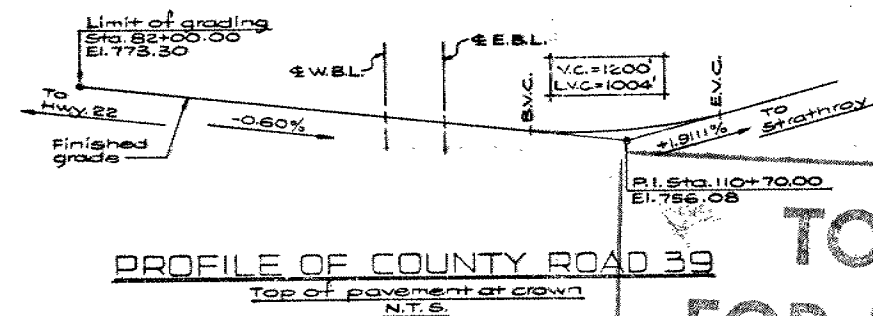
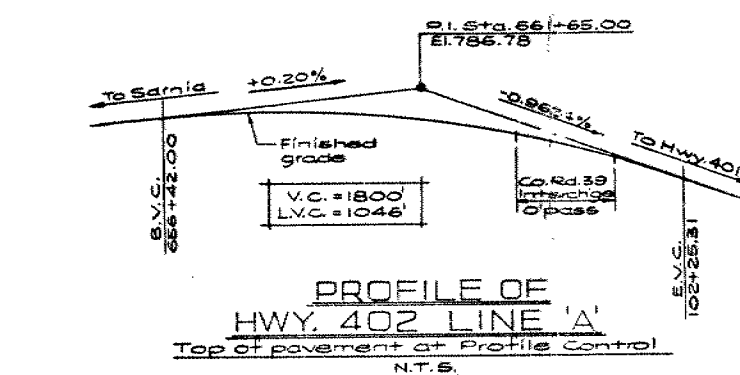
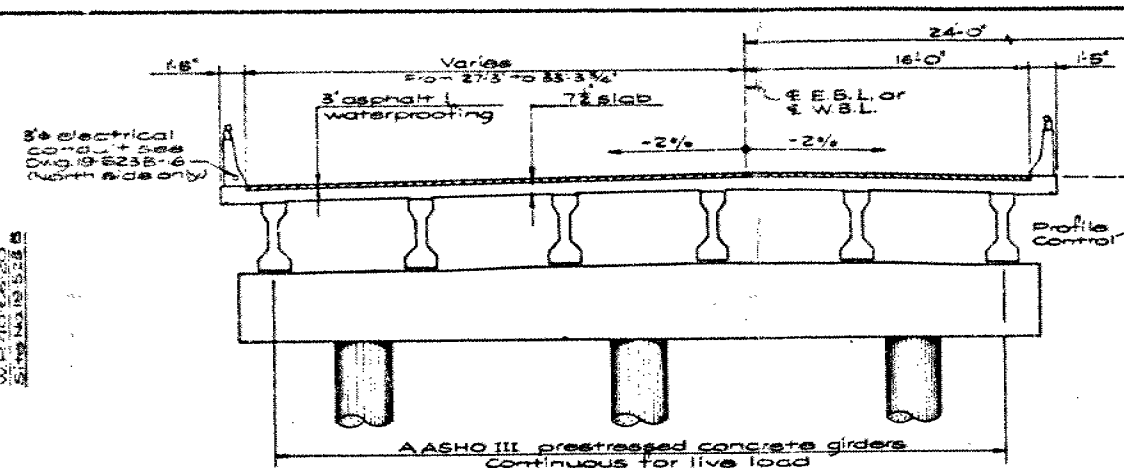
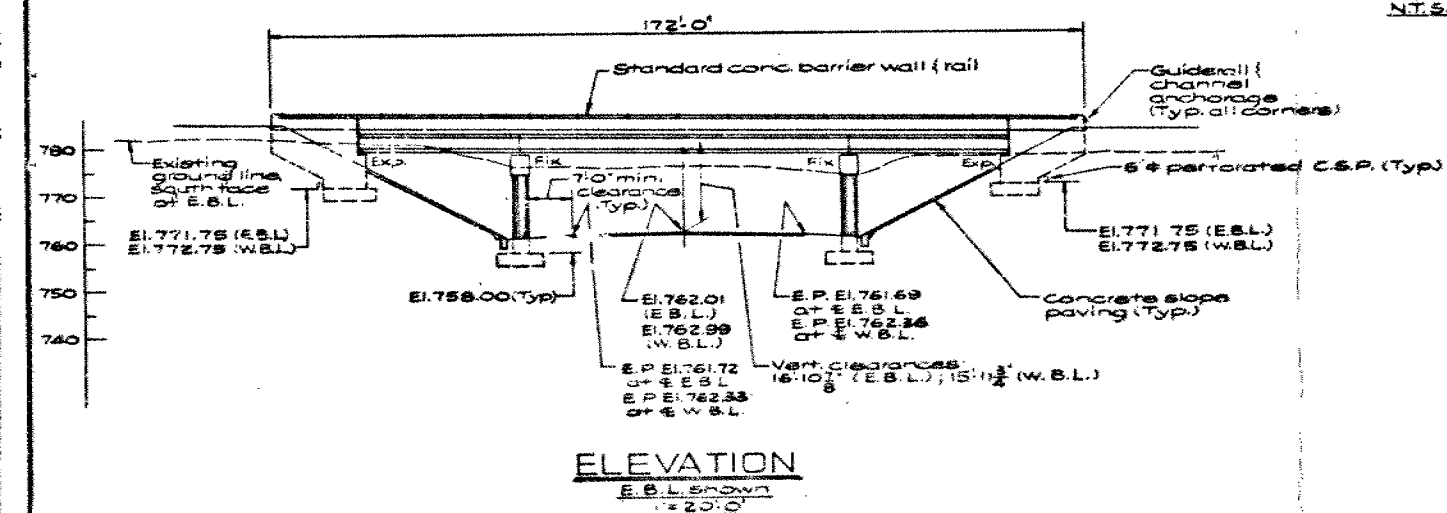
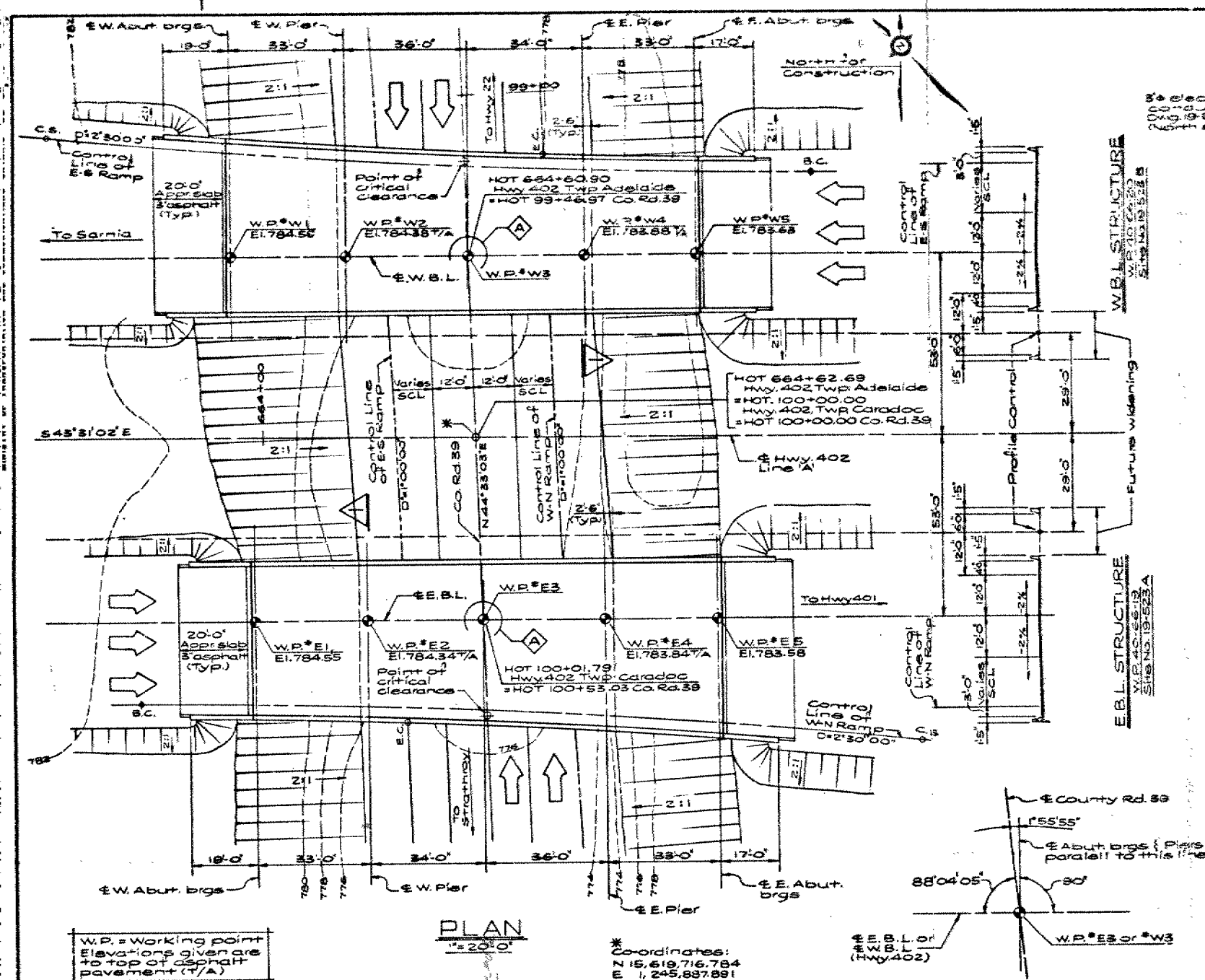



G.I.-30 SEPT. 1976

GEOCRES No. 40I13-46DIST. 2 REGION W.P. No. 40-66-19/20CONT. No. 79-51W. O. No. STR. SITE No. 19-523HWY. No. 402LOCATION County Rd. 39 Interchange
Overpass (EBL & WBL)No of PAGES - =====OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:



DIST. No. 2	
CONT No WP No 43-66-20	
COUNTY RD. 39 INTERCH. O'PASS 9.9 m. S.E. of Hwy. 2	SHEET
GENERAL PLAN	
W.B.L. BRIDGE HWY. 402	

NOTES

<u>Class of Concrete</u>	
Prestressed girders	5,000 P.S.I.
Deck slab, diaphragms, barrier walls (piers)	4,000 P.S.I.
Remainder	3,000 P.S.I.

Clear Cover to Reinf. Steel

Footings	3'
Abuts.	3'
Deck	2" top, 1" bot
Barrier walls	1 1/2"
Approach slabs	2"

Or as noted on the drawings.

Construction Notes

The Contractor is responsible for finishing the bearing seats dead level to the specified elevations with a tolerance of not $\pm 1/8"$. No concrete shall be placed above the abutment bearing seats until concrete in the deck has been placed.

Reinforcing Steel: Grade
All steel -- 60 KSI

Concrete Quantities

Concrete quantities are listed below for the appropriate lump sum tender items:

Concrete in piers, abutments
{ wingwalls ----- 3,000 P.S.I. 120 Cu.yd
4,000 P.S.I. 73 Cu.yd

Concrete in deck & diaphragms _____ 200 Cu.yd.

Concrete in barrier walls_____	26 Cuyd.
Concrete in approach slabs_____	53 Cuyd.

concrete in slope
paving----- 55 cu.yd

756.08
39
TO BE USED
FOR ESTIMATING
PURPOSES ONLY

DATE SEP 14 1977

BM 783.28
Geodetic Dept. Unit
N.W. 1/4 N. 4. Sec. 55
363' L. 10-73

SEP 20 1977

REVISIONS		DATE BY		DESCRIPTION	DATE
DESIGN	XXX	CHECK		LOADING AND UNLOAD	
DRAWING	CCC	CHECK		& SITE NO. 523L	DWG

FOR REDUCED PLAN

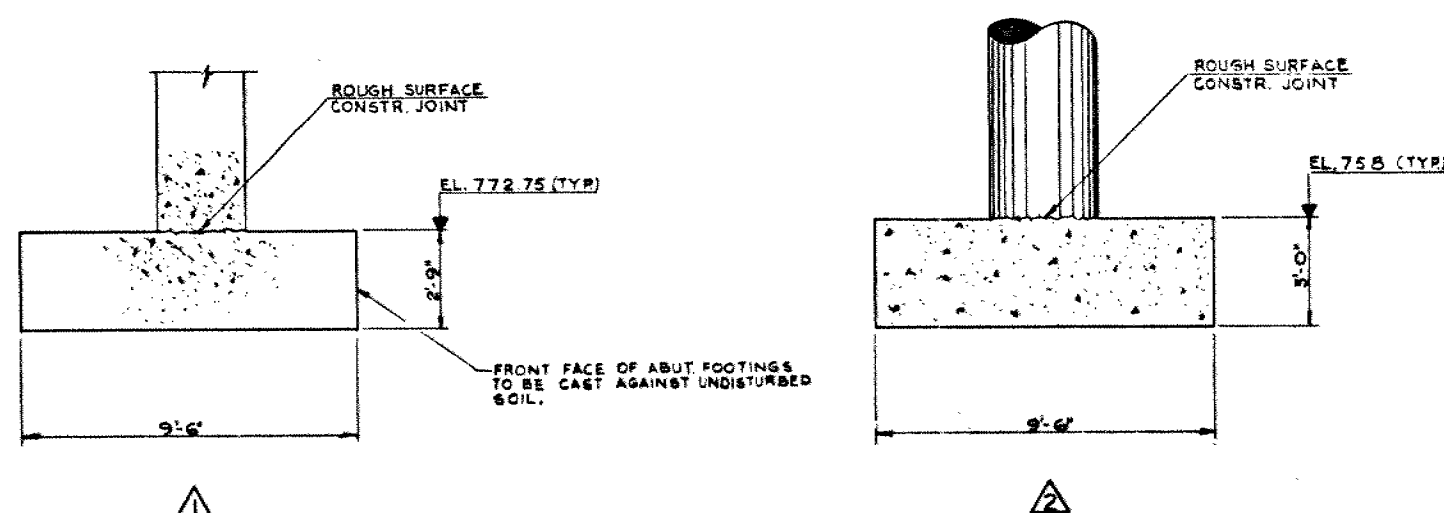
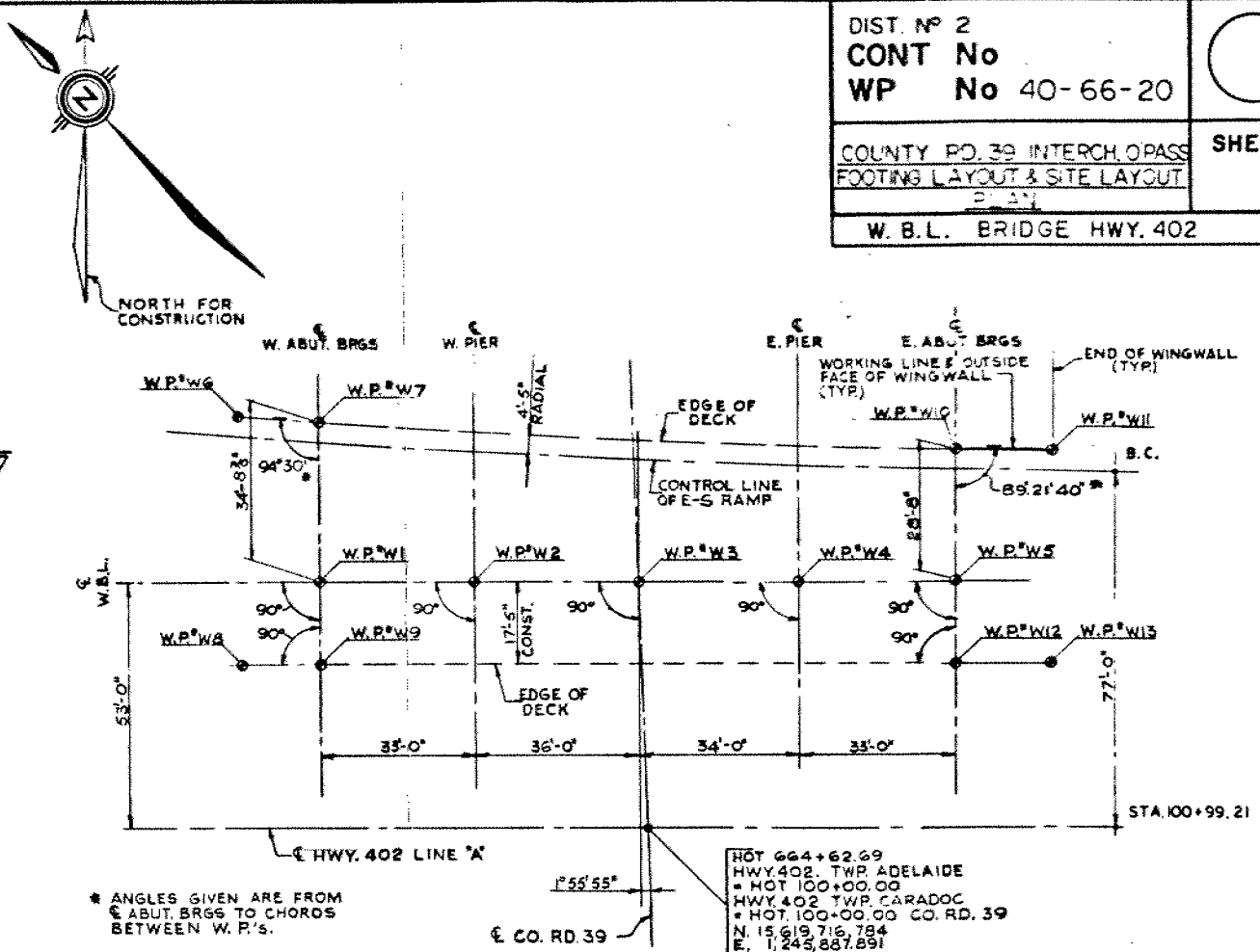
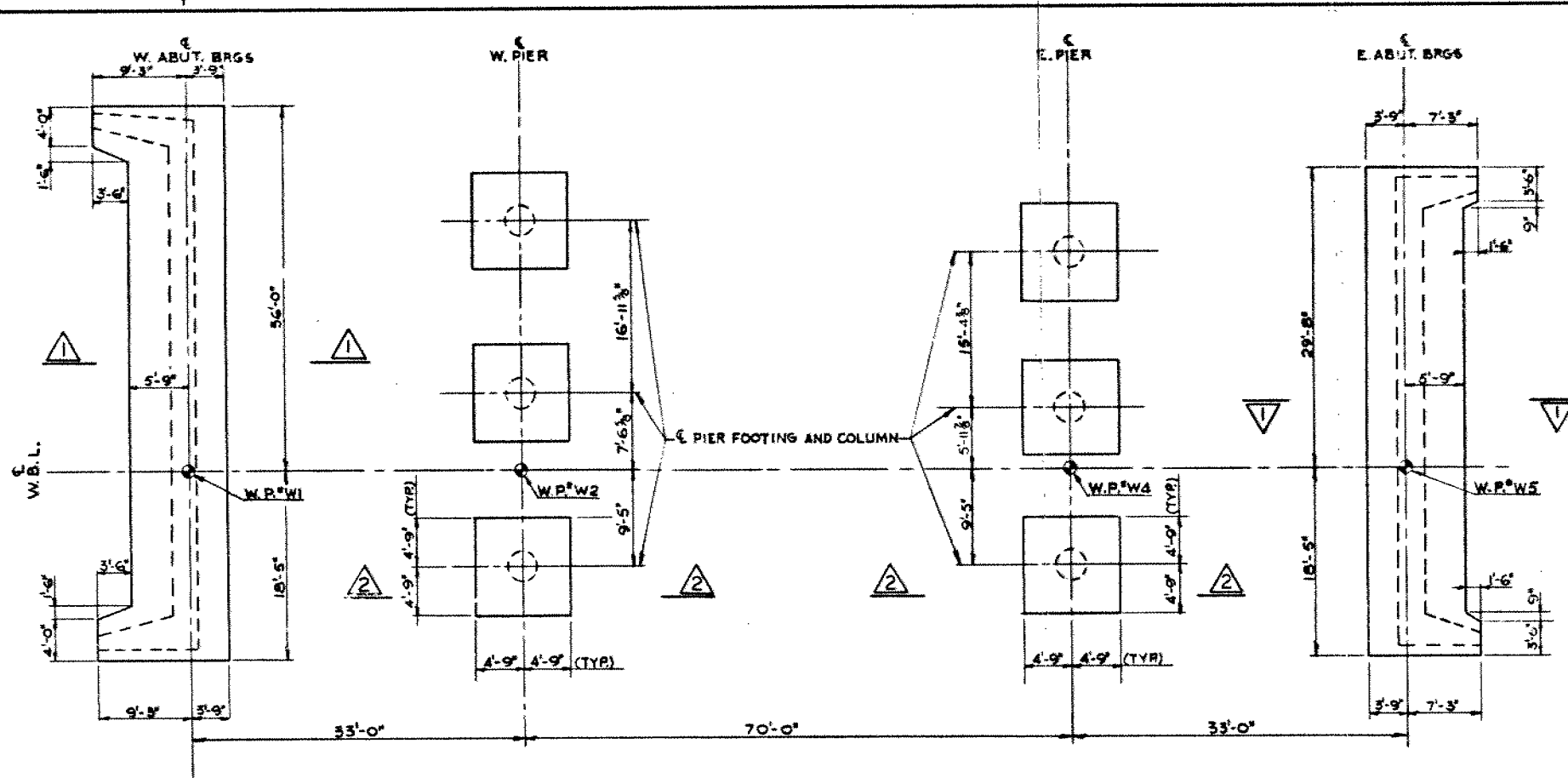
USE SCALE BELOW

0 1 2

3 INCHES ON ORIGINAL PLAN

LIST OF DRAWINGS

- 19-5235-1 General Plan
- 11 2 Bore Hole Locations
{ Soil Strata
- 11 3 Footing Layout { Site Layout Plan
- 11 4 West Abutment
- 11 5 East Abutment
- 11 6 Piers
- 11 7 Bearing Layout { Details
- 11 8 Prestressed Girders
- 11 9 Deck Details
- 11 10 Barrier Walls
- 11 11 Steel Railing
- 11 12 20 Ft. Approach Slabs
- 11 13 Details of Conc. Slope Paving
- 11 14 Standard Details I
- 11 15 Standard Details II
- 11 16 Bridge Electrical Detail- Type
- 11 17 As Constructed Elev. { Dim.



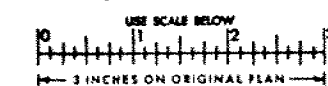
W.P.	STATION	CO - ORDINATES		W.P.	STATION	CO - ORDINATES	
		NORTH	EAST			NORTH	EAST
W.P.*1	663+91.90	15619804.61	1245877.58	W.P.*8	663+72.90	15619806.39	1245851.86
W.P.*2	664+24.90	15619780.68	1245900.30	W.P.*9	663+91.90	15619792.61	1245864.95
W.P.*3	664+60.90	15619754.57	1245925.09	W.P.*10	100+65.21	15619725.73	1245992.02
W.P.*4	100+32.21	15619729.92	1245948.50	W.P.*11	100+92.21	15619713.27	1246003.59
W.P.*5	100+65.21	15619705.99	1245971.23	W.P.*12	100+65.21	15619693.99	1245958.59
W.P.*6	663+72.96	15619843.30	1245890.82	W.P.*13	100+82.21	15619681.66	1245970.30
W.P.*7	665+91.90	15619823.53	1245902.78				

CURVE DATA OF S-E RAMP					
Δ	8° 23' 30"	R	2291.83	L	335.67
D	2° 30' 00"	T	168.13		

ALL STATIONS GIVEN ARE IN REFERENCE TO HWY 402 LINE "A"



FOR REDUCED PLAN



REVISIONS	DATE	BY	DESCRIPTION
DESIGN	2	K	CHECK
DRAWING	2	K	CHECK
DATE	AUG. 77		
DATE	AUG. 77		
DATE	AUG. 77		



Memorandum

40I13-46

GEOGRES No.

To: Mr. A.P. Watt (2)
Regional Structural Planning Engineer
Southwestern Region, London

From: Soil Mechanics Section
Geotechnical Office
West Building, Downsview

Date: March 30, 1976

Attention:

Our File Ref. W.P. 40-66-19/20

In Reply to

APR 06 1976

Subject:

GEOGRES NO. 40I13-46
FOUNDATION INVESTIGATION REPORT
for

W.P. 40-66-19/20
Hwy. 402, District 2, London
County Road 39 Interchange Overpass
EBL/WBL 9.8 Miles West of Hwy. 2

CONT. No 79-51

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 requirements. Should additional information be required, please do not hesitate to contact our Office.

K.G. SELBY
Supervising Engineer

cc: R.S. Pillar
C.S. Grebski
B.J. Giroux
G.A. Wrong
A. Wittenberg
J.R. Roy
D.P. Collins
R. Hore
J. Anderson)
A. Crowley) memo only
G. Sloan)
Files

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1. INTRODUCTION
2. SITE DESCRIPTION
3. FIELD AND LABORATORY INVESTIGATION
4. SUBSURFACE CONDITIONS
 - (4.1) Soil Conditions
 - (4.2) Groundwater Conditions
5. DISCUSSION AND RECOMMENDATIONS
 - (5.1) General
 - (5.2) Foundations
 - (5.3) Approaches

FOUNDATION INVESTIGATION REPORT

for

W.P. 40-66-19/20
Hwy. 402, District 2, London
County Road 39 Interchange Overpass
EBL/WBL 9.8 Miles West of Hwy. 2

1. INTRODUCTION

This report contains the results of a Foundation Investigation carried out at the following site:

County Road #39 Overpass
W.P. 40-66-19 & 20
1.8 Miles SW of Hickory Corner (Hwy. #22)
Hwy. 402, Line 'A'
District 2, London

The Report contains factual and interpreted soil data and recommendations pertaining to the design and construction of the proposed twin structures and approaches.

2. SITE DESCRIPTION

The proposed overpass structures will be located at the crossing of the existing Middlesex County Rd. #39 and future Hwy. #402, approximately 1.8 miles southwest of Hickory Corner which is situated at the junction of Co. Rd. #39 and Hwy. #22.

County Road #39 is the boundary line between Townships of Adelaide and Caradoc. The road is located in a shallow cut (approx. 6' deep), the top of pavement at centreline being at elev. 778 \pm . The depth of drainage ditches which are located on both sides of the roadway is about 3.5 feet.

In terms of topography, the immediate area of the site is relatively flat and gently sloping toward the southeast. The land is used for agricultural purposes and was plowed at the time of the field investigation.

Physiographically, the site is situated in the region referred to as the Caradoc Sand Plains. Sand and other light textured waterlaid deposits are characteristic of this region.

3. FIELD AND LABORATORY INVESTIGATION

A total of six boreholes, five accompanied by dynamic cone penetration tests, were carried out during the course of the field investigation (Nov. 5-18, 1975).

The borings were advanced by means of continuous flight augers (hollow stem or solid) above the groundwater and by washboring methods below that depth.

Samples were obtained in 2" O.D. split-spoon samplers, which were hammered into the soil in accordance with the specifications for the Standard Penetration Test. The same energy was used to carry out the dynamic cone penetration tests.

The groundwater conditions across the site were determined by recording the water level in the open holes during the course of the field investigation.

The locations and elevations of all borings were surveyed by personnel from the Southwestern Region Engineering Surveys and are shown on Drawing 406619 & 20-A.

The samples were subjected to visual examination in the field and subsequently in the laboratory.

Laboratory tests were performed on selected samples to determine the physical properties of the various soil types, namely:

Natural Moisture Content

Grain-size Distributions

Atterberg Limits (cohesive soils only)

The results of the field and laboratory testing are plotted on the Record of Borehole Sheets.

4. SUBSURFACE CONDITIONS

(4.1) Soil Conditions

The soil conditions at the site in general, were found to be uniform over the area investigated.

The surficial deposit (below original ground level) across the site is composed of a 3.5' to 8.5' thick, very stiff silty clay with traces of sand, followed by an extensive loose to very dense

cohesionless deposit of sands and silts with traces of clay to a minimum depth of 93 ft. Beneath this cohesionless deposit, a stratum of very stiff to hard clayey silt was penetrated up to 37 ft. The sandy silt to silty sand deposit was fully penetrated in boreholes No. 2 & 5 and the borings were terminated in the clayey silt layer.

Roadway fill material (up to 3.5') consisting of mixtures or layers of sand, silt, clay and organics, was encountered in boreholes No. 3 & 4 which were put down adjacent to the existing Co. Rd. #39.

The boundaries of the various deposits are shown on the accompanying Record of Borehole Sheets. The stratigraphical sections plotted on drawing No. 406619 & 20-A are inferred from this data. A description of the soil types encountered in the boreholes follows:

(4.1.1) Silty Clay With Traces of Sand

This deposit occurs from the original (natural) ground surface to a maximum depth of 8.5' (B.H.'s #1, 2, 5 & 6). The material in the stratum consists of silty clay with traces of sand. Atterberg Limit Tests indicate that the compressibility or plasticity of this inorganic stratum is in the medium range.

Standard Penetration Tests were carried out within this deposit. The obtained 'N' values varied between 8 and 25 blows per foot from which it is estimated that the consistency ranges from firm to very stiff.

(4.1.2) Fill Material

This material was observed in B.H.'s No. 3 and 4 which were drilled through the existing road shoulders. The soil consists of mixtures or layers of sand, silt, clay and organics. The thickness at the borehole locations ranges from 2.5 to 3.5 ft.

(4.1.3) Sandy Silt to Silty Sand, Traces of Clay

This deposit was intersected at every boring location immediately beneath the silty clay or the fill material but was not penetrated to its full extent in every borehole. The thickness was found to range from 81 to 93 ft. in borehole No. 5 and 2 respectively.

The material in the stratum consists of silts and sand in varying proportions. The chief constituent is silt in the upper half of the deposit, while the lower half consists mostly of sand. Traces of clay were also found throughout the stratum. Grain-size distribution tests were carried out on selected samples. The results are plotted in envelope form on Fig. 1 of the Appendix.

Standard Penetration Tests were carried out within this cohesionless (granular) deposit and the results are plotted on the Record of Borehole Sheets. The obtained 'N' values varied from 5 blows/ft. to 100 blows for 5 inches. Based on these results, it is estimated that the relative density of this deposit is generally loose in the upper 5 feet and ranges somewhat randomly from compact to very dense in the remainder of the deposit.

The natural moisture content varies between 5% and 21%, however, the bulk of the deposit has a moisture content close to 20%.

(4.1.4) Clayey Silt

Boreholes No. 2 & 5 which were drilled beyond the lower boundary of the sandy silt to silty sand deposit encountered a stratum of clayey silt at elev. 679± and elev. 693± respectively. The stratum was penetrated up to 37 feet.

A limited number of laboratory tests indicated that the deposit is inorganic and has a low plasticity.

The natural moisture content ranges from 20 to 23%.

Based on Standard Penetration Test 'N' values, the consistency is estimated to range from very stiff to hard.

(4.2) Groundwater Conditions

At the time of the field investigation, Nov. 5-18, 1975, the following groundwater levels were recorded:

B.H. #1	Elev. 754.2
2	754.2
3	753.0
4	757.5
5	756.3
6	758.0

The average natural ground surface is at elev. 780+ in the vicinity of the site.

It is pointed out that the water level observations were carried out during a relatively dry period and that higher levels will probably prevail in the spring period.

5. DISCUSSION AND RECOMMENDATIONS

(5.1) General

It is proposed to build three span (35'-73'-35') twin overpass structures at the crossing of County Road #39 and future EB lanes and WB lanes (ref. dwg. 406619 & 20-A) of Hwy. #402.

The profile grade of Hwy. #402 will be at elev. 784+ which is about 3 to 6 ft. above the original ground. County Road #39 will be lowered from the existing grade (elev. 778+) to elev. 763.

(5.2) Foundations

(5.2.1) Piers

The proposed piers for both structures may be founded on spread footings placed within the sandy silt to silty sand deposit. An allowable bearing pressure of 4.0 tsf may be used for design purposes at or below elev. 761. In the vicinity of the east piers for both EBL and WBL structures the groundwater level was observed to be at elev. 757.5. This level may be higher during the wet season and it may be necessary to employ a dewatering scheme to prevent boiling of the footing bases, depending on the prevailing groundwater level at the time of construction.

(5.2.2) Abutments

The subsoil at the abutment locations consists of approximately 3 to 8.5 ft. of silty clay with traces of sand, followed by an extensive deposit of mainly compact to very dense sand and silt.

The sand and silt material is competent to support an allowable bearing pressure of 3.0 tsf at or below the following elevations:

West Abutments: WBL Structure: Elev. 772+
EBL Structure: Elev. 772+
East Abutments: WBL Structure: Elev. 770+
EBL Structure: Elev. 768+

For computation of sliding resistance a friction coefficient of 0.40 may be assumed to apply between bases of footings and the underlying soil at the foundation level.

The front face of the abutment footing (measured in the plane of the underside of footing) should not be placed closer than 10 ft. from the forward slope surface.

(5.2.3) Settlement

Total settlements under the footings should not be more than 1 inch and should occur immediately the load is applied. Differential settlements between piers and abutments should be less than 1 inch.

(5.2.4) Frost Protection

Bases of spread footings should be protected against frost action with a minimum of 4 ft. of earth cover.

(5.2.5) Dewatering

The sandy silt to silty sand subsoil encountered at this site is highly susceptible to conditions of unbalanced hydrostatic head and it is likely to 'boil' when exposed to such conditions.

In view of this, a dewatering scheme may be necessary if excavations are carried below the groundwater level.

(5.3) Approaches

To realize the proposed profile grade (elev. 784+) of highway #402 up to 6 ft. high fills and about 16 ft. deep cuts will be required at this location.

No stability problems are anticipated for the proposed fills and cuts, constructed with 2 horizontal to 1 vertical slopes.

The slopes should be protected against erosion according to current MTC practices.

Settlement of the subsoil due to the load imposed by the
fills will be negligible.

P. Payer
P. Payer
Senior Engineer



K.G. Selby
K.G. Selby, P. Eng.
Supervising Engineer

March, 1976

APPENDIX

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS-ONTARIO

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

WP 40-66-19/20

LOCATION Co-ords. 15,619,814 N; 1,245,881 E.

ORIGINATED BY MK

DIST 2 HWY 402

BORING DATE November 5-7, 1975

COMPILED BY OJ

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger & Cone Test

CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N VALUES		25	50	75	100	125	W_P	W	W_L		
781.5	Ground Level															
0.0	Silty clay, traces of sand. Very Stiff		1	SS	23	780										0 1 49 50
773.0			2	SS	25											0 10 74 16
8.5			3	SS	9											
			4	SS	21											
			5	SS	35											
			6	SS	39											
			7	SS	34											
			8	SS	95											
			9	SS	67											
			10	SS	41											
			11	SS	31											
			12	SS	95											
			13	SS	52											
			14	SS	24											
			15	SS	9											
			16	SS	31											
			17	SS	83											
			18	SS	100											
725.0			19	SS	76											
56.5	End of Borehole															

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

RECORD OF BOREHOLE NO 2

WP 40-66-19/20 LOCATION Co-ords. 15,619,730 N; 1,245,793 E. ORIGINATED BY MK
DIST 2 HWY 402 BORING DATE November 7-11, 1975 COMPILED BY GP
DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Bi-Cone & Cone Test CHECKED BY *GP*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	w_p	w	w_L	
780.8	Ground Level														
0.0	Silty clay traces of sand Very Stiff		1	SS	21	780									
			1A	TW	PH										
772.3			1B	TW	PH										
8.5			2	SS	17	770									0 27 (73)
			3	SS	32										
			4	SS	31										
			5	SS	43										
	Sandy Silt		6	SS	107	760									
			7	SS	127										
	to		8	SS	60										
			9	SS	39										
	Silty Sand		10	SS	100	5"750									0 83 (17)
			11	SS	15										
	Trace of Clay		12	SS	154	740									
			13	SS	90										
			14	SS	100	5"730									
	Compact to Very		15	SS	80	6"									
	Dense		16	SS	117	720									0 89 (11)
			17	SS	153	710									
			18	SS	130	700									0 54 42 4
			19	SS	58	690									
679.4			20	SS	86	680									
101.4	Clayey silt, very														
676.8	Stiff to Hard														
104.0															

RECORD OF BOREHOLE No 2 Continued

WP 40-66-19/20 LOCATION Co-ords. 15,619,730 N; 1,245,793 E. ORIGINATED BY MK
 DIST 2 HWY 402 BORING DATE November 7-11, 1975 COMPILED BY GP
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Bi-Cone CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	w_p	w	w_L		
676.8	continued															GR SA SI CL
104.0	Clayey Silt Very Stiff to Hard		21	SS	41	670										
659.3			22	SS	24	660										
121.5	End of Borehole															

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 40-66-19/20 LOCATION Co-ords. 15,619,737 N; 1,245,869 E. ORIGINATED BY MK
 DIST 2 HWY 402 BORING DATE November 12, 1975 COMPILED BY GP
 DATUM Geodetic BOREHOLE TYPE Hollow Stem Auger & Tri-Cone & Cone Test CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	w_p	w	w_L		
776.7	Ground Level															
0.0	Fill Material-layers of sand, clayey silt & organics.															
773.2			1	SS	3											0 15 75 10
3.5	Sandy Silt to Silty Sand		2	SS	10	770										
			3	SS	33											
			4	SS	35											
			5	SS	31											0 60 (40)
			6	SS	63	760										
	traces of clay		7	SS	73											
			8	SS	49											
			9	SS	167	750										
	Loose to Very Dense		10	SS	85											
			11	SS	160	740										0 87 (13)
			12	SS	127											
			13	SS	54	730										
722.7			14	SS	62											
54.0	End of Borehole		15	SS	42											

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

RECORD OF BOREHOLE NO 4

WP 40-66-19/20 LOCATION Co-ords. 15,619,694 N; 1,245,914 E. ORIGINATED BY PP
 DIST 2 HWY 402 BORING DATE November 20-24, 1975 COMPILED BY GP
 DATUM Geodetic BOREHOLE TYPE Auger BX Casing & Bi-Cone & Cone Test CHECKED BY GP

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT <u>W_L</u> PLASTIC LIMIT <u>W_P</u> WATER CONTENT <u>W</u>			UNIT WEIGHT <u>γ</u>	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	W _P	W	W _L		
775.0	Ground Level															
772.5	Fill mat. 1. layers of sand, clayey si. & org.															
2.5	Sandy silt to silty sand, traces of clay Compact to Very Dense		1	SS	26											
			2	SS	47											
			3	SS	58											
			4	SS	63											
			5	SS	68											
			6	SS	90											
			7	SS	132											
			8	SS	63											
			9	SS	139											
			10	SS	87											
			11	SS	33											
			12	SS	34											
			13	SS	123											
			14	SS	113											
			15	SS	63											
723.5			16	SS	68											
51.5	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

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

RECORD OF BOREHOLE NO 5

WP 40-66-19/20 LOCATION Co-ords. 15,619,706 N; 1,245,981 E. ORIGINATED BY PP; MK
DIST 2 HWY 402 BORING DATE November 25-27, 1975 COMPILED BY GP
DATUM Geodetic BOREHOLE TYPE Auger & BX Casing CHECKED BY

SOIL PROFILE		STRAT. PLOT	SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W W_p — W — W_L WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION		NUMBER	TYPE	N' VALUES		25	50	75	100	125			
777.8	Ground Level													
0.0	Silty clay, traces of sand. Very Stiff		1	SS	18									
773.8			2	SS	5									
4.0			3	SS	18	770								
	Sandy silt to silty		4	SS	21									
			5	SS	48									
	sand, traces of		6	SS	26	760								0 51 (49)
	clay.		7	SS	138									
			8	SS	45									
			9	SS	40									
			10	SS	170	750								
			12	SS	37									0 55 (45)
	Loose to Very Dense		13	SS	66	740								
			14	SS	89									
			15	SS	100	730								
			16	SS	74									
			17	SS	51	720								0 92 (8)
			18	SS	87	710								
			19	SS	100/6"	700								
692.8														
85.0	Clayey Silt		20	SS	54	690								
	Hard													
			21	SS	80	680								0 0 69 31
673.8														
104.0														

20
15 5 % STRAIN AT FAILURE

Continued

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

RECORD OF BOREHOLE No 5 Continued

WP 40-66-19/20 LOCATION Co-ords. 15,619,706 N; 1,245,981 E. ORIGINATED BY PP;MK
 DIST 2 HWY 402 BORING DATE November 25-27, 1975 COMPILED BY GP
 DATUM Geodetic BOREHOLE TYPE Auger & BX Casing CHECKED BY GP

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT _____w _L PLASTIC LIMIT _____w _p WATER CONTENT _____w			UNIT WEIGHT γ	REMARKS																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		25	50	75	100	125	w _p — w — w _L																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							
							SHEAR STRENGTH					WATER CONTENT %																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																							

RECORD OF BOREHOLE NO 6

WP 40-66-19/20

LOCATION Co-ords. 15,619,622 N; 1,245,893 E.

ORIGINATED BY MK


DIST 2 HWY 402

BORING DATE November 28, 1975

COMPILED BY GP

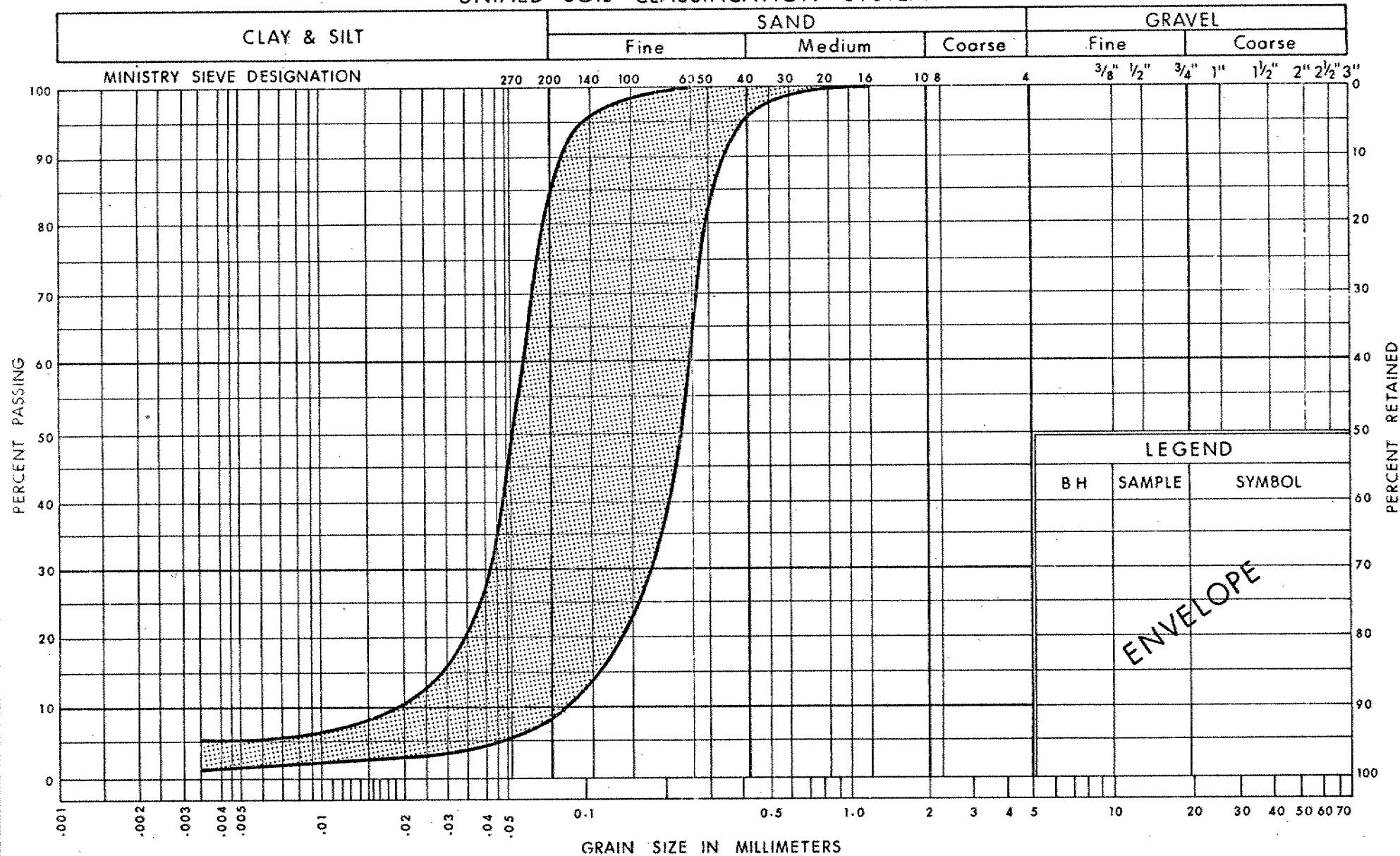
DATUM Geodetic

BOREHOLE TYPE Auger & Cone Test

CHECKED BY 

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	N' VALUES		25	50	75	100	125	w_p	w	w_L		
777.5	Ground Level															
0.0	Silty Clay															
774.0	Firm		1	SS	8											
3.5			2	SS	6											
			3	SS	7											
	Sandy silt to silty		4	SS	25											
			5	SS	49											
	sand, traces of		6	SS	29											
	clay.		7	SS	104											
			8	SS	52											
			9	SS	41											
			10	SS	137											
	Loose to Very Dense		11	SS	27											
			12	SS	50											
			13	SS	70											
			14	SS	55											
			15	SS	202/10"											
726.0			16	SS	69											
51.5	End of Borehole															

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation and
Communications

GRAIN SIZE DISTRIBUTION
SANDY SILT TO SILTY SAND
TRACES OF CLAY

FIG No 1

WP 40-66-19 & 20

ENGINEERING SERVICES BRANCH

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

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

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

DESCRIPTION OF SOIL

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

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

TERMS TO BE USED IN DESCRIBING SOILS :-

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

TYPE OF SAMPLE

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

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

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

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

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

STRESS AND STRAIN

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

EARTH PRESSURE

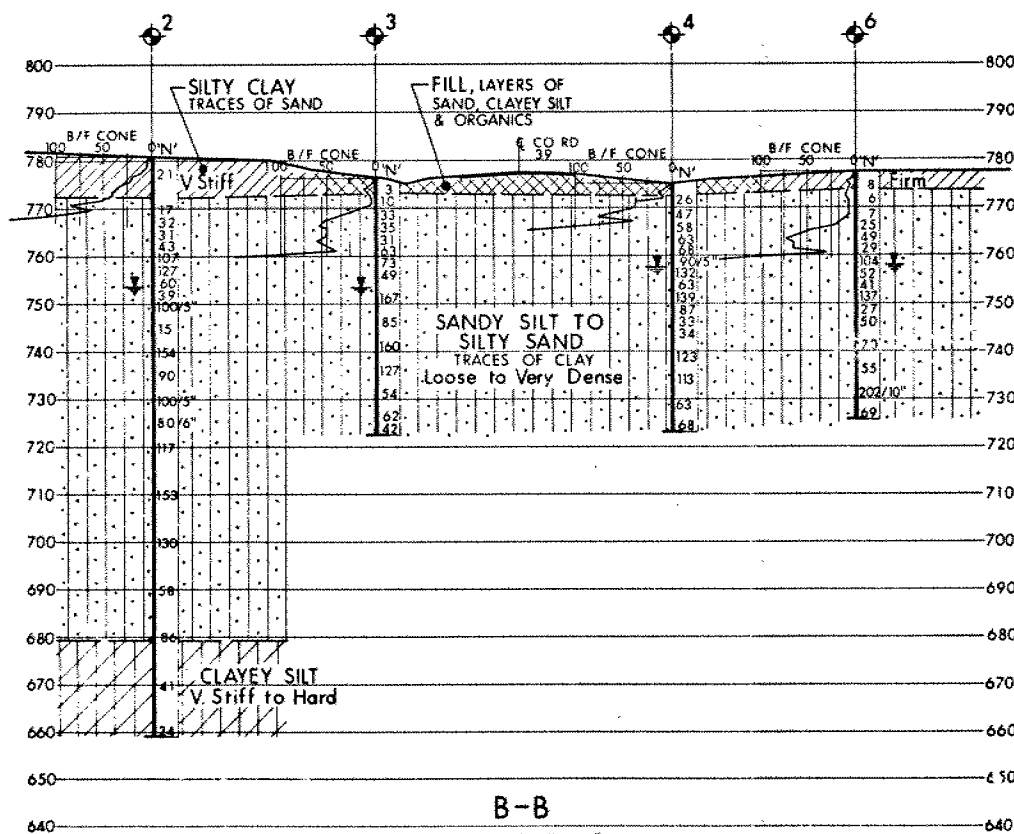
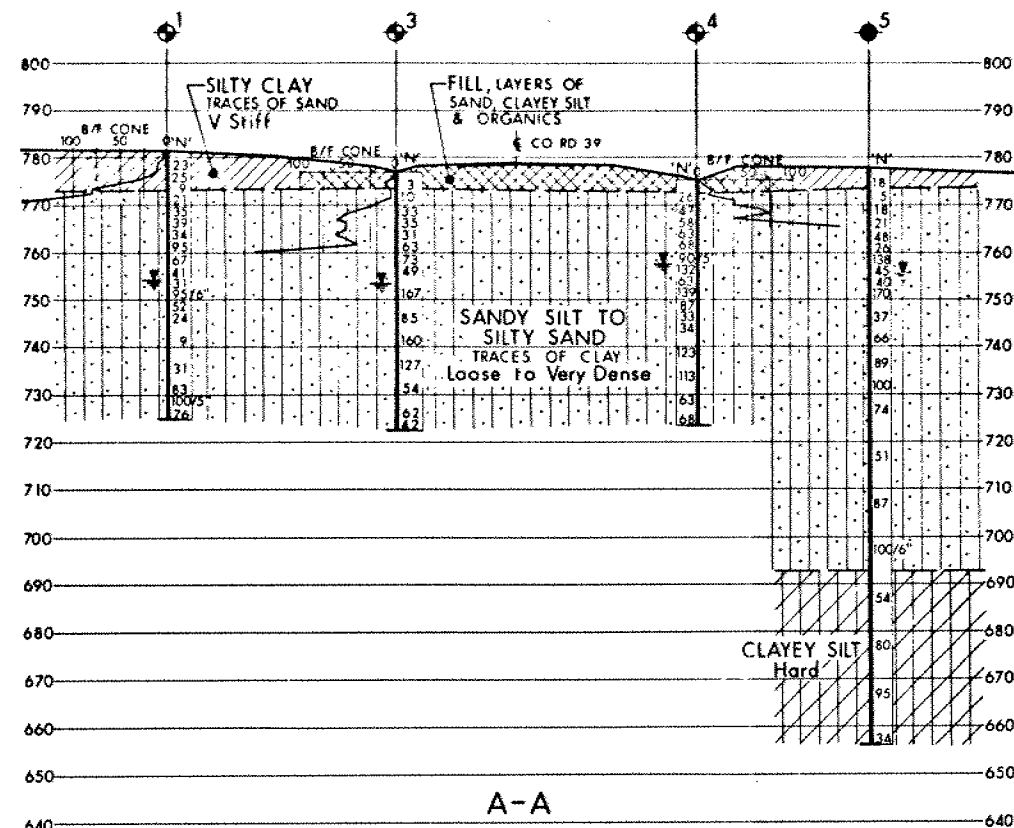
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

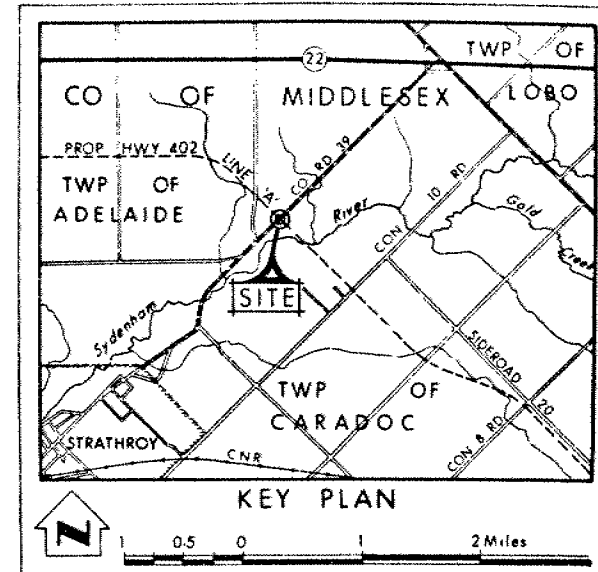
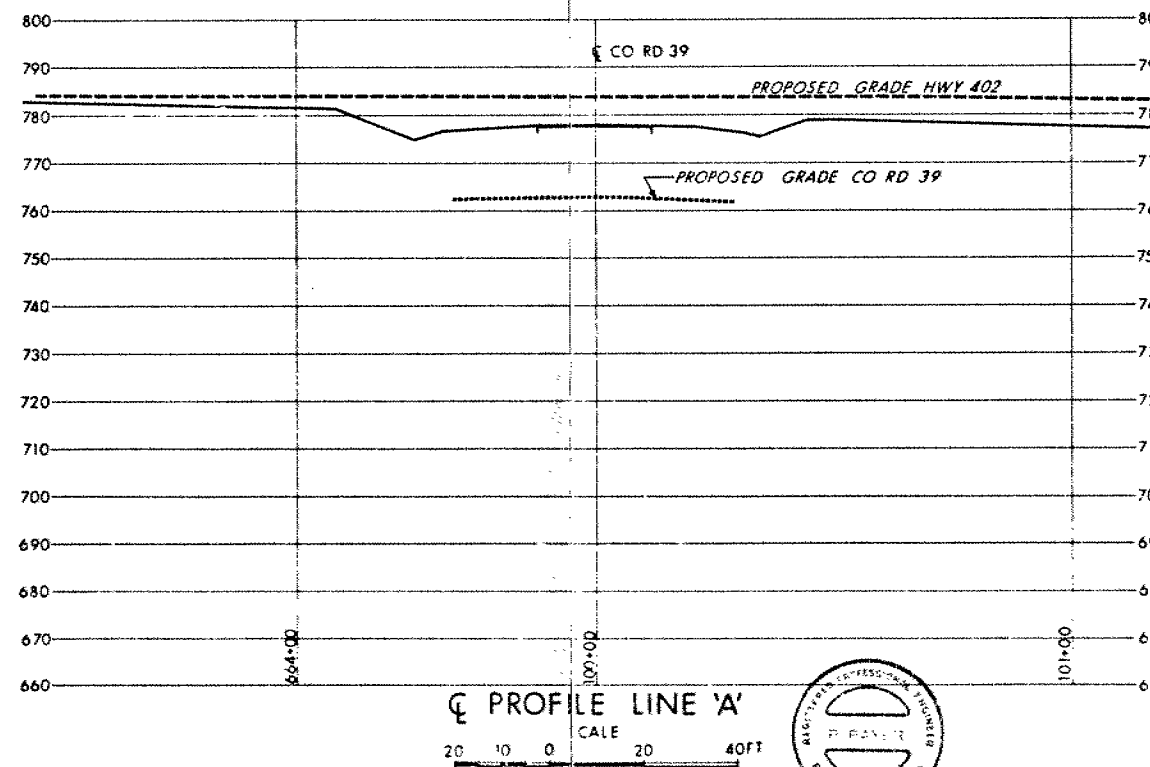
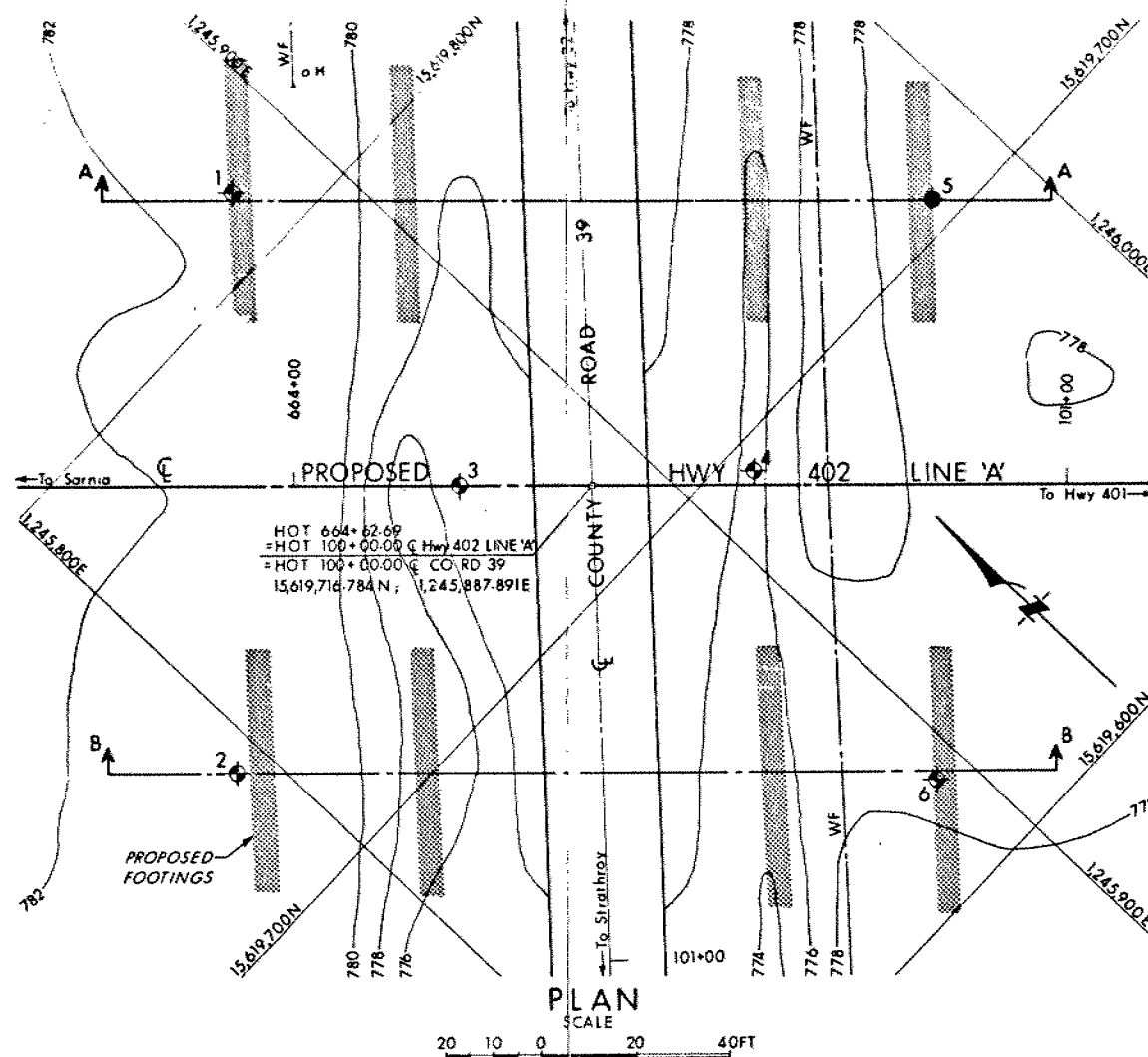
B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

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



SECTIONS
 SCALE
 20 10 0 20 40FT



- LEGEND**
- Bore Hole
 - ⊕ Dynamic Cone Penetration Resistance Test
B/F CONE - Blows/Ft. Cone Test (350 ft lbs energy/blow)
 - ⬢ Bore Hole & Cone Test
 - ⬆ Water Level established at time of field investigation, Nov 1975

NO.	ELEVATION	CO-ORDINATES NORTH	EAST
1	781.5	15,619,814	1,245,881
2	780.8	15,619,730	1,245,793
3	776.7	15,619,737	1,245,869
4	775.0	15,619,694	1,245,914
5	777.8	15,619,706	1,245,981
6	777.5	15,619,622	1,245,893

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

GEOCRES No 40113-46

REVISIONS	DATE	BY	DESCRIPTION

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

COUNTY ROAD 39
 (9.8 Miles West of Hwy 2)

HIGHWAY NO Proposed 402 LINE 'A' DIST NO 2
 CO MIDDLESEX
 TWP ADELAIDE & CARADOC 28 & 20 CON II & X

BORE HOLE LOCATIONS & SOIL STRATA

SUBWD P.F. CHECKED P.F. W.F. NO 40-06-19 & 20 DRAWING NO 406619 & 20-A
 DRAWN CHECKED W.F. NO DATE March 19, 1976 SITE NO 19-523 BRIDGE DRAWING NO
 APPROVED CONT NO

REF No E-5388-1, July 1975