samples for the determination of Atterberg limits, moisture content and grain size distribution.

Laboratory and field test results have been summarized and are included in this report in Appendix I.

4. SUBSOIL CONDITIONS:

4.1) General:

The investigation has shown that, in general, the subsoil stratification can be considered as uniform but irregular. Apart from a thin layer of topsoil and roots, a layer of cohesive material consisting of silty clay to clayey silt was encountered above bedrock profile. One exception to this, is the condition in borehole 27, where a dense layer of sand and fine gravel was encountered below the layer of cohesive material and just above bedrock. It was intercepted between elevations 239' and 250'.

The subsoil stratification is considered as irregular because the bedrock profile varies from place to place and the thickness of the cohesive layer varies with it.

Following paragraphs give additional details for
Silty Clay and Clayey Silt,
Bedrock.

4.2) Silty Clay and Clayey Silt:

A layer of silty clay to clayey silt material was encountered in all boreholes. It contains, in places, traces of organic root material and fine sand at its upper surface. The thickness of this layer varies from place to place, depending on the bedrock profile. At its deepest in borehole 27, it extends to as low as elevation 250', while in borehole 15, its depth is undetermined. The consistency of this layer is hard to very stiff at its upper surface, probably due to desiccation, becoming stiff and very stiff at greater depths. The minimum value of shear

cont'd. /4 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.2) Silty Clay and Clayey Silt: (cont'd.) ...

strength is 1360 p.s.f. and the maximum value is in excess of 2000 p.s.f., as measured by the field vane test. The material in this layer has a wide range of plasticity, varying from low to high. The average values of Atterberg limits and moisture content for the clayey silt portion are 29.3%, 16.8%, and 24%, respectively, and for the silty clay, are 47.2%, 26.3%, and 32.3%, respectively. The color of the material in this layer is brown in the top 8 to 12 feet, changing to grey at greater depths.

4.3) Bedrock:

Below the above-mentioned layer, diabase type of bedrock was encountered in all the boreholes except borehole 15, which lies in the area of the approach fill. It is grey-colored rock with pink ferrous intrusions. It was proved in the following boreholes by obtaining AXT size core samples:

<u>Borehole No.</u>	<u>Bedrock Elevations (Feet)</u>
1	298.9
3	298.6
6	302.2
17	280.4
27	239.0

cont'd. /5 ...

5. GROUND WATER CONDITIONS:

Water level observed during this investigation was found to be close to the ground surface. As mentioned earlier, the site is undulating and swampy. Exact location of shallow creeks and ditches in the area could not be observed as it was heavily covered with snow.

Given below, are the elevations for the water level as observed in some of the boreholes. In the remaining boreholes no water level was observed.

<u>Borehole No.</u>	<u>Ground Water Elevation (Feet)</u>
1	307.2
2	305.0
4	309.0
5	308.9
7	301.9
7A	302.3
12	302.0
13	307.0
14	302.5
15	303.5
16	302.6
17	302.3
18	301.3
19	303.0
22	299.5
23	297.4
24	300.0
25	301.8
29	300.0

cont'd. /6 ...

5. GROUND WATER CONDITIONS: (cont'd.) ...

An artesian water condition was observed in boreholes 17 and 27. Given below, are the elevations of depths at which the condition was observed and the heights to which the water rose in the casing.

<u>Bore Hole No.</u>	<u>Approx. Elev. of Encounter.</u>	<u>Height of Water in Casing.</u>
17	280.0	303.6
27	240.0	303.2

6. DISCUSSION AND RECOMMENDATIONS:

It is proposed to construct a structure to carry proposed Line G of Hwy. 401 over proposed Line B of Ivy Lea Road.

In the preceding paragraphs, the characteristics of different subsoil strata are described. It is clear that the ground surface is undulating and the soil stratification is irregular with regard to the bedrock profile.

The proposed grade for Ivy Lea Road is around 304' and the grade for Hwy. 401 is 327'. This will necessitate approach embankments to the bridge structure of up to 23 feet above the existing ground level.

No stability problems are expected with embankments of that height.

From the information presented in the borehole logs and especially from the cross-sections and longitudinal sections shown on Drawing No. 63-F-2A, it is clearly visible that the depth

cont'd. /7 ...

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

to bedrock along the eastbound and the westbound lanes is substantially different and, consequently, the footings of the two bridges will require different solutions.

Because of the relative proximity (up to 12 ft.) of bedrock along the westbound lane, spread footings founded on bedrock, are recommended. A safe load of up to 20 T/sq.ft. can be used. In places where bedrock is at very shallow depth, provision for adequate frost protection should be made.

Section A-A at the east abutment location of the westbound lane shows bedrock to be dipping quite rapidly from the centre towards south. Slightly more than half of the footing would be founded on bedrock, while the remainder would have to be founded on the clayey silt. Such an arrangement would result in cracking of the footing and probably, in undesirable differential settlements. It is, therefore, recommended that either the silty clay be excavated and the footing be founded on bedrock, or piles driven to bedrock, be used.

The conditions along the bridge of the eastbound lane are quite different because the depth to bedrock is considerably greater. The silty clay layer is of variable thickness and, consequently, any settlements that would occur would be non-uniform. The shear strength of the silty clay layer decreased with depth, and tests also indicate that the clay is quite sensitive. It is, therefore, recommended that the abutments and piers of the eastbound lane bridge be founded on piles driven to bedrock. A load of up to 70 tons per pile can be used for 14 BP 73 H-piles.

cont'd. /8 ...

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

Due to the irregularity of bedrock, it is impractical to determine in advance, the precise pile lengths. It will, therefore, be necessary to include in the Contract, a special provision covering this item.

7. CONCLUSIONS:

- (a) The site of the proposed structure is undulating and partly swampy. The investigation has shown that an overburden of silt and clay material overlies diabase type of bedrock. The bedrock profile is quite irregular.
- (b) The existing water table at the time of the investigation, coincided with, or was very close to the ground surface. Artesian water was encountered in B.H.'s 17 and 27 in the granular material just overlying bedrock. This condition should have no bearing on the proposed foundation.
- (c) Spread footings founded on bedrock are recommended for the westbound lane structure. Recommendations for some details are given under "Discussion and Recommendations". A safe load of up to 20 T/sq.ft. can be used.

Footings resting on piles driven to bedrock, are recommended for the eastbound lane structure. A safe load of up to 70 tons per 14 BP 73 H-pile can be used.

cont'd. /9 ...

7. CONCLUSIONS: (cont'd.) ...

(d) No embankment stability problems are anticipated for the proposed fill heights.

(e) No dewatering problems are expected.

8. MISCELLANEOUS:

The field work was undertaken during the period from January 14, 1963 to February 1, 1963, by Mr. B. Ghadiali, who also prepared this report, under the supervision of Mr. K. Selby.

Equipment was owned and operated by Longyear Drilling Co., North Bay, and Johnston Drilling Co., Ltd., of Ottawa.

March 1963

APPENDIX I.

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 :-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
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

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
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_P}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

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

STRESS AND STRAIN

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

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_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
β	ANGLE OF SLOPE TO HORIZONTAL

MEMORANDUM

Information with Paul Payer
Nov 28/63.
On Devata.

TO: Mr. A. G. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

FROM: A. P. Watt

DATE: November 22, 1963.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 172-61
Bridge Site #17-164
Ivy Lea Bridge Rd. Interchange U'Pass
8.4 Miles East of Jct. Hwy. 2 Gananoque
Hwy. 401
District #8

Would you kindly arrange to have a foundation investigation conducted at the above location. I have enclosed one copy of the site plan number E 4129-1 with the probable footing locations marked in red and a profile C 21-46 of the Ivy Lea Connection. Would you also have additional borings made south of the site along the center line of Ivy Lea Connection West-bound Lane to check the approach stability.

Bedrock will be near the surface and vary considerably.

The scheme of an Underpass at this location is dependent upon your review of the approach fills for stability. Therefore an answer at any early date would be very much appreciated.

A. P. Watt

APW/es

A. P. Watt,
Bridge Location Engineer.

cc. N. D. Smith
cc. R. Fitzgibbon

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

FROM: Bridge Division,
Downsview, Ontario.

DATE: October 13, 1964.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 172-61-2
Bridge Site 17-164
Ivy Lea Bridge Road Interchange Overpass
(Westbound Lane)
8.4 Miles East of Hwy. 2
Hwy. 401 - Dist. 8

Enclosed please find one copy of the preliminary
plan D-5391-P-2 for the above noted structure.

Would you kindly review the bridge foundations
proposed and inform us if they are satisfactory.

APW/sp

Apw
A. P. Watt,
Regional Bridge Location Engineer.

OK 12.2.64

MEMORANDUM

25 15 550

To: Mr. A. G. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Bldg.

FROM: Bridge Division,
Downsview, Ontario.

DATE: October 13, 1964.

OUR FILE REF.

IN REPLY TO

SUBJECT: W.P. 172-61-1
Bridge Site 17-164
Ivy Lea Bridge Road Interchange Overpass
(Eastbound Lane)
8.4 Miles East of Hwy. 2
Hwy. 401 - Dist. 8

65-7-2

Enclosed please find one copy of the preliminary plan
D-5313-P-1 for the above noted structure.

Would you kindly review the bridge foundation proposed
and inform us if they are satisfactory.

Apwatt

APW/sp

A. P. Watt,
Regional Bridge Location Engineer.

OK. *Watt*

BA 1603A

CC: GEN. FILES

23-65-250

DEPARTMENT OF HIGHWAYS ONTARIO

MEMORANDUM

To: Mr. A. M. Toye,
Bridge Engineer,
Bridge Division.

FROM: Mr. A. G. Stermac,
Principal Foundation Engr.,
Foundation Section,
Materials and Research Div.

Attention: Mr. S. McCombie

DATE: December 23, 1963

OUR FILE REF.

IN REPLY TO

SUBJECT:

SUPPLEMENTARY FOUNDATION REPORT -
W.J. 63-F-2 - W.P. 172-61
Proposed Structure at Ivy Lea
Connection Line 'B' and Proposed
Revision of Hwy. #401, Line 'G',
District #8

(Note: Please include with Report
W.J. 63-F-2.)

Since the original foundation report for the above-mentioned structure was prepared in March 1963, some changes in proposal have occurred which necessitated a further foundation investigation in the field. This foundation investigation was requested verbally by Mr. A. Watt in November 1963, and was carried out by this Section during the period December 3rd to 13th.

It is now proposed that Ivy Lea Connection will cross over Hwy. #401 by means of a single 4-span bridge. The height of the approach embankments in the vicinity of the proposed structure will be in the order of 40 ft. at the South abutment, and 25 ft. at the North abutment. The centreline of Ivy Lea Connection will follow what was formerly the centreline of Ivy Lea Connection W.B.L.

A total of 6 sampled boreholes and 11 dynamic cone penetration tests was carried out during the course of the field work. The locations and elevations of these were established in the field by

cont'd. /2 ...

Engineering Surveys Section, Eastern Region, and are shown on the accompanying Drawing #63-F-2B.

A full description of the subsoil conditions is given in the original report #63-F-2. The additional work was carried out primarily to determine the depth to bedrock at the new proposed footing locations and to investigate the stability of the proposed embankments at the structure approaches, where it was known that a cohesive deposit existed. The additional findings confirmed the original findings as to subsoil type, and are summarized as follows:

A deposit of silty clay to clayey silt overlies bedrock. The thickness of this deposit varies from 8 ft. to about 56 ft., and it is overlain in places, by up to 5 ft. of organic material. Field vane tests indicated the undrained shear strength of the cohesive material to be everywhere in excess of 2000 p.s.f. The record of Borehole Logs #31 - #39, inclusive, and #41 - #43, inclusive, are included with this report, together with Dwg. #63-F-2B, on which is shown the estimated stratigraphical profile along centreline and cross sections through the proposed footings.

In view of the foregoing, the following recommendations are given:

North & South Abutments -

These footings should be constructed within the approach embankments and should be founded on end-bearing piles driven to bedrock. Steel 'H' piles would be suitable for this purpose and the maximum allowable load for the section adopted may be assumed. Piles should be designed so as to resist all lateral forces induced on the abutments.

cont'd. /3 ...

Centre Pier & South Pier -

These footings should be constructed within the fill material for Hwy. #401 and should be founded on end-bearing piles driven to bedrock, as in the case of the abutments.

North Pier -

This footing should be founded directly on the bedrock since this would involve excavations of only up to about 11 feet in depth. An allowable pressure of up to 20 tons per sq. ft. may be assumed in this case.

Approach Fills -

The proposed approach embankments should be constructed with side slopes of 2 horizontal to 1 vertical, after removal of all organic material within the limits of the fill. The exact areal extent of the organic material will be determined during the course of the soils survey by the Regional Soils Section.

The additional field work necessary for this project was carried out under the supervision of Mr. Paul Payer, Project Foundation Engineer, during the period December 3rd to 13th, 1963. Equipment used was owned and operated by Canadian Longyear Ltd. This report was written by Mr. K. G. Selby, Sr. Project Foundation Engr.

KGS/MdeF

Attach.

cc: Messrs. A. M. Toye (2)
H. A. Tregaskes
H. D. McMillan
J. Ford
E. A. Cash
J. E. Gruspier
A. Watt

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATION ENGINEER

Foundations Office
Gen. Files

APPENDIX I.

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 490+95 and 74' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 16, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Washboring using BX Casing. CHECKED BY _____

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT ——— w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F.					WATER CONTENT % 20 40 60		
308.7	Groundlevel														G.W.L. 307.2
308.0	Top Soil														
0.9	Clayey silt and silty clay. Contains fine sand to Elev. 303. V. stiff.		1	SS	29	305									
			2	SS	17										
								300							
298.9	Br. grey and grey.														
9.10	Diabase Bedrock.	3	RC	-											
					295										
293.9															
14.10	End of borehole.														
						290									

Refusal

G.W.L.
307.2

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 491/55 and 30' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 17, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	SHEAR STRENGTH - P.S.F.	wp — w — wl WATER CONTENT %				Y P.C.F.
306.6	Groundlevel					306.6						
0.0						305						
	Probably clayey silt and silty clay.					300						
298.1												
8.6	Probably Bedrock. End of Cone Test.					295		Refusal				

61-4391

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & RESEARCH DIVISION		RECORD OF BOREHOLE NO. 3		FOUNDATION SECTION
JOB <u>63-F-2</u>	LOCATION <u>Stn. 492/10 and 30' to left of E</u>	ORIGINATED BY <u>B.M.G.</u>		
W.P. <u>172-61</u>	BORING DATE <u>January 18, 1963.</u>	COMPILED BY <u>B.M.G.</u>		
DATUM <u>G.S.C.</u>	BOREHOLE TYPE <u>Washboring using BX Casing.</u>	CHECKED BY _____		

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT	20	40	60	80	100	WP			W	WL
								SHEAR STRENGTH P.S.F.					WATER CONTENT % 20 40 60				
305.6						305											
304.6	Top Soil																
	Clayey silt and some fine sand. V. stiff Brown and grey.		1	SS	19		300										
298.6																	
7.0	Diabase Bedrock.		2	RC	-	295											
293.6																	
12.0	End of borehole.					290											

Refusal

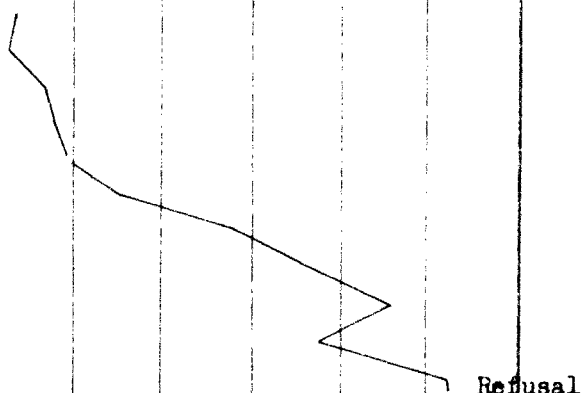
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 491+96 and 75' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 18, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100				SHEAR STRENGTH P.S.F.		Wp W WL ————— WATER CONTENT %		
309.0	Groundlevel														
	Probably clayey silt and silty clay.					305									
						300									
297.5															
11.6	Probably Bedrock. End of Cone Test.					295									


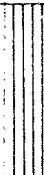


FOUNDATION SECTION

[illegible]

FOUNDATION SECTION

JOB	<u>63-F-2</u>	LOCATION	<u>Stn. 492/96 and 74' to left of E (Hwy. 401)</u>	ORIGINATED BY	<u>B.M.G.</u>
W. P.	<u>172-61</u>	BORING DATE	<u>January 21, 1963.</u>	COMPILED BY	<u>B.M.G.</u>
DATUM	<u>G.S.C.</u>	BOREHOLE TYPE	<u>Washboring using BX Casing.</u>	CHECKED BY	

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL			BULK DENSITY P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT					PLASTIC LIMIT ——— WP				WATER CONTENT %
							20	40	60	80	100	WATER CONTENT ——— W				
							SHEAR STRENGTH P.S.F.					WP ——— W ——— WL				
308.1																
	Topsoil															
1.0	Clayey silt. Some fine sand to El. 304'		1	SS	44		305									
302.2	Hard Brown															
5'-11"	Diabase Bedrock.			2	RC	-		300								
297.1																
11.0	End of borehole.						295									

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 493/12 and 31' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 21, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Washboring using BX Casing. CHECKED BY _____

[illegible]

JOB 63-F-2

LOCATION Stn. 493+10 and 37' to left of E (Hwy. 401)

ORIGINATED BY B.M.G.

W. P. 172-61

BORING DATE January 30, 1963.

COMPILED BY B.M.G.

DATUM G.S.C.

BOREHOLE TYPE Washboring using NX Casing for vane tests.

CHECKED BY _____

SOIL PROFILE			SAMPLES		DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W WP W WL ————— O WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT			
303.0	Groundlevel							
302.0	Top Soil							
1.0	Silty clay and clayey silt. V. stiff. Brown changing to grey around El. 295.0				300			
					295			
					290			
					285			
283.3	Rock Surface							
19.9	End of borehole.							

RECORD OF BOREHOLE NO. 8

JOB 63-F-2 LOCATION Stn. 493+07 and 50' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 23, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT 20 40 60 80 100	SHEAR STRENGTH P.S.F.	WP ——— W ——— WL WATER CONTENT %		
304.5	Groundlevel										
	Probably clayey silt.										
301.8											
2.8	Probably Bedrock End of Cone Test						300	Refusal			
							295				

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 493+06 and 45' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 23, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

SOIL PROFILE		SAMPLES		DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— WL	PLASTIC LIMIT ——— WP	WATER CONTENT ——— W	BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION.	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	SHEAR STRENGTH P.S.F.	WATER CONTENT % <div style="text-align: center;">WP W WL ----- ----- </div>	P.C.F.
304	Groundlevel				304				
	Probably clayey silt.								
300					300				
4.0	Probably Bedrock End of Cone Test						Refusal		
					295				

FOUNDATION SECTION

SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT	PLASTIC LIMIT ——— WP		
							WATER CONTENT ——— W			
							WP ——— W ——— WL WATER CONTENT %			
							SHEAR STRENGTH P.S.F.			
304.5	Rock is at 5" to 6" Depth in this vicinity. Ground is heavily covered with snow.					304.5				G.L. 304.5 Rock at 304.0
						300				

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 492465 and 29' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
 W.P. 172-61 BORING DATE January 23, 1963. COMPILED BY B.M.G.
 DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

[illegible]

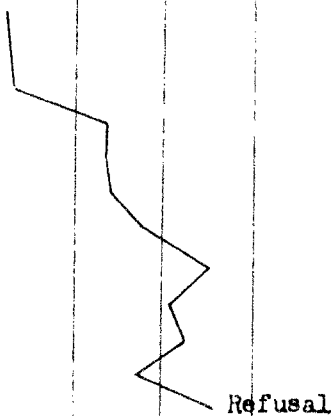
DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 12

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 491/40 and 77' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 23, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

SOIL PROFILE			SAMPLES		ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		BLOWS / FOOT	20	40	60	80	100	PLASTIC LIMIT ——— WP		
							SHEAR STRENGTH P.S.F.					WATER CONTENT ——— W		
												WP ——— W ——— WL		
												WATER CONTENT %		
308	Groundlevel													
	Probably clayey silt and silty clay.					305								
						300								
295.8														
12.2	Probably Bedrock. End of Borehole.					295								



W.L. 302

FOUNDATION SECTION

SOIL PROFILE		SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL		BULK DENSITY P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT							PLASTIC LIMIT ——— WP	
							SHEAR STRENGTH P.S.F.							WATER CONTENT ——— W	
							20 40 60 80 100					wp ——— w ——— WL		WATER CONTENT %	
307	Groundlevel					307									
	Probably clayey silt and silty clay.					305									
						300									
296.5															
10.6	Probably Bedrock End of Cone Test					295									

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 14

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 491/25 and 29' to right of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 23, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL		BULK DENSITY P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT					PLASTIC LIMIT ——— WP			
							20	40	60	80	100	WATER CONTENT ——— W			
							SHEAR STRENGTH P.S.F.					WP ——— W ——— WL WATER CONTENT %			
302.8	Groundlevel					302.8									
	Probably clayey silt and silty clay.					300									
						295									
						290									
						285									
						280									
						275									
						270									
266.7	Probably Bedrock End of Cone Test.					265									
36.1															

Refusal

W.L.
302.5

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 15

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 490/95 and 52' to right of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 24, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Washboring using NX Casing. CHECKED BY _____

[illegible]

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT						LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	SHEAR STRENGTH P.S.F.					WATER CONTENT % WP ——— W ——— WL			P.C.F.		
02.6						302.6										
	Probably clayey silt and silty clay.					300										W.L. at Ground Surface.
						290										
						280										
						270										
						260										
55.5 47.1	Probably Bedrock. End of Cone Test.					250										Refusal

FOUNDATION SECTION

[illegible][illegible]

301.3	Groundlevel	301.3		W.L. at Ground Surface
	Probably clayey silt and silty clay.	300		
		295		
		290		
		285		
		280		
278.5	Probably Bedrock. End of Cone Test.	275	Refusal	

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 19

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 491/30 and 50' to right of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 25, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT	20	40	60	80	100		
303	Groundlevel					303								
	Probably clayey silt and silty clay.					300								
						295								
						290								
						285								
						280								
						275								
						270								
264.6	Probably Bedrock. End of Cone Test.					265								
38.5						260								

Refusal

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 20

FOUNDATION SECTION

JOB 63-F-2

LOCATION Stn. 491+68 and 29' to right of E (Hwy. 401)

ORIGINATED BY B.M.G.

W.P. 172-61

BORING DATE January 25, 1963.

COMPILED BY B.M.G.

DATUM U.S.C.

BOREHOLE TYPE Dynamic Cone Penetration Test.

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	20	40	60	80	100	SHEAR STRENGTH P.S.F.				WATER CONTENT % WP ——— W ——— WL	
303	Groundlevel					303											
	Probably clayey silt and silty clay.					300											
						295											
						290											
						285											
						280											
						275											
269.5						270											
33.6	Probably Bedrock. End of Cone Test.					265											

Refusal

FOUNDATION SECTION

[illegible]

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 492+88 and 74' to right of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 28, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

[illegible]

FOUNDATION SECTION

CHECKED BY _____

[illegible]

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE	LIQUID LIMIT ——— WL		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	PLASTIC LIMIT ——— WP	WATER CONTENT ——— W		
						SHEAR STRENGTH P.S.F.	WP ——— W ——— WL	WATER CONTENT %		
002	Groundlevel				300					
	Probably clayey silt and silty clay.				290					
					280					
270.7 31.4	Probably Bedrock. End of Cone Test.				270	Refusal				

FOUNDATION SECTION

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— WL		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT ——— WP	WATER CONTENT ——— W		
301.7	Groundlevel				300						
	Probably clayey silt and silty clay.				290						
					280						
					270						
					260						
253.8											
47.11	Probably Bedrock. End of Cone Test.				250						

FOUNDATION SECTION

SOIL PROFILE			SAMPLES		ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W		REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			WP	WL	
			BLOWS / FOOT			SHEAR STRENGTH P.S.F.	WATER CONTENT % 20 40 60		
						● Field Vane Test ○ Remoulded Strength			
						500 1000 2000 2500			
300.8	Groundlevel				300				
1.6	Top Soil								
	Silty clay and clayey silt. (Organic material to Elev. 296')		1	SS	22				
	Stiff to v. stiff.		2	SS	15				
	Brown changing to grey around El. 295'.		3	SS	7				
			4	SS	6				
			5	SS	5				
			6	SS	7				
			7	SS	8				
			8	SS	5				
249.8					250				
1.0	Silty sand and gravel.								
	Dense.								
339			9	SS	33				
1.9	Diabase Bedrock		10	RC	-				
6.9	End of borehole.				230				

FOUNDATION SECTION

JOB 63-F-2 LOCATION Stn. 492+60 and 40' to left of E (Hwy. 401) ORIGINATED BY B.M.G.
W.P. 172-61 BORING DATE January 30, 1963. COMPILED BY B.M.G.
DATUM G.S.C. BOREHOLE TYPE Dynamic Cone Penetration Test. CHECKED BY _____

[illegible]

SOIL PROFILE			SAMPLES		BLOWS / FOOT	ELEV SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE			BLOWS / FOOT	20	40	60	80	100	SHEAR STRENGTH P.S.F.	WP		
307	Groundlevel					307										
	Probably clayey silt and silty clay.					305										
299.6	Probably Bedrock. End of Cone Test.					300										

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 29

FOUNDATION SECTION

JOB 63-F-2

LOCATION Stn. 493+27 and 51' to right of E. (Hwy. 401)

ORIGINATED BY B.M.G.

W.P. 172-61

BORING DATE January 30, 1963.

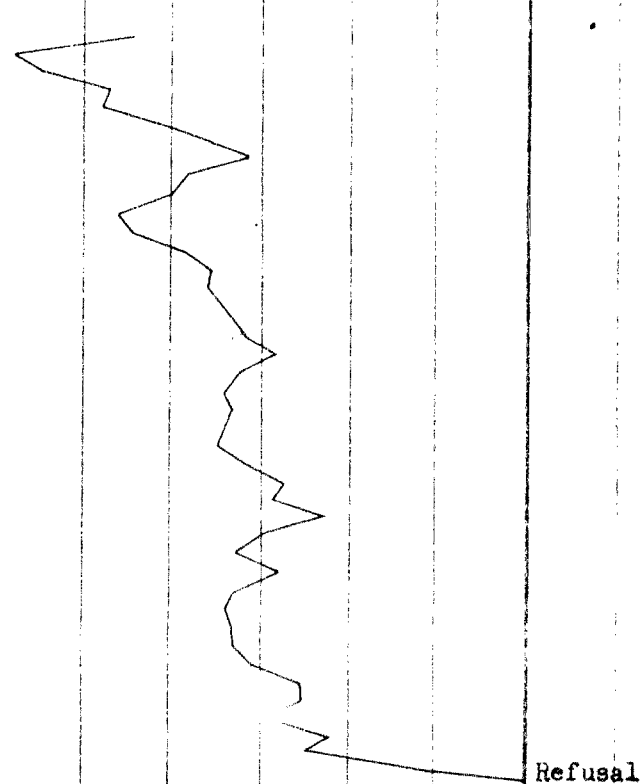
COMPILED BY B.M.G.

DATUM G.S.C.

BOREHOLE TYPE Dynamic Cone Penetration Test.

CHECKED BY _____

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT ——— w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT 20 40 60 80 100					w _p w w _L WATER CONTENT %			
300.5	Groundlevel					300									W.L. 300.0
	Probably clayey silt and silty clay.					290									
						280									
						270									
						260									
258 42.6	Probably Bedrock End of Cone Test.					250									Refusal



FOUNDATION SECTION

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & RESEARCH DIVISION		RECORD OF BOREHOLE NO. 31		FOUNDATION SECTION
JOB <u>63-F-2</u>	LOCATION <u>Stn. 28+75 and 60' Rt. of Line B</u>	ORIGINATED BY <u>P.P.</u>		
W.P. <u>172-61</u>	BORING DATE <u>Dec. 5, 1963.</u>	COMPILED BY <u>B.G.</u>		
DATUM <u>Geodetic</u>	BOREHOLE TYPE <u>Washboring NX Casing, Cone</u>	CHECKED BY <u>A.G.S.</u>		

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.		<div style="display: flex; justify-content: space-between; width: 100px;"> WP W WL </div> WATER CONTENT %			
307.8	Groundlevel											
0.0	Topsoil	[Hatched Pattern]										
	Silty clay and clayey silt.	[Hatched Pattern]	1	SS	30	305						
	Stiff to v. stiff		2	SS	24	300						
	Grey.		3	SS	20							
295.3						295						
12.6'	Clayey silt with sand and occasional gravel.	[Vertical Lines Pattern]	4	SS	8							
	Loose to v. dense.		5	SS	97	290						
	Br. grey.		6	SS	27	285						
24.4"	Diabase Bedrock	[Diagonal Lines Pattern]										
280.8						280						
27.0'	End of borehole.					275						
						270						

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 32

FOUNDATION SECTION

JOB 63-F-2 LOCATION Sta. 28+74 41' Rt. ORIGINATED BY P.P.
W.P. 172-61 BORING DATE Dec. 13, 1963. COMPILED BY B.G.
DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY A.G.S.

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	SHEAR STRENGTH P.S.F.	PLASTIC LIMIT ——— w_p	WATER CONTENT ——— w		
307.6	Groundlevel											
						305						
						300						
						295			180	178		
						290			150	128		
						285			120			
285.1	Presumed Bedrock.					280			81 blows for 6" refusal elev. 285.1			

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 33

FOUNDATION SECTION

JOB 63-F-2 LOCATION Sta. 29+20 44' Rt. of Line 'B'. ORIGINATED BY P.P.
W.P. 172-61 BORING DATE Dec. 13, 1963. COMPILED BY B.G.
DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY A.G.S.

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. LOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.					w_P ——— w ——— w_L WATER CONTENT %				
309.7	Groundlevel						25	50	75	100	125					
299.8	9.11' Presumed Bedrock.															

FOUNDATION SECTION

JOB 63-F-2 LOCATION Sta. 30+02 37 ft. Rt. of Line B ORIGINATED BY P.P.
W.P. 172-61 BORING DATE Dec. 9, 1963. COMPILED BY B.G.
DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY A.G.S.

[illegible]

FOUNDATION SECTION

JOB <u>63-F-2</u>	LOCATION <u>Sta. 30+01 16' Rt. of Line B</u>	ORIGINATED BY <u>P.F.</u>
W.P. <u>172-61</u>	BORING DATE <u>Dec. 10, 1963.</u>	COMPILED BY <u>B.G.</u>
DATUM <u>Geodetic</u>	BOREHOLE TYPE <u>Washboring NX Casing - Cone</u>	CHECKED BY <u>A.C.S.</u>

[illegible]

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 36

FOUNDATION SECTION

JOB 63-F-2 LOCATION Sta. 29+99 6ft. Lt. of Line B ORIGINATED BY P.P.
W.P. 172-61 BORING DATE Dec. 10, 1963. COMPILED BY B.G.
DATUM Geodetic BOREHOLE TYPE Cone Test CHECKED BY A.G.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WP	WL		
302.9	Groundlevel														
0.0															
						300									
						295									
						290									
						285									
						280									
						275									
						270									
						265									
						260									
256.4						255									
46.6"	Presumed Bedrock														

70 blows for 6"

150
135

FOUNDATION SECTION

CHECKED BY A.G.S.

[illegible]

FOUNDATION SECTION

JOB 63-F-2 LOCATION Sta. 31/20 9' Rt. of Line B ORIGINATED BY P.P.
W. P. 172-61 BORING DATE Dec. 11, 1963 COMPILED BY B.G.
DATUM Geodetic BOREHOLE TYPE Cone Test. CHECKED BY A.G.S.

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L		BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV. SCALE	BLOWS / FOOT	PLASTIC LIMIT ——— w_p	WATER CONTENT ——— w		
300.5	Groundlevel										
0.0						300					
						290					
						280					
273.4											
27.1"	Presumed Bedrock.										
						270					

DEPARTMENT OF HIGHWAYS - ONTARIO
MATERIALS & RESEARCH DIVISION

RECORD OF BOREHOLE NO. 39

FOUNDATION SECTION

JOB 63-F-2 LOCATION Sta. 31+19 14' Left of Line B ORIGINATED BY P.P.
W.P. 172-61 BORING DATE Dec. 11, 1963. COMPILED BY B.G.
DATUM Geodetic BOREHOLE TYPE Washboring NX Casing, Cone CHECKED BY A.G.S.

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT 20 40 60 80 100					SHEAR STRENGTH P.S.F.				
299.6	Groundlevel															
0.0'	Topsoil															
1.0'																
	Silty clay clayey silt.		1	SS	4	295										
	(Occasional silt seams around El. 271.0)		2	SS	8											
	Firm to stiff.		3	TW	P	290										
	Grey.															
						285										
			4	SS	7											
						280										
			5	SS	9											
						275										
			6	SS	17	270										
267.7	Probable Bedrock															
31.11"	End of borehole.															
						265										
						260										

→ 50 for 9" refusal

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & RESEARCH DIVISION		RECORD OF BOREHOLE NO. 40			FOUNDATION SECTION	
JOB <u>63-F-2</u>		LOCATION <u>Sta. 29+12.43 ft. Rt. of Line B</u>			ORIGINATED BY <u>P.P.</u>	
W.P. <u>172-61</u>		BORING DATE <u>Dec. 9, 1963.</u>			COMPILED BY <u>B.G.</u>	
DATUM <u>Geodetic</u>		BOREHOLE TYPE <u>Cone Test</u>			CHECKED BY <u>A.G.S.</u>	

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT					LIQUID LIMIT ——— W _L PLASTIC LIMIT ——— W _P WATER CONTENT ——— W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	SHEAR STRENGTH P.S.F.				
310.2	Groundlevel															
0.0																
						305										
302.4						300										
7.8	Presumed Bedrock.															
		</														

80 blows for 9"
refusal El. 300

DEPARTMENT OF HIGHWAYS - ONTARIO MATERIALS & RESEARCH DIVISION		RECORD OF BOREHOLE NO. 41		FOUNDATION SECTION	
JOB <u>63-F-2</u>	LOCATION <u>Sta. 28+17 94' Rt. of Line B</u>	ORIGINATED BY <u>P.P.</u>			
W.P. <u>172-61</u>	BORING DATE <u>Dec. 4, 1963.</u>	COMPILED BY <u>B.G.</u>			
DATUM <u>Geodetic</u>	BOREHOLE TYPE <u>Washboring NX Casing, Cone</u>	CHECKED BY <u>A.G.S.</u>			

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100 SHEAR STRENGTH P.S.F.	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W WP — W — WL WATER CONTENT %	BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT					
308.8	Groundlevel									
0.0	Topsoil									
1.0	Silty clay, clayey silt. Stiff to v. stiff. Grey.		1	SS	16	305				
302.8	Silty sand. Very loose to compact. Grey.		2	SS	7					
6.0			3	SS	3	300				
				SS	22	295				
293.6	Diabase Bedrock.		5	RC	-					
15.2			6	RC	-	290				
289.0	End of borehole.									
19.10										
						285				
						280				
						275				
						270				

35 for 2" refusal

▼ 303.8
W.L.

RECORD OF BOREHOLE NO. 42

JOB 63-F-2 LOCATION Sta. 31765 22 Lt. of Line B. ORIGINATED BY P.P.
W.P. 172-61 BORING DATE Dec. 11, 1963. COMPILED BY B.G.
DATUM Geodetic BOREHOLE TYPE Washboring NX Casing - Cone CHECKED BY A.G.S.

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE			LIQUID LIMIT ——— w _L PLASTIC LIMIT ——— w _p WATER CONTENT ——— w			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS / FOOT	ELEV SCALE	BLOWS / FOOT	SHEAR STRENGTH P.S.F.	WATER CONTENT %				
299.3	Groundlevel												
0.0	Muck V. loose Black	~~~~~	1	SS	2	295							
294.3		~~~~~	2	SS	13								
5.0	Silty clay, clayey silt. Stiff to v. stiff. Grey.		3	TW	P	290							
			4	TW	P								
			5	TW	P	285							
			6	SS	17	280							
274.8			7	SS	15	275							
24.6"	End of borehole.												
						270							
						265							

65 for 11" refusal
Elev. 272.4

FOUNDATION SECTION

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			EULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		SHEAR STRENGTH P.S.F.	WATER CONTENT % WP W WL				
300.6	Groundlevel					300						
0.0	Topsoil											
1.0	Silty clay, clayey silt. (Trace of fine gravel at 6' depth). Stiff to v. stiff. Grey.		1	SS	22							
						295						
			2	SS	18							
						290						
			3	SS	13							
			4	TW	P							
			5	TW	P	285						
			6	SS	17	280						
			7	SS	14	275						
272.6												
28.0	End of borehole.					270						