MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

30M4-52

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

FROM: Geotechnical Office,
Engineering Services Branch,
West Bldg., Downsview.

DATE: January 8, 1974.

OUR FILE REF.

IN REPLY TO JAN 14 1974

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Proposed Twenty Mile Creek Crossing
on Highway 56
District #4 (Hamilton)
W.O. 73-11092 -- W.P. 277-60
CONT. 75-02

Attached we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above-mentioned site.

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.

K. G. Selby

K. G. Selby,
Supervising Foundations Eng.,
For: A. Rutka,
Manager, Geotechnical Office.

KGS/ao
Attch.
c.c. E. J. Orr
B. R. Davis
R. S. Pillar
C. R. Robertson
B. J. Giroux
C. Mirza
G. A. Wrong
B. A. Singh

Foundations Files ✓
Documents

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FOUNDATION INVESTIGATION REPORT
For
Proposed Twenty Mile Creek Crossing
on Highway 56
District #4 (Hamilton)
W.O. 73-11092 --- W.P. 277-60

1. INTRODUCTION:

A request for a foundation investigation where Highway 56 crosses Twenty Mile Creek was received from Mr. G.C.E. Burkhardt, Regional Structural Planning Engineer, in a memo dated November 7, 1973.

A field investigation was subsequently carried out by the Foundations Office to determine the subsoil conditions at this site. This report contains the results of the investigation and our recommendations.

2. SITE CONDITIONS:

Highway #56 crosses Twenty Mile Creek about 2.2 miles south of Elfrida and 4 to 5 miles south of the Niagara Escarpment. The surrounding area is generally quite flat as witnessed by the meandering nature of Twenty Mile Creek. During the foundation investigation three days of not unusually heavy rain resulted in a rapid change of river level (about 2.5 ft.) and discussion with neighbouring farmers revealed that there is considerable flooding at this location in the spring.

The existing structure was built in two sections; the east side having been built some time after the west side. Both sides of the bridge show considerable spalling of concrete, with a severe crack visible on the west side. The steel guard

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rail on the bridge was in a poor condition having rusted through completely in several places. The approach fills are both about 6 feet high with no visible signs of instability.

3. FIELD AND LABORATORY INVESTIGATION:

Three sampled boreholes and two dynamic cone penetration tests were carried out at the site. The boreholes were advanced by washboring and diamond drilling, using a diamond drill modified for soil sampling.

Disturbed samples were obtained using a 2-inch O.D. split-spoon sampler driven according to the specifications of the Standard Penetration Test. Rock cores were obtained at the ends of two of the boreholes.

Dynamic cone penetration tests were taken adjacent to two boreholes. Driving energy to advance the cone was 350 ft.-lbs. per blow.

Locations and elevations of the boreholes and cone tests are shown on Drawing No. 73-11092A accompanying this report.

Samples were examined visually in the field and later in the laboratory. Selected samples were tested to determine the following properties:

- Grain-Size Distribution
- Atterberg Limits
- Natural Moisture Content

The results of the field and laboratory tests are given in the Record of Borehole sheets and in Figures 1 to 4 of the Appendix.

4. SUBSOIL CONDITIONS:

4.1) General:

The subsoil is basically cohesive clayey silt, although a layer of clayey silt to silt up to 4.5 feet thick divides the clayey silt at varying elevations. A Plasticity Chart for the subsoil is included as Fig. 1 of the Appendix.

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Underlying the subsoil is Dolomite bedrock.
From ground level, the soil strata are as follows:

4.2) Clayey Silt:

This 5 to 9 foot thick stratum consisted of clayey silt with some or traces of sand, traces of gravel, and traces of organics (in the upper 3 to 4 feet). Colour ranged from orange-brown (0 to 5 ft.) to grey. In B.H.'s 1 and 3, Standard Penetration Resistances were 11 and 7 blows per foot for the upper 4.5 ft., increasing to 64 blows per foot at 6 feet. Standard Penetration Resistance in B.H. 2 was 74 blows per foot. The Natural Moisture Content ranged from 19 to 27 percent with an average value of 25 percent.

Grain-size distribution analyses of this layer produced the following results:

Gravel	0 - 7%
Sand	2 - 17%
Silt	66 - 69%
Clay	11 - 24%

A typical grain size curve envelope is included in the Appendix (Fig. 2).

4.3) Clayey Silt to Silt:

This layer ranged in thickness from 3 to 4.5 feet and intersected the clayey silt at different elevations in each borehole. In B.H.'s 1 and 3, the upper boundary lies between elevation 655 and 656 with the lower boundary at 650.8 and 653.3, respectively. The soil consisted of grey clayey silt to silt with traces of sand, however, in B.H. 2, the material was borderline between silt and silt to clayey silt. Standard Penetration Resistances ranged from 51 to 99 blows per foot. Natural Moisture Contents varied from 16.5 to 20.5 percent with an average value of 19 percent.

Grain-size analyses for this stratum resulted in the

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following distribution:

Gravel	0%
Sand	1 - 2%
Silt	76 - 94%
Clay	5 - 22%

A typical grain size curve envelope is incorporated as Fig. 3 of the Appendix.

4.4) Clayey Silt:

A 3 to 7.5 foot thick stratum of grey clayey silt with traces of sand overlies bedrock. Standard Penetration Resistances of 38 to 118 blows per foot were encountered in this layer. Natural Moisture Contents of 17.5 to 21.5 with an average value of 20 percent were also found.

For this stratum, grain size analysis yielded the following distribution:

Gravel	0%
Sand	1%
Silt	70 - 90%
Clay	9 - 29%

A typical grain size curve envelope is shown in Fig. 4 of the Appendix.

5. GROUNDWATER CONDITIONS:

All the boreholes were placed less than 3 feet from the existing river edge. Water levels in the river fluctuated considerably, for example, following several days of rain (November 15 to November 19, 1973), the river rose from elevation 661.3 to 663.5. Moreover, local residents explained that the river rises to within a foot of the roof of the existing concrete arch bridge, during spring floods.

Artesian water was encountered in a fractured rock seam in B.H. 2, with water rising to elevation 664.4, 8 inches above ground level. No artesian condition was noticed prior to coring. Artesian water may have been present in B.H. 1 where the water level was 661.2 vs. river level 661.3 prior to coring

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(November 15). After coring (November 19), the water level in B.H. 1 was 664.0 vs. 663.5 in the river although the river was less than 1 foot from the hole.

The water level in B.H. 3 was found to be at river level.

It should be noted that the water in this area has a high sulphate concentration, therefore, sulphate resistant concrete should be used.

6. BEDROCK:

Rock cores taken from this site were examined by Z. Koniuszy, Geologist. Her description is as follows:

Borehole 1:

16.5' to 21.5' Bedrock elevation 647.8

From	To	
16.5	17.2	Dolomite, slightly weathered - core broken
17.2	18.6	Dolomite, light grey, hard, pitted
18.6	18.8	Dolomite, slightly weathered - core broken (water seepage zone)
18.8	21.5	Dolomite, light grey, hard, pitted

Borehole 2:

15.5 to 20.5 Bedrock elevation 648.2

From	To	
15.5	15.8	Dolomite, light grey, hard pitted - core broken
15.8	20.2	Dolomite, light grey, hard, pitted
20.2	20.5	Dolomite, slightly weathered, core broken (water seepage zone)

7. DISCUSSION AND RECOMMENDATIONS:

7.1) General:

It is proposed that the existing structure be replaced with a new structure at the same location. The new structure will be some 10 ft. wider than the present bridge, but approximately the same length.

The subsoil consists of 5 to 9 feet of firm to hard clayey silt, followed by 3 to 4.5 feet of very dense clayey silt to silt. Underlying the clayey silt to silt, another layer of hard clayey silt varying in thickness from 3 to 7.5 feet extends to bedrock. The Dolomite bedrock contained seams of fractured rock with zones of water seepage.

7.2) Foundations:

Since the relative density of the clayey silt to silt layer is very dense and the clayey silt layers are of hard consistency, spread footings are practical at this site. At any elevation below 658.0, a safe design load of 3.5 tons/sq.ft. may be assumed. Scour and frost protection may require spread footings to be several feet below the above elevation. At least 4 feet of cover for frost protection will be required.

Alternatively, the spread footing can be placed on bedrock. Elevations of the bedrock varied from 647.8 in B.H. 1 to 648.2 in B.H. 2 and 649.1 in B.H. 3 (a maximum difference of 1.3 feet). An allowable bearing capacity of 20 tons/sq.ft. may be used for design purposes.

7.3) Dewatering:

Because the excavation for the footings will be below the water level of Twenty Mile Creek, dewatering will be required. Some seepage from seams of silt within the subsoil may also be anticipated if the footing extends into the clayey silt to silt stratum. It should be noted that rapid fluctuations of the river water level with rainfall could affect excavation of the footings.

Due to the relatively impervious nature of the subsoil, no major dewatering problems are anticipated. Excavation can proceed with conventional pumping methods using sumps in the bottom of the excavation. It is possible that slight seepage may soften the bottom of the excavation; hence, it is desirable that a concrete working slab be placed on the surface of the

foundation soil as soon as possible after exposure.

8. MISCELLANEOUS:

This project was carried out between November 14 and 22, 1973, under the immediate supervision of Mr. W. J. Alcock, Project Foundations Engineer, who also prepared this report.

The drilling equipment used was owned and operated by P.V.K. and Sons Drilling Limited, Burford.

This project was under the overall supervision of Mr. A. Prakash, Senior Foundations Engineer, and was reviewed by Mr. K. G. Selby, Supervising Foundations Engineer.

W. J. Alcock

K. G. Selby, P. Eng.

WJA/ao
Jan. 7, 1974.

APPENDIX I

B.H. No. 1 ○
B.H. No. 2 □
B.H. No. 3 △

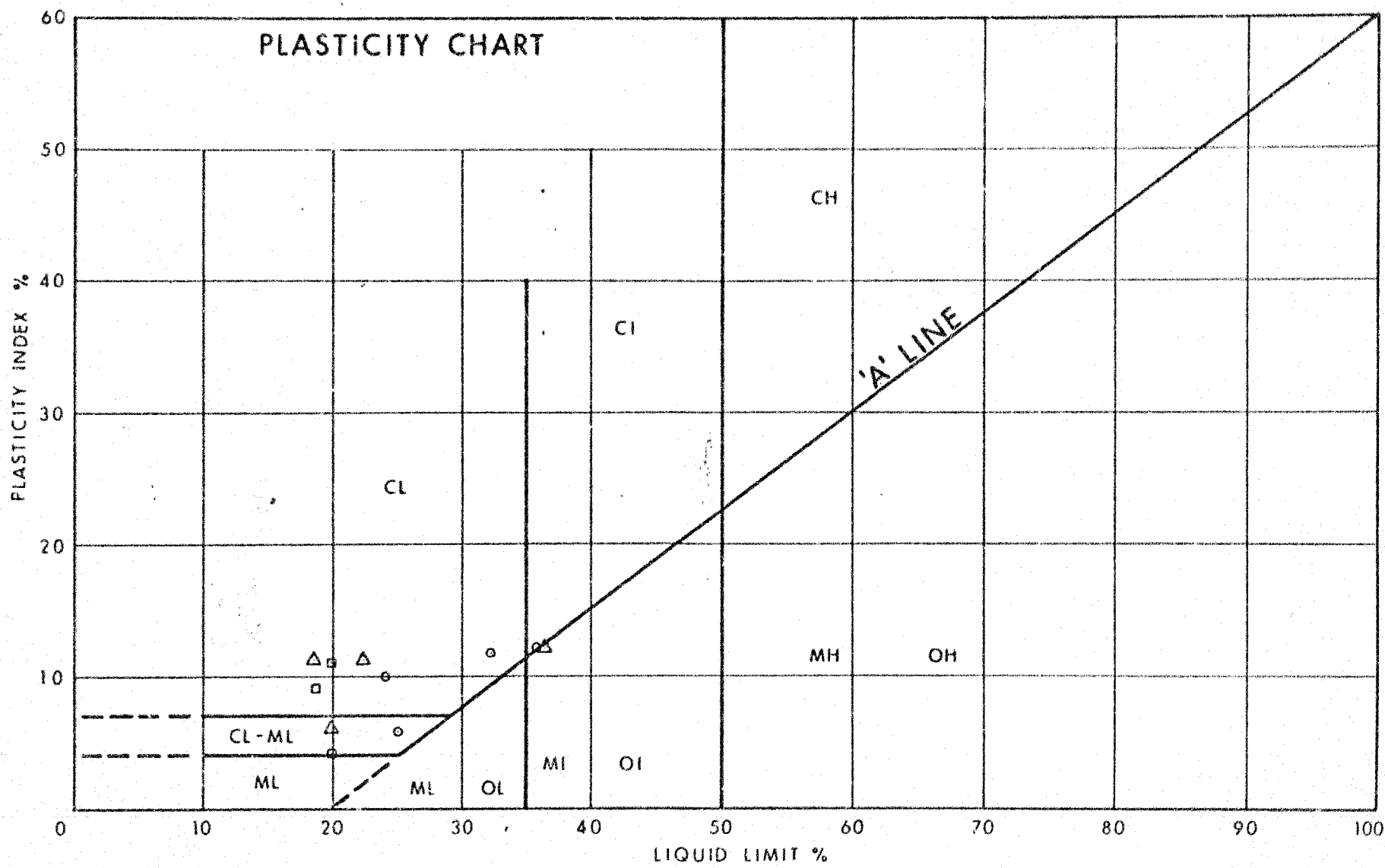


FIG. 1

W.O. 73-11092

GRAIN SIZE DISTRIBUTION

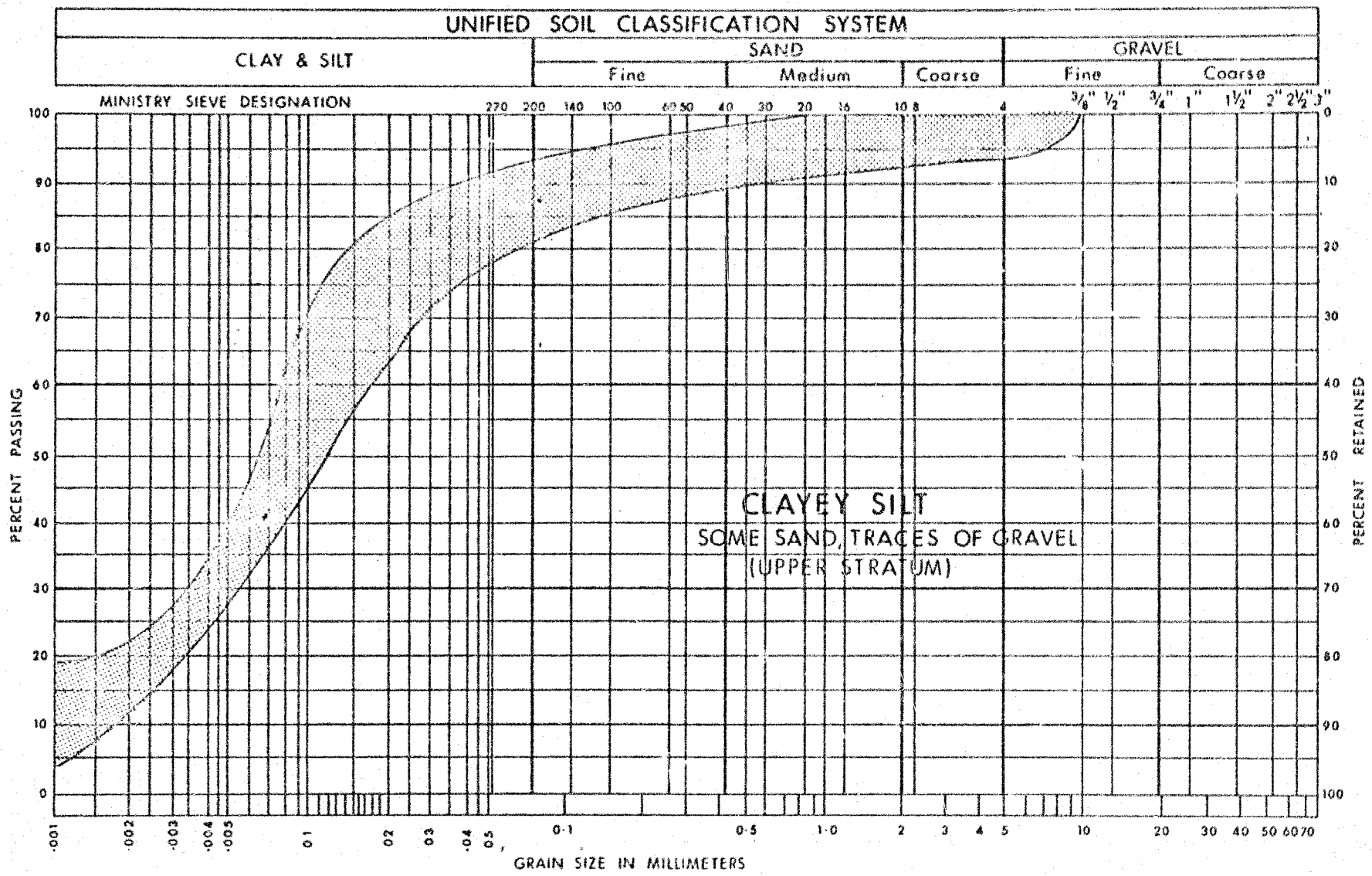


FIG. 2

W.O. 73-11092

GRAIN SIZE DISTRIBUTION

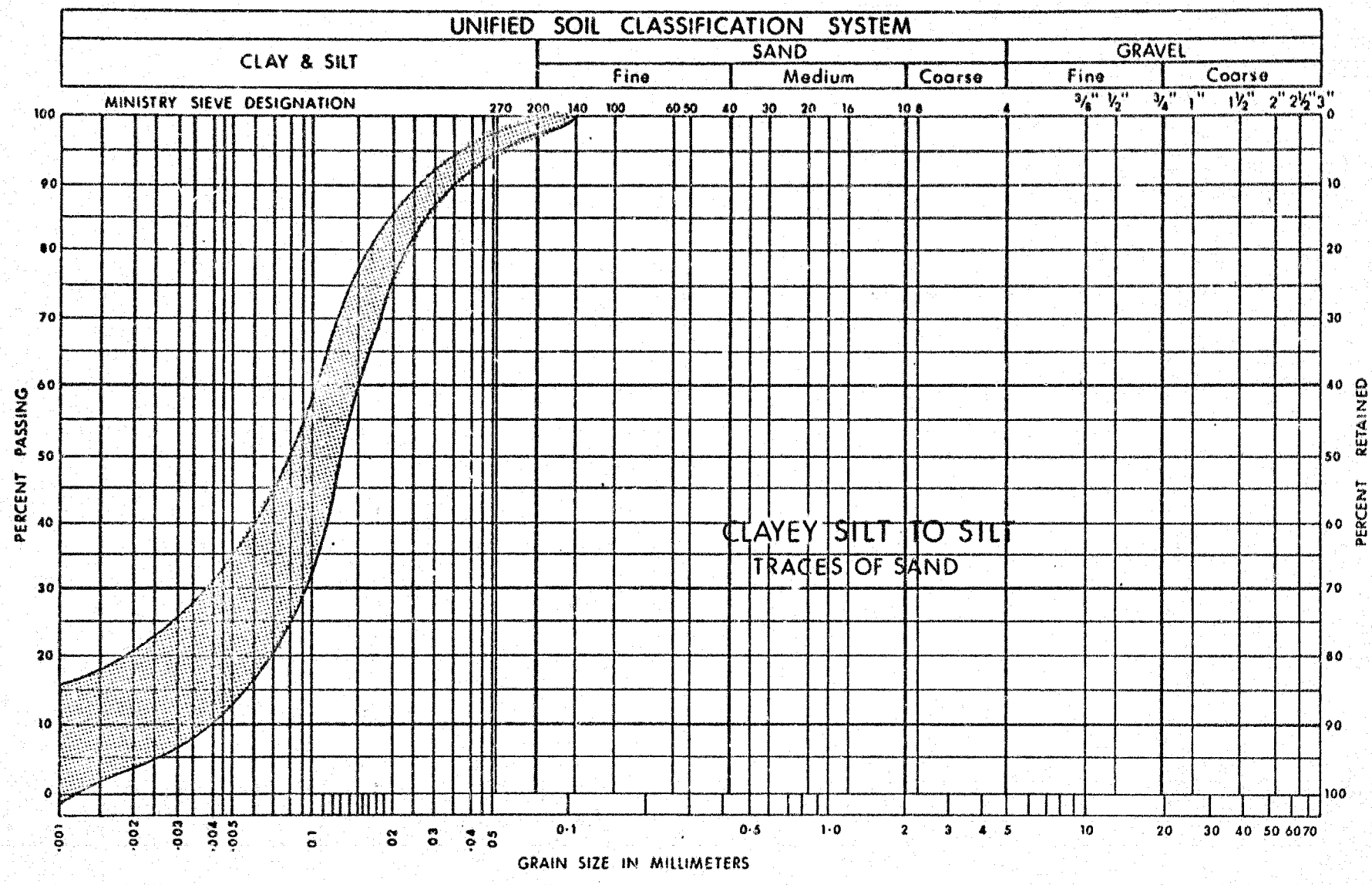


FIG. 3

W.O. 73-11092

GRAIN SIZE DISTRIBUTION

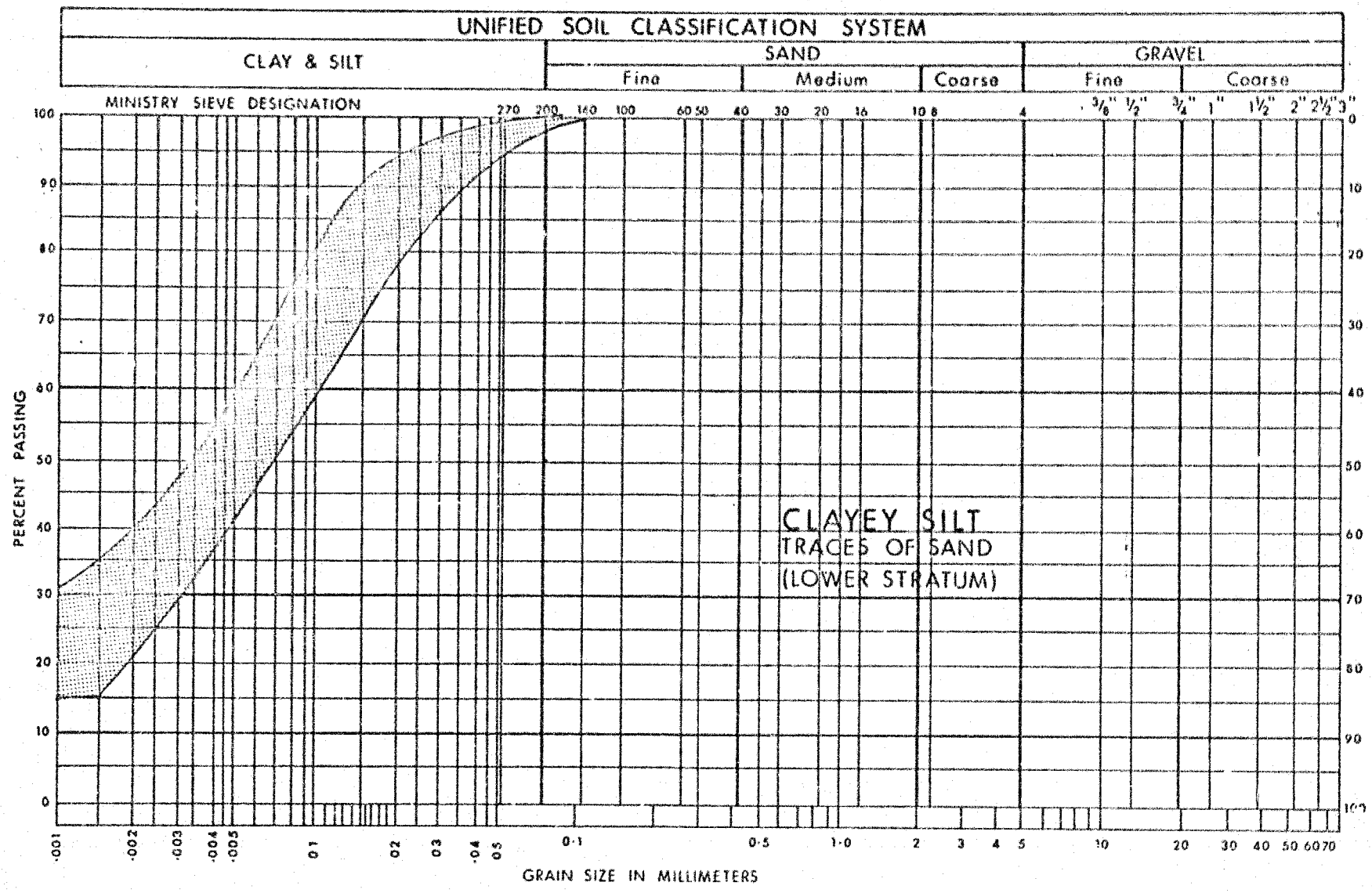


FIG. 4

W.O. 73-11092

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 1

JOB 73-11092 — LOCATION Sta. 377+77 O/S 30' RT. ℄ Hwy. 56 Line 'B' — ORIGINATED BY WJA

W.P. 277-60 — BORING DATE November 14, 15, 1973 — COMPILED BY WJA

DATUM Geodetic — BOREHOLE TYPE Washboring, NX Casing — CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	TYPE	BLOWS/FOOT	ELEV. SCALE
664.3	Ground Level					
0.0	Clayey Silt Some Sand Brown Stiff to Tr. Organics Hard		1	SS	11	660
			2	SS	67	
655.3	Grey					
9.0	Clayey Silt to Silt Trace Sand Grey Very Dense		3	SS	89	655
650.8	Silt Tr. Clay		4	SS	99	
13.5	Clayey Silt Trace Sand Grey, Hard		5	SS	118	650
647.8			6	SS	43	
16.5	Bedrock Dolomite With Fractured Seams		7	RC	100%	645
642.8						
21.5	End of Borehole					640

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 40 60

664.0

645.7

BULK DENSITY γ P.C.F.

663.5

REMARKS	GR	SA	SI	CL
	0	14	66	20
	0	2	76	22
	0	1	90	9
	01		71	28

20
15 ◇ 5 % STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE Nº 2

JOB 73-11092 — LOCATION Sta. 378+37 O/S 38' LT. ℄ Hwy. 56 Line 'R' — ORIGINATED BY WJA

W.P. 277-60 — BORING DATE November 19, 20, 1973 — COMPILED BY WJA

DATUM Geodetic — BOREHOLE TYPE Washboring, NX Casing — CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE
663.7	Ground Level					
	Clayey Silt Some Sand Tr. Organics Hard Brown		1	SS	74	660
658.5 / 5.2	Clayey Silt to Silt Tr. Sand Grey Very Dense		2	SS	51	
655.5 / 8.2	Clayey Silt Tr. Sand Grey, Hard		3	SS	38	655
			4	SS	30	
648.2 / 15.5	With Sand, Some Gr.		5	SS	100/1"	650
	Bedrock – Dolomite With Fractured Seams		6	RC	100%	645
643.2 / 20.5	End of Borehole					640

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 % 20 40 60

BULK DENSITY γ P.C.F.

REMARKS
664.0
GR. SA. SI. CL.
663.5
0 8 68 24
0 1 94 5
0 1 70 29
0 1 60 39
643.5

OFFICE REPORT ON SOIL EXPLORATION

20
15 ◇ 5 % STRAIN AT FAILURE
10

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS–ONTARIO

DESIGN SERVICES BRANCH — FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 3

JOB 73-11092 — LOCATION Sta. 378+27 O/S 28' RT. ℄ Hwy. 56 Line 'B' — ORIGINATED BY WJA

W.P. 277-60 — BORING DATE November 22, 1973 — COMPILED BY WJA

DATUM Geodetic — BOREHOLE TYPE Washboring, NX Casing — CHECKED BY

ELEV. / DEPTH	DESCRIPTION	STRAT. PLOT	SAMPLES NUMBER	SAMPLES TYPE	SAMPLES BLOWS/FOOT	ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100; SHEAR STRENGTH P.S.F. ○ UNCONFINED ● QUICK TRIAXIAL + FIELD VANE × LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w (w_P w w_L) WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS GR. SA. SI. CL.
664.5	Ground Level									
	Clayey Silt Some Sand Orange-Tr. Gravel Brown Firm to Tr.Organics Hard		1	SS	7	660				663.5 ▼ 4 17 68 11
			2	SS	64					7 2 69 22
656.3	Grey									
8.2	Clayey Silt to Silt		3	SS	52	655				0 0 94 6
653.3	Grey Very Dense									
11.2	Clayey Silt Grey Hard		4	SS	50					0 0 75 25
649.1	Probable Bedrock		5	SS	100/4"	650				
15.4	End of Borehole					645				

20 15 5 10 % STRAIN AT FAILURE

OFFICE REPORT ON SOIL EXPLORATION

FD-2 (Rev. Jan 73)

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

CONSISTENCY	c LB/SQ FT
VERY SOFT	0 - 250
SOFT	250 - 500
FIRM	500 - 1000
STIFF	1000 - 2000
VERY STIFF	2000 - 4000
HARD	> 4000

DENSENESS	'N' BLOWS / FT.
VERY LOOSE	0 - 4
LOOSE	4 - 10
COMPACT	10 - 30
DENSE	30 - 50
VERY DENSE	> 50

TERMS TO BE USED IN DESCRIBING SOILS :-

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

TYPE OF SAMPLE

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

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

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

FD-9b (Rev. Jan. 73)

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
w_s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX $= \frac{w - w_p}{I_p}$
I_C	CONSISTENCY INDEX $= \frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta p}{(1+e)\Delta \sigma'}$
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
	IN TERMS OF EFFECTIVE STRESS $\tau_f = c' + \sigma' \tan \phi'$
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
	IN TERMS OF TOTAL STRESS $\tau_f = c_u + \sigma \tan \phi$
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
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ε	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNGS MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

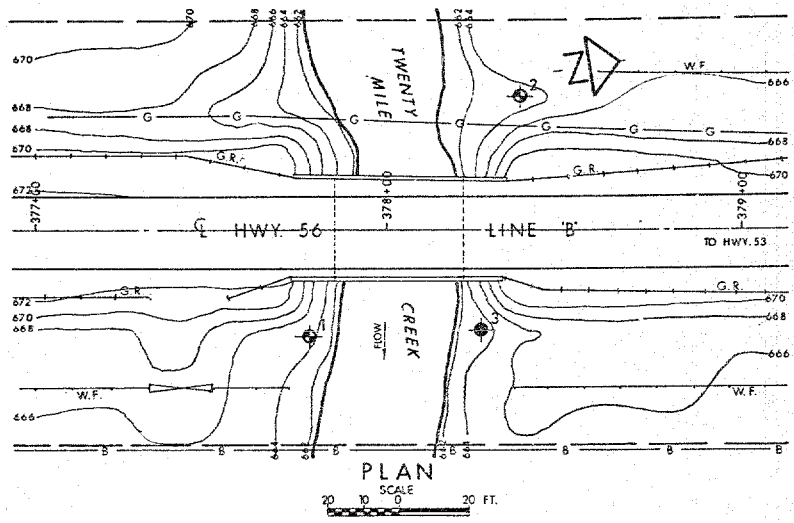
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_o	COEFFICIENT OF EARTH PRESSURE AT REST

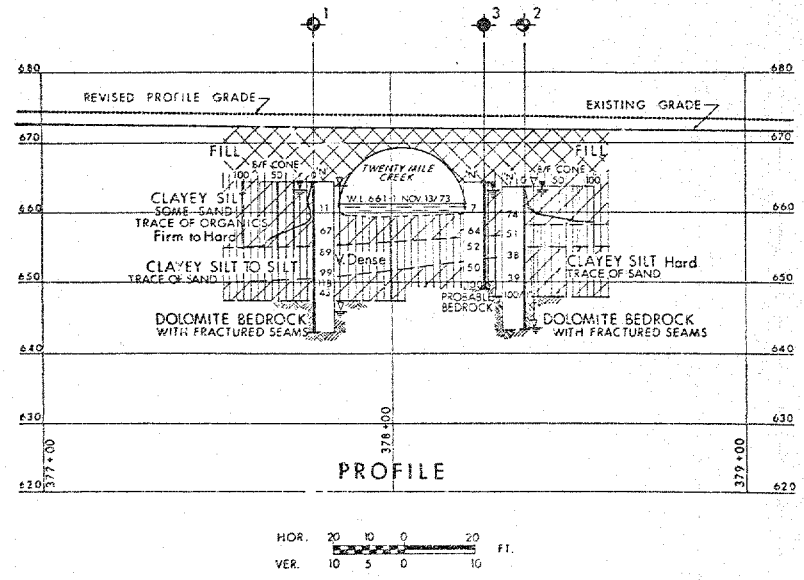
FOUNDATIONS

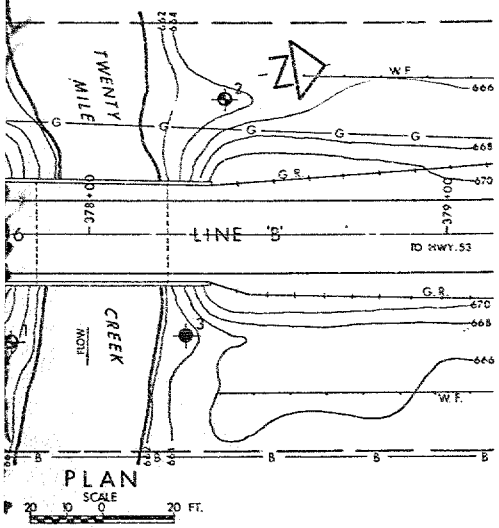
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY. DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

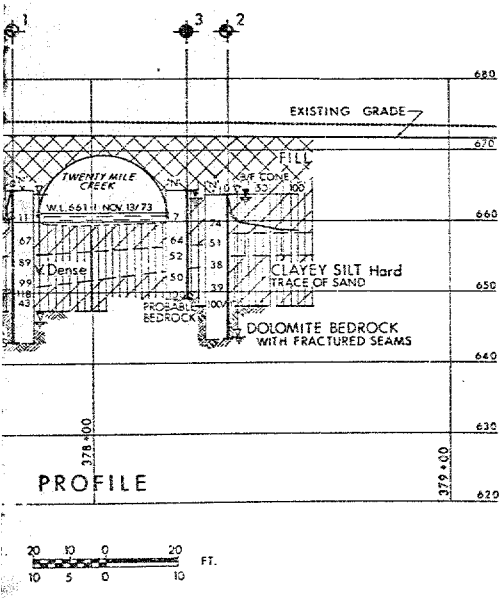
SLOPES

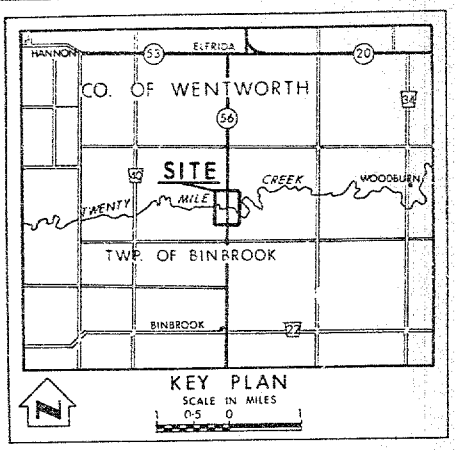
H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL


TWENTY MILE CREEK
FLOW
℄ HWY. 56
LINE 'B'
TO HWY. 53
W.F.
G.R.
G
B
PLAN
SCALE
20 10 0 20 FT.


REVISED PROFILE GRADE
EXISTING GRADE
FILL
B/F CONE
TWENTY MILE CREEK
W.L. 661 - NOV. 13/73
CLAYEY SILT
SOME SAND
TRACE OF ORGANICS
Firm to Hard
CLAYEY SILT TO SILT
TRACE OF SAND
V. Dense
CLAYEY SILT Hard
TRACE OF SAND
PROBABLE BEDROCK
DOLOMITE BEDROCK
WITH FRACTURED SEAMS
377+00
378+00
379+00
PROFILE
HOR. 20 10 0 20 FT.
VER. 10 5 0 10







LEGEND

- Bore Hole
- Cone Penetration Test
- Bore Hole & Cone Test
- Water Levels established at time of field investigation. NOV. 19/73
- Head Artesian Condition Encountered

NO.	ELEVATION	STATION	OFFSET
.1	664·3	377+77	30'RT.
.2	663·7	378+37	38'LT.
.3	664·5	378+27	28'RT.

NOTE:
The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the HAMILTON District Office.

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

REVISIONS			
	DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
ENGINEERING SERVICES BRANCH – GEOTECHNICAL OFFICE

TWENTY MILE CREEK

HIGHWAY NO 56 LINE 'B' DIST. NO. 4
CO. WENTWORTH
TWP. BINBROOK LOT 5 & 1 CON. 2

BORE HOLE LOCATIONS & SOIL STRATA

SUBMD W.A.	CHECKED	W.P. NO 277 – 60	DRAWING NO. 73-11092A
DRAWN O.J.	CHECKED	W.O. NO 73 – 11092	
DATE 7 JAN 1974		SITE NO	BRIDGE DRAWING NO.
APPROVED PRINCIPAL FOUNDATION ENGINEER		CONT NO	

REF E-5421-1

73-11092

MINISTRY DUE DATE JAN 9, 74

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundation Engineer,
West Building.

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

ATTENTION: Mr. K. Selby

DATE: November 7, 1973,

OUR FILE REF.

IN REPLY TO

SUBJECT: Twenty Mile Creek Bridge
near Binbrook,
W.P. 277-60, Site 36-114,
Highway 56, District 4.

Further to our conversation, we are enclosing a sketch of the foundation layout for the above structure. Also attached are photographs and a map showing the location of the site.

Systems Design Office have recently requested from Engineering Surveys a survey of the site and a new E Plan. Copies of the E Plan will be provided at a later date for the completion of the Foundation Report.

Please arrange for a Foundation investigation of sufficient scope for bridge design purposes.

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

WMK:lm
Encl.

c.c. J. Cullen
R. Fitzgibbon
J. Barclay

START OF FIELD WORK NOV 13
END OF FIELD WORK NOV 20
END OF REPORT DEC 19
WRITING OF THE REPORT DEC 27

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

November 19, 1973.

P.V.K. & Sons,
R.R. #4,
Brantford, Ontario.
N3T 5L7

Dear Sirs:

This letter confirms our request of November 12th, 1973 for the supply of a diamond drill together with all necessary equipment, as specified under the terms of our Contract Agreement, at Binbrook, Ontario on November 14th, 1973.

Mobilization will be from Burford, Ontario.

Our Project Number is W.O. 73-11092.

Yours truly,

KGS/jl

A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

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

Foundations Files
Documents

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. G. Burkhardt,
Regional Str. Planning Engineer,
3501 Dufferin Street,
Downsview, Ontario.

FROM: Structural Office,
West Building,
Downsview, Ontario.

ATTENTION:

DATE: April 11, 1974.

OUR FILE REF.

IN REPLY TO

SUBJECT:

Twenty Mile Creek Bridge
1.5 Miles North of Binbrook
W.P. 277-69, Site 36-114
Hwy. #56, District #4

73-11-092

Attached herewith are prints of the Preliminary Bridge Plan Drawing D-36-114-P2 for the above-mentioned structure.

The estimated revised cost of the proposed structure is $74,000.00 which includes tender, materials, engineering, and sundry construction.

Any comments or revisions you may have should be submitted within four weeks.

C.S. Grebski,
Structural Design Engineer

CSG/ac
Attach.

c.c. E.R. Davis
W.D. Birch
A.E. McKim
W. McFarlane
M. Stoyanoff
A. Rutka
J. Anderson
R. Fitzgibbon

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

73-11092

TO: Mr. C. Mirza
Head
Soils Mechanics Office
West Bldg.

FROM: Structural Office
West Bldg.

ATTENTION: K. G. Selby

DATE: June 13/74

OUR FILE REF.

IN REPLY TO

SUBJECT: Twenty Mile Creek Bridge
1.5 Miles North of Binbrook
W.P. 277-60, Site #36-114
Hwy. 56, District #4

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

C. S. Grebski
Structural Design Engineer

CSG/ek

Attached

Finalized and
copy sent to C.H. Grebski
July 3/74. A. Jaworski

No comments

A Prakash
June 26/74

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 30M74-52

DIST. 4 REGION CENTRAL

W.P. No. 277-60

CONT. No. 75-02

W. O. No. 73-11092

STR. SITE No. 36-114

HWY. No. 56

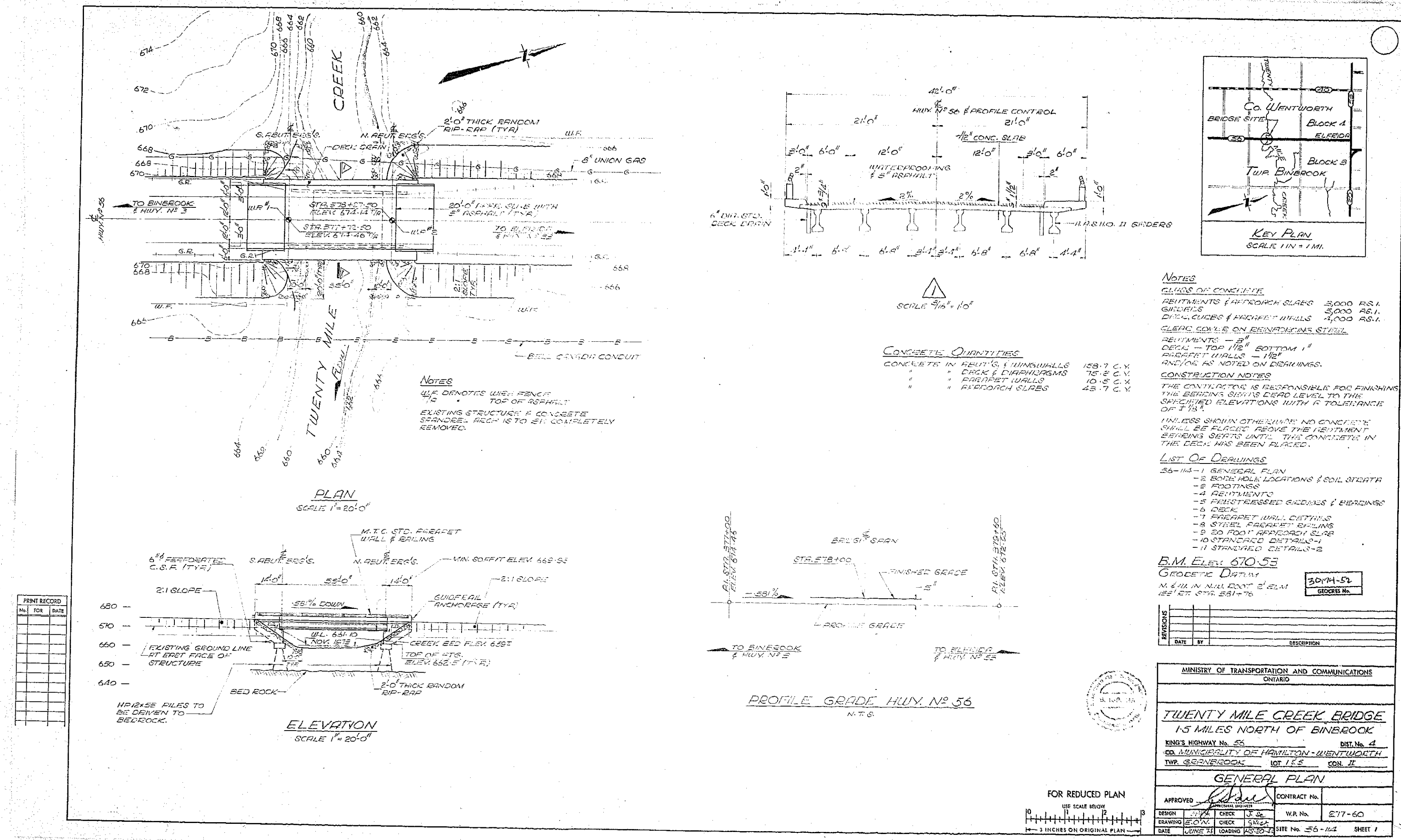
LOCATION TWENTY MILE CREEK CROSSING HWY 56

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 2

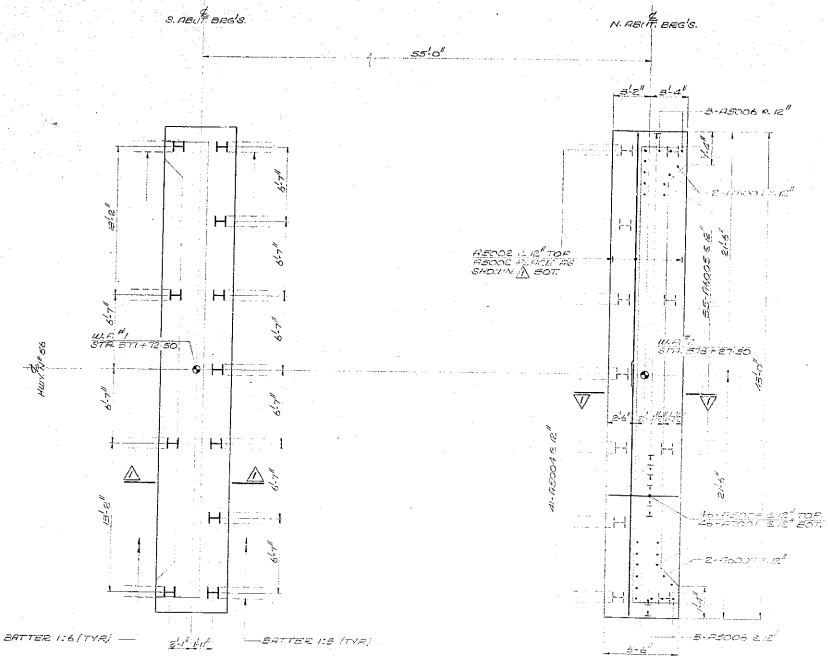
REMARKS: ~~6 to be added to ensure~~ ~~microfilm~~

6 documents to be unfolded before microfilmed

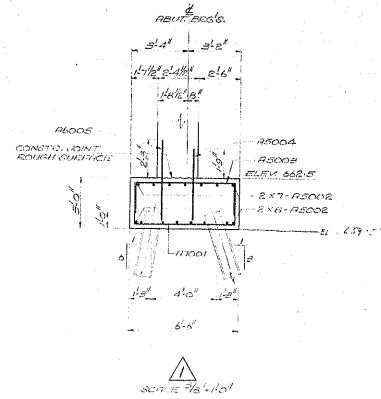
SEPT. 1978



TWENTY MILE CREEK
TO BINBROOK
℄ HWY. Nº 3
TO ELFRIDA
2'-0" THICK RANDOM RIP-RAP (TYP.)
6" UNION GAS
BELL CANADA CONDUIT
NOTES
W.F. DENOTES WIRE FENCE
EXISTING STRUCTURE A CONCRETE SPANDREL ARCH IS TO BE COMPLETELY REMOVED.
PLAN
SCALE 1" = 20'-0"
42'-0"
HWY. Nº 56 ℄ PROFILE CONTROL
21'-0"
21'-0"
WATERPROOFING & 3" ASPHALT
2%
2%
SCALE 3/16" = 1'-0"
CONCRETE QUANTITIES
CONCRETE IN ABUT'S, WINGWALLS 158.7 C.Y.
" " DECK & DIAPHRAGMS 75.8 C.Y.
" " PARAPET WALLS 10.5 C.Y.
" " APPROACH SLABS 43.7 C.Y.
M.T.C. STD. PARAPET WALL & RAILING
S. ABUT. BRG'S.
N. ABUT. BRG'S.
14'-0"
55'-0"
14'-0"
2:1 SLOPE
GUIDERAIL ANCHORAGE (TYP.)
EXISTING GROUND LINE AT EAST FACE OF STRUCTURE
BED ROCK
2'-0" THICK RANDOM RIP-RAP
HP12×53 PILES TO BE DRIVEN TO BEDROCK.
ELEVATION
SCALE 1" = 20'-0"
STA. 578+00
FINISHED GRADE
TO BINBROOK ℄ HWY. Nº 3
TO ELFRIDA ℄ HWY. Nº 53
PROFILE GRADE HWY. Nº 56
N.T.S.
KEY PLAN
SCALE 1 IN = 1 MI.
CO. WENTWORTH
BRIDGE SITE
BLOCK 4
ELFRIDA
BLOCK 3
TWP. BINBROOK
NOTES
CLASS OF CONCRETE
ABUTMENTS & APPROACH SLABS 3,000 P.S.I.
GIRDERS 5,000 P.S.I.
DECK, CURBS & PARAPET WALLS 4,000 P.S.I.
CLEAR COVER ON REINFORCING STEEL
ABUTMENTS — 3"
DECK — TOP 1½" BOTTOM 1"
PARAPET WALLS — 1½"
AND/OR AS NOTED ON DRAWINGS.
CONSTRUCTION NOTES
THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8".
UNLESS SHOWN OTHERWISE NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED.
LIST OF DRAWINGS
56-114-1 GENERAL PLAN
-2 BORE HOLE LOCATIONS & SOIL STRATA
-3 FOOTINGS
-4 ABUTMENTS
-5 PRESTRESSED GIRDERS & BEARINGS
-6 DECK
-7 PARAPET WALL DETAILS
-8 STEEL PARAPET RAILING
-9 20 FOOT APPROACH SLAB
-10 STANDARD DETAILS-1
-11 STANDARD DETAILS-2
B.M. ELEV. 670.53
GEODETIC DATUM
30M-52
GEOCRES No.
PRINT RECORD
No. FOR DATE
REVISIONS
DATE BY DESCRIPTION
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO
TWENTY MILE CREEK BRIDGE
1.5 MILES NORTH OF BINBROOK
KING'S HIGHWAY No. 56
DIST. No. 4
CO. MUNICIPALITY OF HAMILTON-WENTWORTH
TWP. BINBROOK
CON. II
GENERAL PLAN
APPROVED
STRUCTURAL ENGINEER
CONTRACT No.
DESIGN
CHECK
DRAWING E.O'N.
CHECK
DATE JUNE 71
LOADING
W.P. No. 277-60
SITE No. 56-114
SHEET 1
FOR REDUCED PLAN
USE SCALE BELOW
3 INCHES ON ORIGINAL PLAN



PLAN
SCALE 1/8" = 1'-0"



LIST OF 11P 12 X 53 STEEL H PILES			
LOCATION	No. PILES	LENGTH	DESIGN LOAD
S. ABUT.	11	21'-0"	
N. ABUT.	11	21'-0"	

PRINT RECORD		
No.	FOR	DATE

30M-52
CROCKES No.

REVISIONS		
DATE	BY	DESCRIPTION

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

TWENTY MILE CREEK BRIDGE
1.5 MILES NORTH OF BINBROOK

KING'S HIGHWAY No. 55 DIST. No. 12
CO. MUNICIPALITY OF HAMILTON-WENTWORTH
TWP. SALTFLEET LOT 7 & 8 CON. II

FOOTINGS

APPROVED				CONTRACT No.	
DESIGN	J.H.	CHECK	J.H.	W.P. No.	877-60
DRAWING	E.O.M.	CHECK	J.H.		
DATE	JUNE '59	LOADING	H20-S16	SITE No. 56-114	SHEET 3

FOR REDUCED PLAN
USE SCALE SHOWN
3 INCHES ON ℄ EQUAL PLAN