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GEOCRES No. 30M5-110

DIST. 4 REGION Central

W.P. No. 159-75-07

CONT. No. 78-104

W. O. No. _____

STR. SITE No. 10-282A

HWY. No. _____

LOCATION QEW/Ford Drive /
Hwy 403

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 1

REMARKS: documents to be unfolded
before microfilming

ENGINEERING MATERIALS OFFICE
SOIL MECHANICS SECTION

WP 159-75-07

DIST 4

HWY QEW/Ford Drive/ STR SITE 10-282A
Hwy. 403

W-N Ramp Hwy. 403 Structure
under Ramp E-NS

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SAMPLE DISPOSITION NOTICE		
TYPE	DISCARD AFTER	RECOMM. BY
JARS	77 of 23	MD
TUBES	—	—
ROCK CORES	The remainder of the Core	MD

FOUNDATION INVESTIGATION REPORT

For

W-N Ramp Hwy. 403 Structure under Ramp E-NS
QEW/Ford Drive/Hwy. 403 Interchange
W.P. 159-75-07 Site 10-282A
District 4, Hamilton

INTRODUCTION

This report contains the results of a foundation investigation carried out at the site of the above mentioned project during the period of March 24, 1977 to March 29, 1977. The field work consisted of 5 sampled boreholes advanced by employing solid stem augers and BXL coring techniques. The boreholes ranged in depth from 30 to 40 feet below the ground level.

SITE DESCRIPTION AND GEOLOGY

The site is located adjacent to Upper Middle Road approximately 1,100 feet north of the existing Queen Elizabeth Way Underpass at Ford Drive in the Town of Oakville, Regional Municipality of Halton. The land immediately adjacent to the site has a gentle rolling topography sloping down to the south. Drainage ditches excavated within the area have exposed the underlying red shale characteristic of the Queenston shale area. The land is developed for farming purposes.

Physiographically the site lies on the southern fringe of the region referred to as the South Slope. This region is a strip of land bounded by the Iroquois Plain on the south and the Peel Plain on the north and extends from the Niagara escarpment to the Trent River. The region is characterized by a shallow till overlying shale of the Queenston and Dundas Formations of the Upper Ordovician age.

SUBSURFACE CONDITIONS

Generally uniform subsurface conditions were found to exist across the site. A 6 to 9 foot layer of clayey silt was found to overly shale bedrock of the Queenston Formation. Detail descriptions of the various soil and rock types encountered in each borehole are given on the Record of Borehole Sheets. The

estimated stratigraphical profile and sections shown on Drawing No. 1597507-A are based upon this information. From ground level downwards, the various soil types encountered are as follows:

Clayey Silt, Trace of Sand

Immediately below the natural ground level a cohesive stratum 6 to 9 feet thick consisting of clayey silt with traces of sand was encountered. The Standard Penetration Test gave 'N' values ranging from 27 to 44 blows/ft., indicating that the consistency of this stratum varies from very stiff to hard.

The physical properties of the clayey silt as determined from laboratory testing are summarized below:

	<u>Range</u>	<u>Average</u>
Liquid Limit (W_L) %	29-35	31
Plastic Limit (W_p) %	18-20	18
Moisture Content (W) %	10-14	12
Plasticity Index (I_p)	11-17	13

The results of the Atterberg Limit tests are shown on the Plasticity Chart Fig. 1. The Atterberg Limits indicate that the cohesive stratum is generally inorganic and of low plasticity.

Two typical grain size distribution curves from this stratum are shown on the grain size distribution curve Fig. 2.

Bedrock

Underlying the cohesive deposit is shale bedrock which was proven to a maximum depth of 34 feet. The bedrock can be described as soft, fine textured, red in colour, fissile and having thin horizontal bedding planes with seams of limestone up to 6" thick. The upper 3 to 6 feet of the shale bedrock is moderately weathered. A detailed description of the bedrock is given on the Record of Borehole Sheets.

The rock quality designation (RQD) classification gives an indication of the quality of the bedrock with respect to the number of fractures and amount of softening or alteration of the rock mass. The RQD is the total length of rock core pieces of 4 or more inches in length expressed as a percentage of the total length of core drilled. The RQD for the rock core varies from 0 to 85%, generally increasing with depth. These values indicate a rock quality of very poor to good. The low RQD is due to the thin horizontal bedding of the fissile shale.

GROUNDWATER

The groundwater level conditions were observed by measuring in the open boreholes during and after the completion of the foundation investigation. The groundwater levels were found to vary between elevation 483 and 487 which corresponds to 2.5 feet below the existing ground surface. The groundwater levels are shown on the Record of Borehole Sheets as well as on Drawing No. 1597507-A.

DISCUSSION AND RECOMMENDATIONS

As part of the proposed new complex interchange connecting QEW to Hwy. 403 several structures will be necessary. This report deals with a structure which will be required in this complex to carry Hwy. 403 W-N Ramp under the E-NS Ramp.

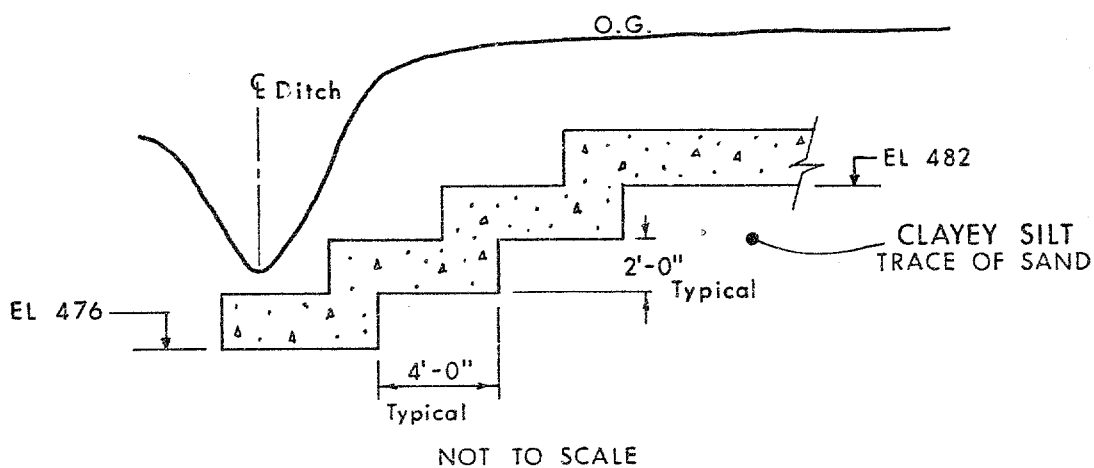
In the vicinity of this proposed structure, the existing ground is at about elevation 487. The proposed grade of the E-NS Ramp will be at elevation 491 and the grade of the W-N Ramp is to be at elevation 468. In order to attain the proposed grade of E-NS Ramp, fills up to 4 feet will be required. The proposed grade of W-N Ramp is such that cuts up to 19 feet will be necessary.

In the vicinity of the southern portion of the proposed west abutment a four to six foot deep drainage ditch paralleling Upper Middle Road is present. Therefore, special measures will be required in the design of this abutment.

Present proposals call for a three span bridge (38'-69'-38') with perched abutments and two centre piers to carry E-NS Ramp over the W-N Ramp Hwy. 403.

Abutment Foundation

The abutments for the proposed structure can be supported on spread footings situated within the clayey silt stratum. To minimize the abutment height the east abutment footing should be located at elevation 485. The footing for the west abutment should be situated at elevation 482 except in the region of the drainage ditch which parallels Upper Middle Road. The footing elevation at the ditch location should be at elevation 476. The difference in footing elevations could be obtained by means of a step footing as shown in the figure below:



Both abutment footings may be designed for a bearing pressure of up to 3 tsf. In any case, the underside of the footing should be provided with at least 4 feet of earth cover for frost protection.

Alternatively, both abutment footings can be founded on the weathered or sound bedrock designed for a bearing pressure of up to 5 tsf and 10 tsf respectively.

For frost protection requirements, the underside of the abutment footings should be provided with 4 feet of earth cover.

For estimating the earth pressure of granular backfill on the abutment walls a coefficient of active earth pressure of $K_a = 0.33$ may be used if some movement at the top of the wall is permitted. If no movement at the top of the wall is anticipated, a coefficient of earth pressure at rest $K_0 = 0.5$ may be used for design purposes.

To estimate the horizontal resistance to sliding between rough concrete and the clayey silt deposit, an adhesion value of up to 2000 psf may be used for design purposes. If the footings are founded on the shale bedrock a coefficient of friction of 0.60 should be used in the design to estimate the resistance to sliding.

In order to relieve the build up of hydrostatic pressures behind the abutment walls the structure should be backfilled with free draining granular material and provided with weepholes or other types of drainage conduit.

Pier Foundation

The proposed grade of the W-N Ramp will be such that the pier footings will be situated within the sound shale bedrock. Therefore, it is recommended that the piers be supported on spread footings designed for a bearing pressure of up to 10 tsf. Since the shale is frost susceptible, the underside of the footing should be provided with 4 feet of earth cores.

Other Considerations

To prevent softening of the shale bedrock at the footing grade due to surface runoff, the shale bedrock should be covered with 3 inches of mass concrete

immediately after the completion of the excavation.

No dewatering problems are anticipated for the construction of the abutment and pier footings. Any minor seepage or surface runoff into the excavations can be handled by pumping from sumps.

Approach Fill - E-NS Ramp

In the vicinity of the proposed structure approach fills of up to 4 feet in height will be required for the E-NS Ramp. No slope stability problems are anticipated provided the slopes are constructed at 2:1 (horizontal:vertical).

Cut W-N Ramp

As mentioned previously, a cut of up to 19 feet will be necessary at the structure site in order to reach the profile grade of the proposed W-N Ramp Hwy. 403. This cut will be made through the cohesive clayey silt and into the shale bedrock. The shale is susceptible to weathering and erosion, therefore, the cut should be treated as an earth cut and constructed with 2:1 slopes. It is further recommended that the cut slopes be covered with topsoil and sodded according to current MTC standards.

MISCELLANEOUS

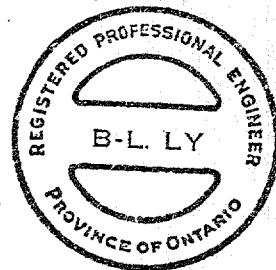
The field work for this investigation was carried out under the supervision of Mr. V. Korlu, Project Engineer and Mr. C.T. Johnson, Project Engineer. The equipment used was owned and operated by Geocon Ltd., Toronto and Atcost Ltd., Toronto.

This report was written by Mr. C.T. Johnson and reviewed by Mr. M. Devata, Supervising Engineer.

for B. Ly

C.T. Johnson, P. Eng.
Project Engineer

M. Devata
M. Devata, P. Eng.
Supervising Engineer



FOUNDATION REQUEST

In a memorandum dated February 16, 1977, Mr. G.C.E. Burkhardt, Head, Structural Section requested the Soil Mechanics Section to prepare a Foundation Investigation Report for the W-N Ramp Hwy. 403 structure under Ramp E-NS.

FIELD AND LABORATORY INVESTIGATION PROCEDURES

A total of five boreholes of which three were accompanied with a dynamic penetration test were put down using a muskeg mounted auger machine equipped with solid stem augers and rock coring equipment.

The locations and elevations of the boreholes were surveyed by personnel from the Central Regional Surveys and Plans Section.

Disturbed soil samples were received by means of a 2 inch O.D. split spoon sampler driven in accordance with the specifications of the Standard Penetration Test. Rock core of the bedrock was obtained by coring with BXL diamond bits.

The samples were visually examined and identified in the field and again in the laboratory. Following this examination, laboratory testing was carried out on selected representative samples of the cohesive stratum to determine the natural moisture content, Atterberg Limits and grain size distribution.

The rock core was examined and logged in detail in the laboratory by Mr. B.K. Glassford, Geologist.

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE No 11

WP 159-75-07

LOCATION Co-ords. N 15,805,900; E 953,757

ORIGINATED BY CTJ

DIST 4 HWY 403

BORING DATE March 28, 1977

COMPILED BY CTJ

DATUM Geodetic

BOREHOLE TYPE Solid Stem Auger; BXL core & Cone Test

CHECKED BY RS

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		20	40	60	80	100	w_p	w	w_L		
488.2	Ground Level															
0.0	Clayey silt, trace of sand		1	SS	31											
482.2	Very stiff Red		2	SS	145	11"										
6.0	(Weathered)															
479.2	(Sound)															
9.0	Shale Bedrock		3	RC BXL	100% Rec										RQD 40%	
	Shale Bedrock, red colour, fine texture soft, fissile, with interbedded thin seams of limestone up to 6" thick, thin horizontal bedding.		4	RC BXL	100% Rec										RQD 50%	
			5	RC BXL	100% Rec										RQD 85%	
448.4																
39.8	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 12

WP 159-75-07 LOCATION Co-ords. N 15,805,758; E 953,686 ORIGINATED BY CTJ
 DIST 4 HWY 403 BORING DATE March 24, 1977 COMPILED BY CTJ
 DATUM Geodetic BOREHOLE TYPE Solid Stem Auger; BXL core CHECKED BY RS

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	20 40 60 80 100					w_p ——— w ——— w_L				
							SHEAR STRENGTH					WATER CONTENT %				
						○ UNCONFINED + FIELD VANE ○ QUICK TRIAXIAL x LAB VANE										
485.4	Ground Level															
0.0	Clayey silt, trace of sand		1	SS	31											
479.4	Very stiff Red		2	SS	55											
6.0			3	SS	100/4 1/2"											
473.4	(weathered)		4	SS	100/4"											
12.0	(sound)		5	SS	100/1"											
	Shale Bedrock															
	Shale Bedrock, red colour, fine texture soft, fissile with thin seams of limestone present, thin horizontal bedding		6	RC BXL	100% Rec										RQD 50%	
			7	RC BXL	100% Rec										RQD 75%	
452.7																
32.7	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 13

WP 159-75-07

LOCATION Co-ords. N 15,805,861; E 953,791

ORIGINATED BY VK

DIST 4 HWY 403

BORING DATE March 28, 1977

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Solid Stem Auger; BXL Core

CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
487.8	Ground Level					ELEV										GR SA Si CL
0.0	Clayey silt Trace of sand Hard. Red		1	SS	38											0 6 74 20
480.8			2	SS	129	480										
7.0 477.8	(weathered)		3	SS	100	477.8										
10.0	(sound)															
	Shale Bedrock		4	RC BXL	100% Rec	470										RQD 30%
	Shale Bedrock, red, fine texture, soft, fissile with lime- stone interbedded seams up to 2" thick thin horizontal bedding.		5	RC BXL	100% Rec	460										RQD 50%
457.9																
29.9	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 14

W.P. 159-75-07

LOCATION Co-ords. N 15,805,727; E 953, 710

ORIGINATED BY VK

DIST 4 HWY 403

BORING DATE March 29, 1977

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Solid Stem Auger; EXL Core & Cone Test

CHECKED BY RS

SOIL PROFILE			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			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL × LAB VANE				
484.7	Ground Level															
0.0	Clayey silt, Trace of sand Red Very Stiff to Hard		1	SS	27	480										
475.7			2	SS	40											
9.0			3	SS	100/6"											
469.7	(weathered)		4	SS	105/5"											
15.0	(sound) Shale Bedrock		5	SS	100/6"	470										
	e below		6	RC EXL	50% Rec	460										
454.7			7	RC EXL	100% Rec											
30.0	End of Borehole															
	* Shale Bedrock, red, fine texture, soft, fissile with interbedded thin seams of limestone up to 2" thick, thin horizontal bedding.															

OFFICE REPORT ON SOIL EXPLORATION

HIGHWAY ENGINEERING DIVISION - ENGINEERING MATERIALS OFFICE - SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 17

WP 159-75-07

LOCATION Co-ords. N 15,805,835; E 953,725

ORIGINATED BY CTJ

DIST 4 HWY 403

BORING DATE March 25, 1977

COMPILED BY CTJ

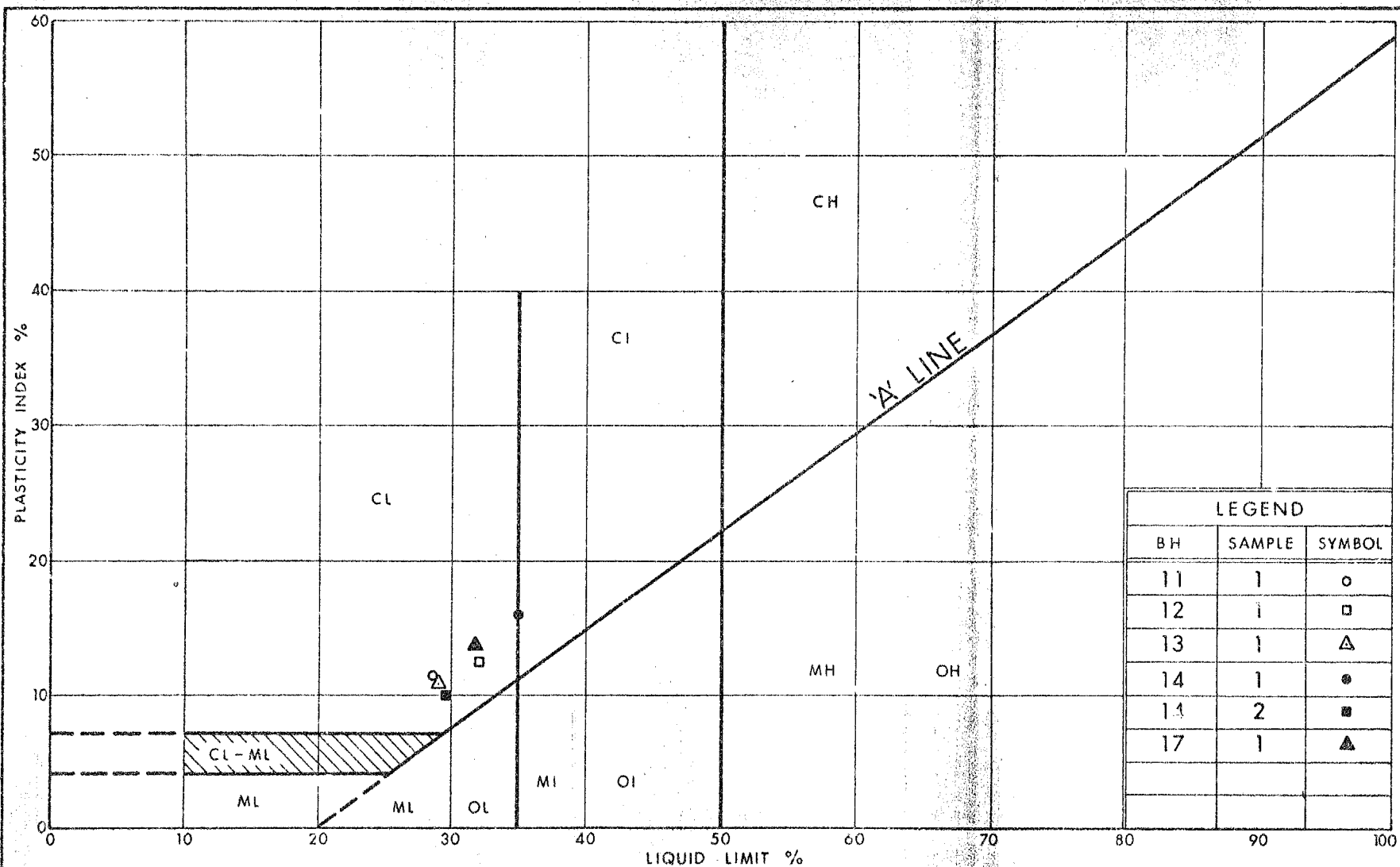
DATUM Geodetic

BOREHOLE TYPE Solid Stem Auger; EXL Core & Cone Test

CHECKED BY RS

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	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
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
487.2	Ground Level									
0.0	Clayey silt, trace of sand, occ. cobbles. Hard Red		1	SS	44					
481.2			2	SS	137	100/8"				
6.0	Shale Bedrock (weathered)		3	SS	100	6"				
475.2	(sound)		4	SS	100	6"				
12.0			5	SS	100	4"				
	Shale bedrock, red colour, fine texture soft fissile, bedding close to very close, interbedded with limestone seams up to 6" thick, thin horizontal bedding.		6	SS	100	3"				
			7	SS	100	1"				
			8	RC BXL	100%	Rec	460			RQD 40%
457.5										
29.7	End of borehole									

OFFICE REPORT ON SOIL EXPLORATION



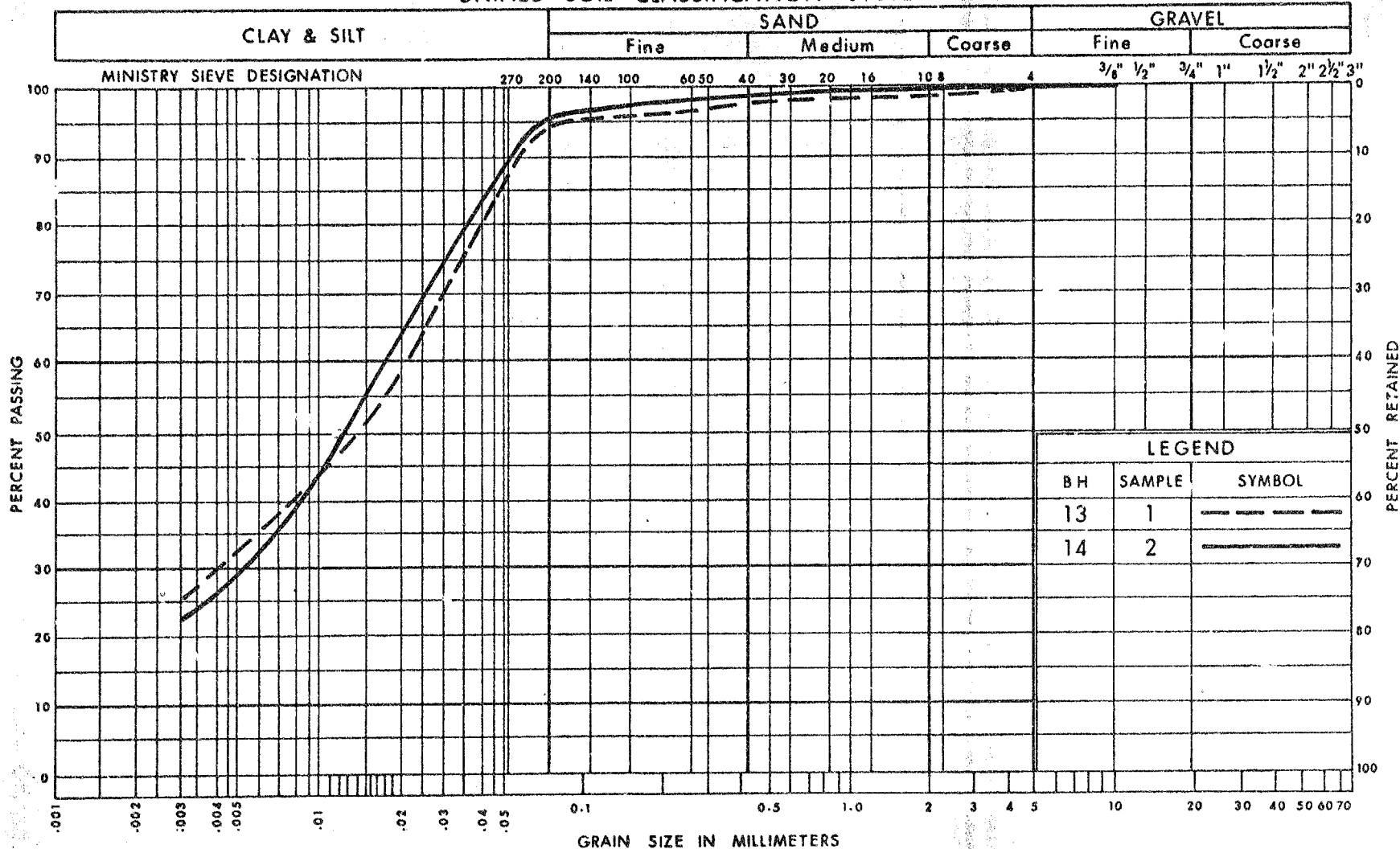
Ministry of
Transportation and
Communications

PLASTICITY CHART CLAYEY SILT TRACE OF SAND

FIG No 1

W P 159 - 75 - 07

UNIFIED SOIL CLASSIFICATION SYSTEM



Ministry of
Transportation and
Communications

ENGINEERING SERVICES BRANCH

GRAIN SIZE DISTRIBUTION
CLAYEY SILT
TRACE OF SAND

FIG No 2

W P 159 - 75 - 07

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
CU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" " ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
w_s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ 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 (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

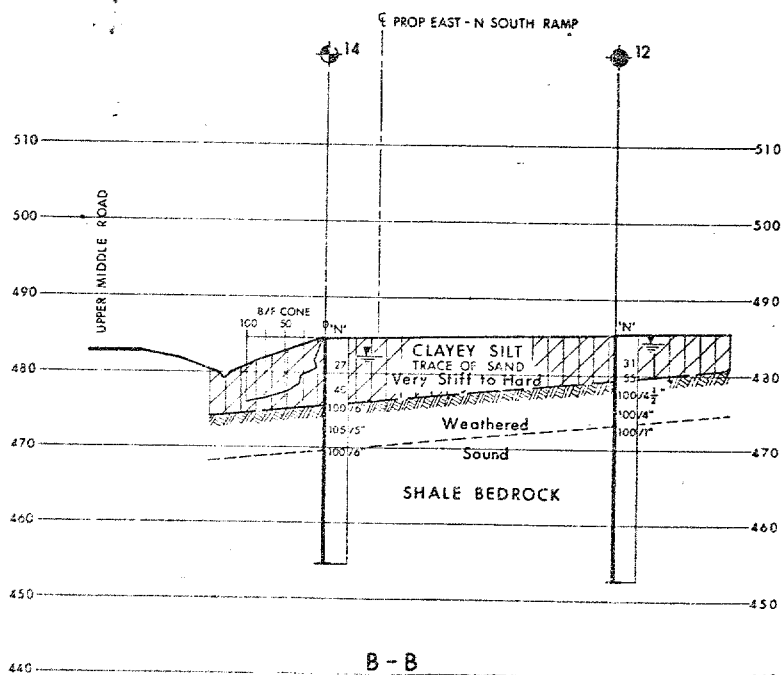
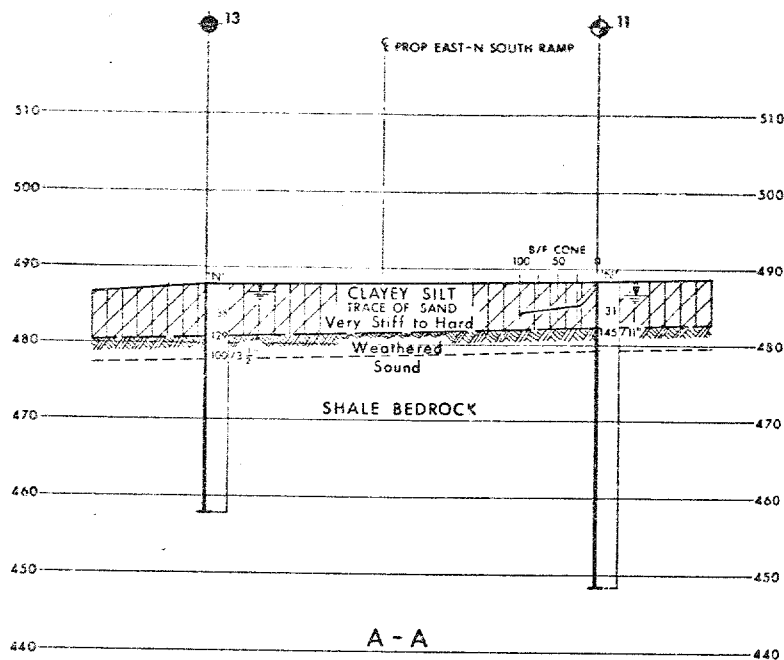
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

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

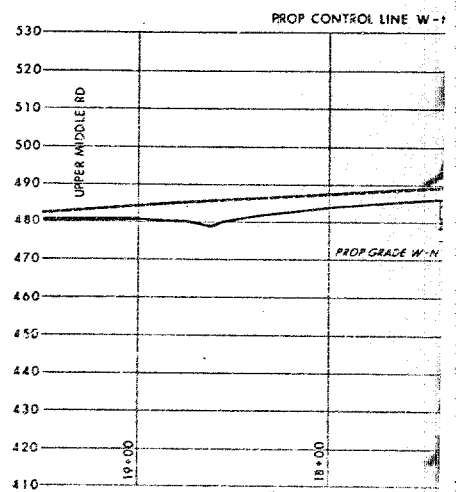
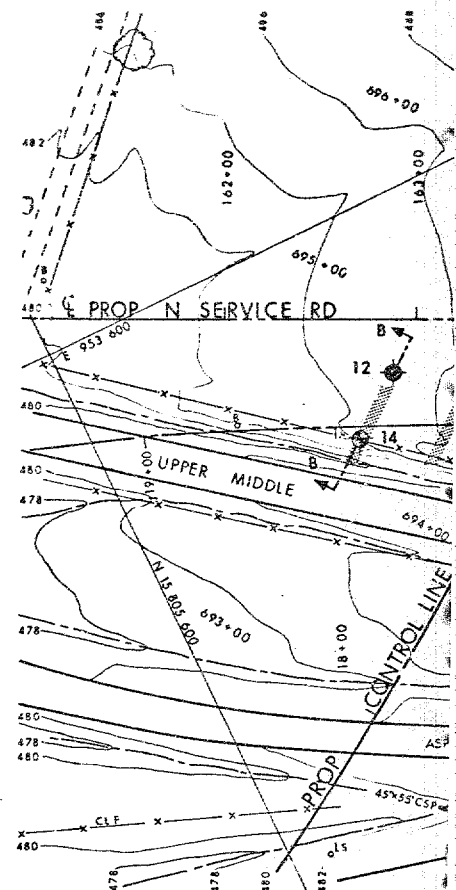
SLOPES

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



B-B
SECTIONS

10 0 SCALE 10 20 FT



PROFILE - PR
HOR 41
VERT 2

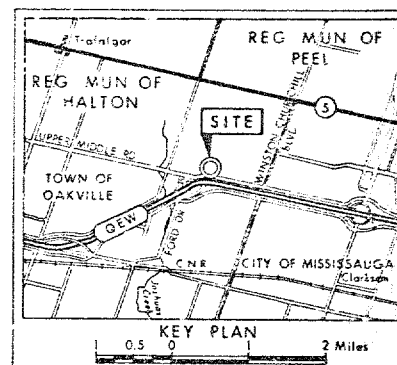
CONT No
WP No 159-75-07



PROPOSED EAST-N SOUTH RAMP

SHEET

BORE HOLE LOCATIONS & SOIL STRATA



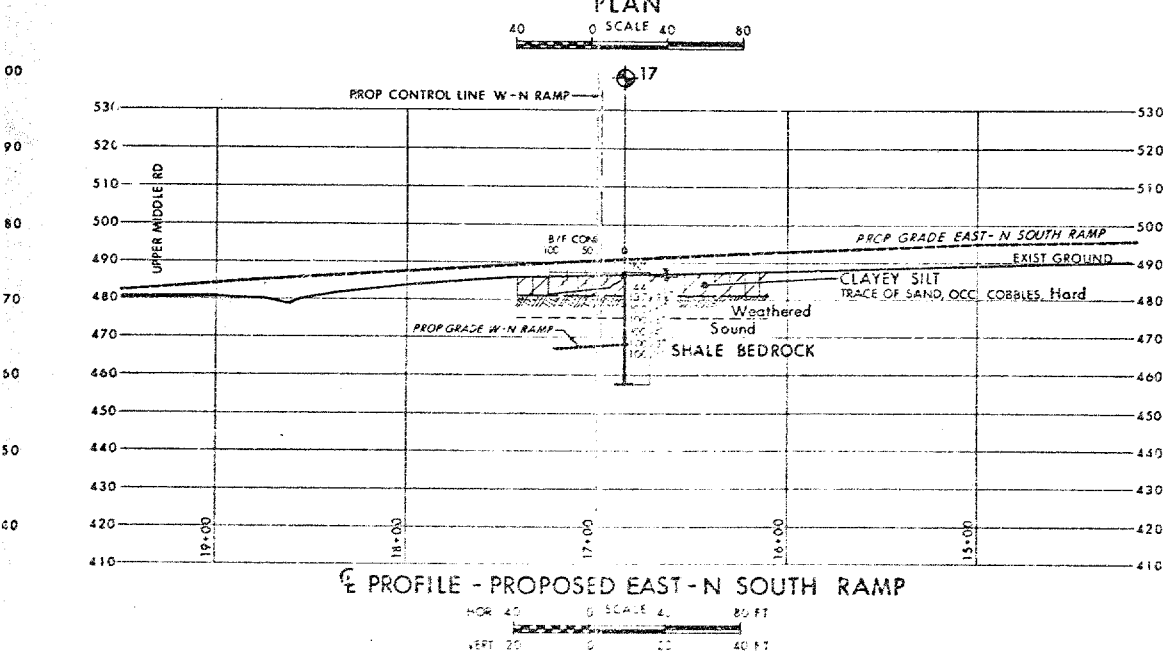
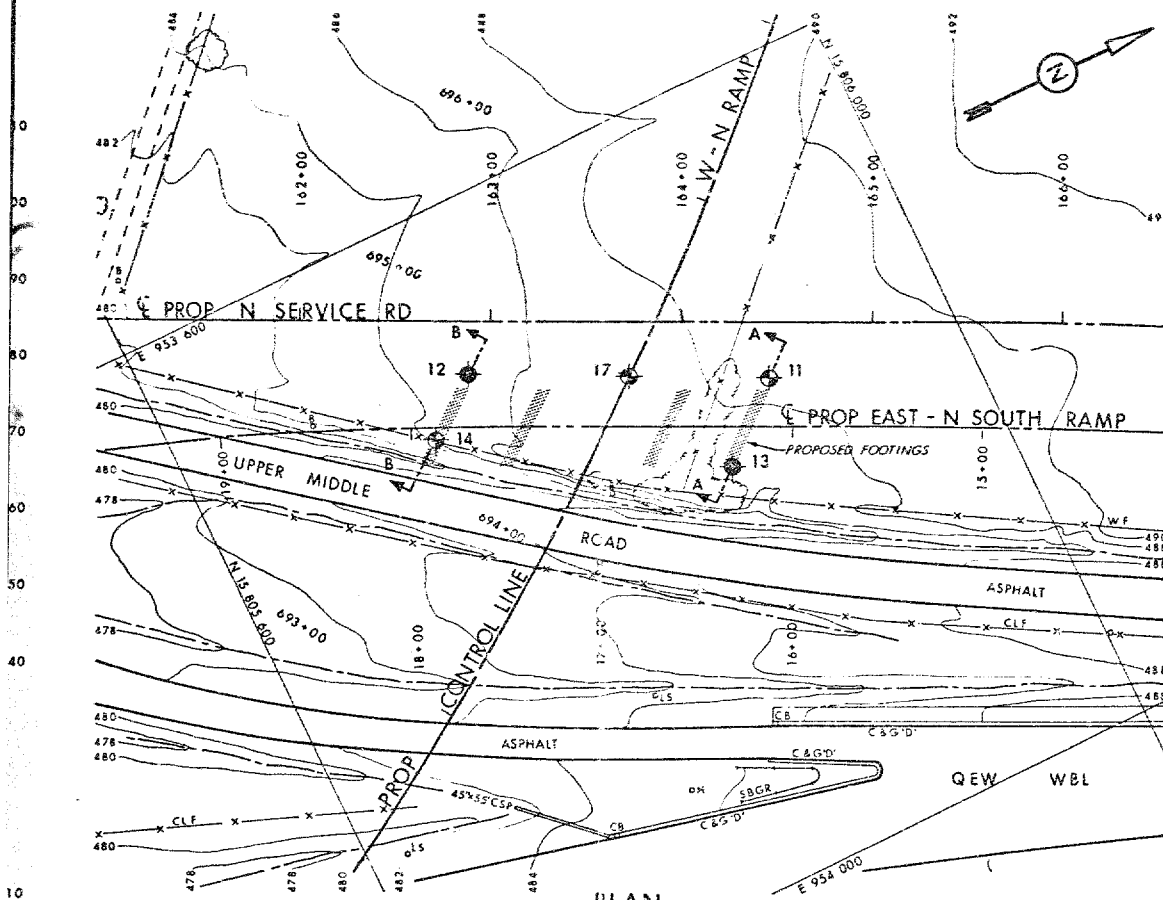
LEGEND			
	Bore Hole		
	Dynamic Cone Penetration Test (Cone)		
	Bore Hole & Cone		
	Blows/ft (Std Pen Test, 350 ft lbs energy)		
	CONE Blows/ft (60° Cone, 350 ft lbs energy)		
	W.L. at time of investigation Mar 1977		

No	ELEVATION	CO-ORDINATES	
		NORTH	EAST
11	488.2	15 805 900	953 757
12	485.4	15 805 738	953 686
13	487.8	15 805 861	953 791
14	484.7	15 805 727	953 710
17	487.2	15 805 835	953 725

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

REVISION	DATE	BY	DESCRIPTION

AT NO 403 W-N RAMP
REV: CT1, CHANGED TO 10/27/1977
DRAWN: RS, CHECKED: [Signature]
REF No B-82-QEW-2, Sept 1976





Memorandum

To: Mr. C. Mirza
Head, Soil Mechanics Section
West Building

From: R.A. Jeffries
Structural Section
3501 Dufferin Street

Attention:

Date: February 16, 1977

Our File Ref.

In Reply to

Subject: Re: Q.E.W./403/Ford Drive Interchange
Site 24 W.P. 159-75-05
District 4

A new complex interchange connecting Q.E.W. to Highway 403 Link and to a re-aligned Ford Drive is presently scheduled for 1978. Due to the intricate staging that is required for this above-mentioned interchange and the adjacent and interconnected, Q.E.W./Winston Churchill Blvd. Interchange, the detour scheme necessary for the Q.E.W. traffic will require four structures to be constructed as an advance structure contract.

Also as part of this contract, additional structures (possibly twin cell box culverts) will be required to carry the Q.E.W. and associated ramps over Joshua Ck., possibly on a new alignment slightly north of the existing creekbed, this data will be submitted to your office when available.

Two structures will be required to carry Q.E.W. detour traffic, and ultimately Highway 403 W-N Ramp and N-W Ramp, over Ford Drive. Ford Drive will be relocated to the south and will be in cut, crossing under Q.E.W. At present single span structures, 3 lanes wide are proposed to carry Q.E.W. over Ford Dr.

A Third structure will be necessary to carry Highway 403 W-N Ramp over the North Service Rd.

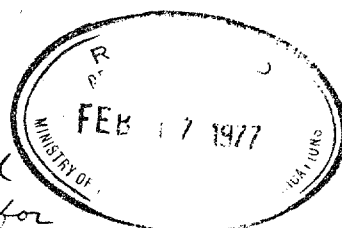
The fourth structure required to complete the detour staging will be Highway 403W-N Ramp over the E-N S Ramp.

Preliminary details of the proposed structure and roadway alignments are indicated on the enclosed plans.

These plans include:

Q.E.W./403/Ford Dr. Interchange sketch plan -- 1 copy
Ford Dr. Underpass at N-W Ramp --- 2 copies
Ford Dr. Underpass at W-N Ramp --- 2 copies
North Service Rd. Underpass at W-N Ramp and E-NS Ramp Underpass at W-N Ramp - 2 copies
Photographs

murty Please advise me when individual W.P's and site numbers are received for recording purposes. Also, please tell me if this should be recorded as 'one request or four and whether you consider this to be adequate to justify field work.



To complete the interchange to the extent shown on the sketch plan (ultimately two addition ramps may be constructed) at least 6 more structures are to be constructed. The Foundation request for these bridges will be submitted at a later date as part of the main Q.E.W./403/Ford Dr. contract.

Could you please prepare a Foundation Investigate Report of sufficient scope to facilitate the design of the proposed structure for each of the four structures.

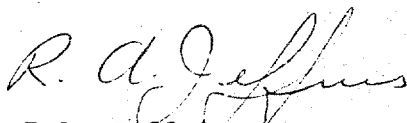
The current schedule calls for a complete Foundation Investigation for the first 4 structures, as follows:

first structure on April 20
second structure on May 4
third structure on May 18
fourth structure on June 1

Individual W.P.'s and Bridge Site No.s will be forwarded to your office as soon as they are assigned.

Should additional clarification and/or details be required, please do not hesitate to call this office.

RAJ:sg
attch:


R.A. Jeffries /
Structural Supervisor
for:
G.C.E. Burkhardt
Head, Structural Section

c,c, W.Roters
J. Anderson
R. Fitzgibbon

INFORMATION SHEET FOR THE LOCATION

GEOCRES No. 36-115-116

DIST 4 REGION CENTRAL

W.P. No. 150-76-67

CONT. No. 78-164

W.O. No. _____

STR. SITE No. 10-282 A

HWY. No. _____

LOCATION OPEN / FORD DRIVE / Hwy 403

OTHER DATA TO BE FURNISHED BY THE FIELD OFFICE _____

REMARKS _____

