

G.I.-30 SEPT. 1976

GEOCRES No. 4077-16DIST. 1 REGION W.P. No. 259-66-06CONT. No. 80-43W. O. No. STR. SITE No. 6-296HWY. No. E. C. Row ExpwyLOCATION Lanzer Parkway &
E. C. Row. ExpwyNo of PAGES -

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. REMARKS:

ENGINEERING MATERIALS OFFICE
SOIL MECHANICS SECTION

WP 259-66-06

DIST 1

HWY E.C. Row

STR SITE 6-296

Lauzon Parkway Underpass
2.4 Miles West of Hwy. 2

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FOUNDATION INVESTIGATION REPORT

For

Lauzon Parkway Underpass
2.4 Miles West of Hwy. 2
W.P. 259-66-06, Site 6-296
E.C. Row Expressway, District 1, Chatham

INTRODUCTION

This report contains the results of a foundation investigation carried out for the above project. Fieldwork consisted of four sampled boreholes advanced during the period December 13 to 19, 1978 with an auger mounted on a rubber tired all-terrain vehicle. Hollow stem augers were employed for all the boreholes. Bedrock was proven in one borehole by obtaining a BXL size rock core.

SITE DESCRIPTION

The site is located in the eastern outskirts of the City of Windsor approximately 1/3 of a mile west of the intersection of E.C. Row Blvd. and Lauzon Road. The surrounding terrain is flat reflecting its physiographic designation as part of the St. Clair Clay Plain. This part of the city has remained largely agricultural and is engaged in the production of cash crops. Its conversion to industrial uses has, however, begun with construction of an automobile plant in the northwest quadrant of this intersection.

SUBSURFACE CONDITIONS

Subsoil

Subsoil consists of a cohesive deposit about 110 feet in thickness overlying a discontinuous layer of up to 5 feet of very dense sandy silt of glacial origin which in turn overlies limestone bedrock.

Reference should be made to the Record of Borehole Sheets which are contained in the report Appendix. They show the boundaries between soil types, as well as a summary of the results of all field and laboratory tests performed. Reference should also be

made to Drawing No. 2596606-A which shows the location and elevations of all borings, together with an inferred subsoil stratigraphy.

The cohesive deposit which extends to a depth of about 110 feet consists primarily of clayey silt (clay of low plasticity) with a trace of sand and gravel. It does contain, however, occasional layers of silty clay (clay of intermediate plasticity) including one which forms the upper six feet of the deposit. Results of Atterberg Limit Tests for both these soil types are shown in Figure 1 of the Appendix. In terms of other parameters the deposit must be divided into a desiccated crust some 10 to 15 feet in thickness and the lower undesiccated portion. The crust is brown in colour with an undrained shear strength ranging from 2000 to 5000 pounds per square foot. The soil below the crust is grey with undrained shear strength decreasing to a minimum of about 1500 pounds per square foot at a depth of 35 feet and then gradually increasing with depth. Samples from the crust have moisture contents of 15 to 18 percent for the clayey silt and approximately 25 percent for the silty clay. Below the crust moisture contents increased to 18 to 20 percent for the clayey silt and 35 percent for the silty clay.

Groundwater

Groundwater levels were recorded in the open boreholes during the period of the field investigation. They indicate that the groundwater level was at elevation 588 some five feet below the ground surface.

DESIGN CONSIDERATIONS

It is proposed that Lauzon Parkway pass over the E.C. Row Expressway on a two span structure approximately 210 feet in length. The proposed grade will require that approach fills be approximately 25 feet in height.

RECOMMENDATIONS

Centre Pier

It is recommended that the centre pier be supported on spread footings at approximate elevation 487 with a design loading of two tons per square foot. Resistance to sliding may be calculated employing a design adhesion value of 2000 pounds per square foot. It is predicted settlement will be less than two inches.

Perched Abutments

The abutments may be supported on compacted granular 'A' cores within the approach fills with a net design load of three tons per square foot. For calculations of sliding resistance a friction coefficient of .5 may be assumed to apply between the footing and the granular 'A'. A construction scheme is outlined in Figure 3 of the Appendix.

As an alternative the abutments may be supported on steel tube piles (12 3/4" X 1/4") driven into the desiccated crust. A safe design load of 25 tons per pile may be used with the piles driven to elevation 584.

It is predicted that total settlement at the abutments will not exceed six inches. The settlement taking place after completion of the structure may be reduced by the use of stage construction.

Piles to Bedrock

Any or all of the footings may be supported on piles driven to bedrock at elev. 475. Either steel tube piles (12 3/4 " x 1/4") or H piles with a 74 pound section may be designed for loads up to 120 tons per pile. If tube piles are adopted the driving energy must be reduced to less than 30,000 ft/lb per blow when the pile tip is

below elevation 482. H piles should have the tips reinforced with standard flange plates to prevent damage from boulders in the till layer, as well as to increase the contact area between the pile tip and the bedrock. If piles to bedrock are employed structure settlement will be reduced to less than one inch.

Dewatering


No dewatering problems are anticipated due to the relatively impervious nature of the upper layers of the subsoil.

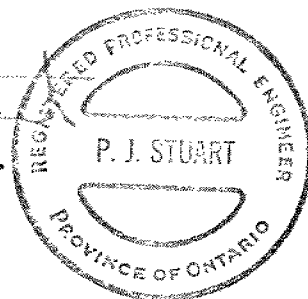
Frost Protection


The base of all footings or pile caps should be protected from frost action by a minimum of four feet of cover.

Approach Embankments

No slope stability problems are anticipated with the approach fills (25 ft) if 2:1 slopes are employed. Settlement of the subsoil of up to six inches is predicted to take place under the approach embankments. Of this amount 60 percent could be expected to take place in the six months following completion of the fill.


P.J. Stuart, P. Eng.
Project Engineer




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

April, 1979

APPENDIX



RECORD OF BOREHOLE No 1

W P 259-66-06 LOCATION Coords. N 15 366 346; E 884 746 ORIGINATED BY PJS
DIST 1 HWY E.C. Row BOREHOLE TYPE Hollow Stem Auger COMPILED BY PJS
DATUM Geodetic DATE December 15, 1978 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
591.2	Ground Level						590									
0.0	Silty Clay															
585.2	Very Stiff		1	SS	8											Om = .5%
6.0			2	SS	26											
			3	SS	15		580									
			4	TW	PH											
	Brown		4A	SS	9										139	P _c = 4.2t/ft ²
	Grey															C _c = 0.115
			5	TW	PH		570								134	e _o = 0.437
	Clayey Silt		5A	SS	9											
	Trace of Sand															
	and Gravel															
	Very Stiff to Stiff						560									
			6	TW	PH											
							550									
			7	SS	8											
							540									
			8	SS	8											
							530									
			9	TW	PH		520								117	
	Silty Clay															
	Layer						510									
			10	SS	8											
							500									
			11	SS	45		490									
							480									
475.2	Refusal to Augering															
116.0	End of Borehole															
	Probable Bedrock															

Note: Water Level
Not Established

+³, x⁵: Numbers refer to
Sensitivity

20
15
10
5
5 (%) STRAIN AT FAILURE

RECORD OF BOREHOLE No 2

W P 259-66-06 LOCATION Coords. N 15 366 233; E 884 744 ORIGINATED BY PJS
 DIST 1 HWY E.C. Row BOREHOLE TYPE Hollow Stem Auger COMPILED BY PJS
 DATUM Geodetic DATE December 19, 1978 CHECKED BY CP

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT Y	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
593.4	Ground Level																
0.0	Silty Clay						590										
587.4	Very Stiff		1	SS	10												
6.0			2	SS	31												
			3	SS	25												
			4	SS	22		580										
			5	TW	PH												
			6	SS	12												
			7	TW	PH		570										
			8	TW	PH												
564.9																	
28.5	End of Borehole Note: Water Level Not Established																

+³, x⁵: Numbers refer to
Sensitivity

20
15
10
+⁵ (%) STRAIN AT FAILURE



RECORD OF BOREHOLE No 3

W P 259-66-06 LOCATION Coords. N 15 366 260; E 884 853 ORIGINATED BY PJS
DIST 1 HWY E.C. Row BOREHOLE TYPE Hollow Stem Auger COMPILED BY PJS
DATUM Geodetic DATE December 19, 1978 CHECKED BY

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT					PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100					
593.4	Ground Level																
0.0	Silty Clay						590										
	Very Stiff		1	SS	11												
587.4			2	SS	26												
6.0			3	SS	28		580										
			4	SS	16												
			5	SS	11												
			6	SS	14												
			7	SS	14		570										
			8	SS	9												
565.4																	
28.0	End of Borehole																
	Note: Water Level Not Established																

RECORD OF BOREHOLE No 4

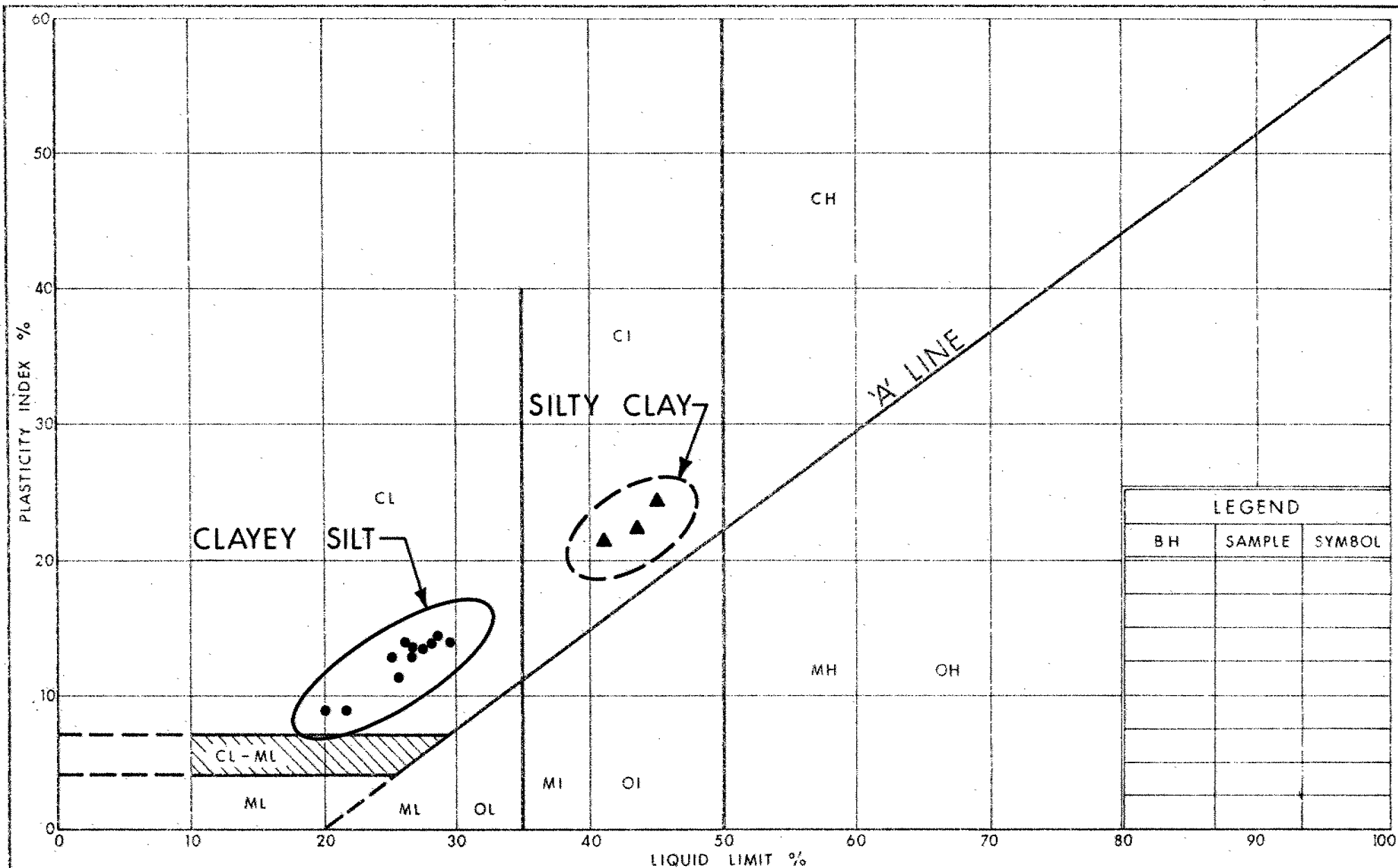
W P 259-66-06 LOCATION Coords. N 15 366 176; E 884 881 ORIGINATED BY PJS
DIST 1 HWY E.C. Row BOREHOLE TYPE Hollow Stem Auger and Cone Test COMPILED BY PJS
DATUM Geodetic DATE December 13 & 14, 1978 CHECKED BY *JP*

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT		PLASTIC LIMIT W _p	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W _L	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%) GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20 40 60 80 100	1000 2000					
592.6	Ground Level													
0.0	Silty Clay						590							
586.6	Very Stiff		1	SS	11									
6.0			2	SS	30									
			3	SS	22									
	Brown		4	SS	15		580							
	Grey		5	SS	11									
	Clayey Silt		6	SS	13				2000					
	Trace of Sand		7	SS	9		570							
	and Gravel		8	SS	9									
	Very Stiff to Stiff		9	SS	9		560		1.3					
			10	SS	10									
			11	SS	15		550		2000					
			12	SS	13		540							
			13	SS	11		530							
			14	SS	14		520							
	Silty Clay		15	SS	26		510							
	Layer		16	SS	100/5"		500							
476.1	Sandy Silt Some Gravel (Till) Very Dense		17	BXL RC	95% Rec		490							
116.5	Limestone						480							
471.6	Bedrock													
121.0	End of Borehole													RQD = 82%

+3 x 5: Numbers refer to
Sensitivity

20
15 5 (%) STRAIN AT FAILURE
10

OFFICE REPORT ON SOIL EXPLORATION



Ministry of
Transportation and
Communications

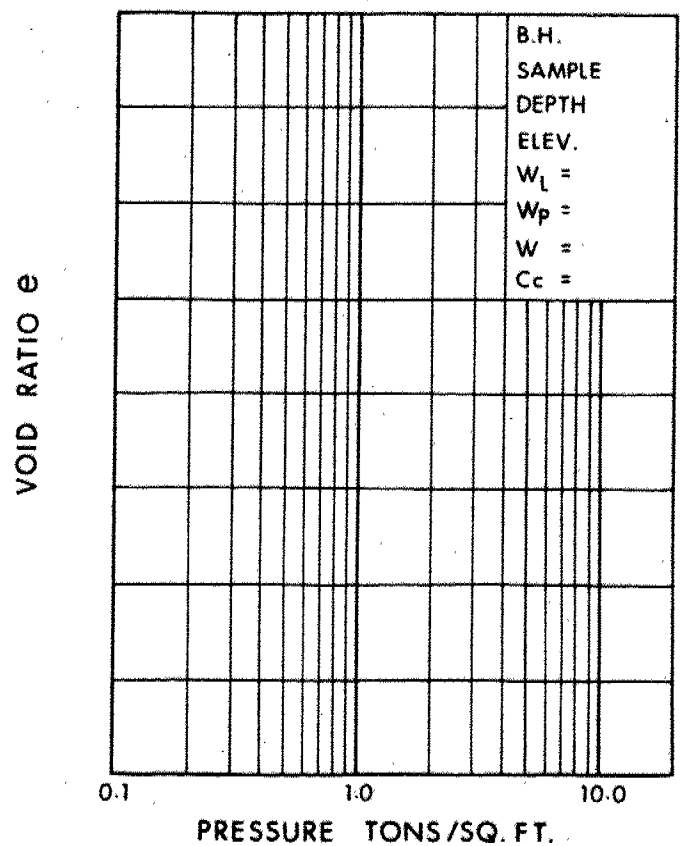
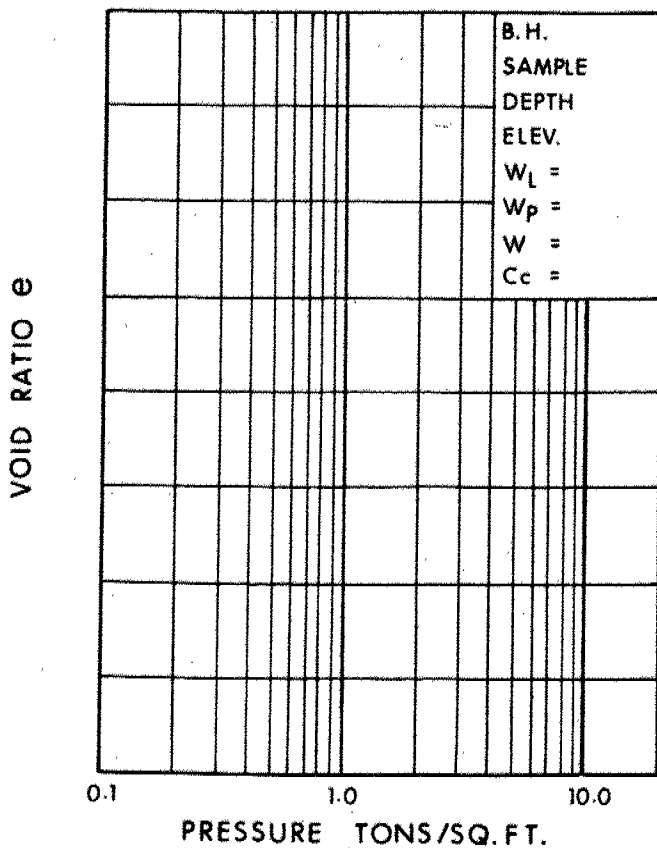
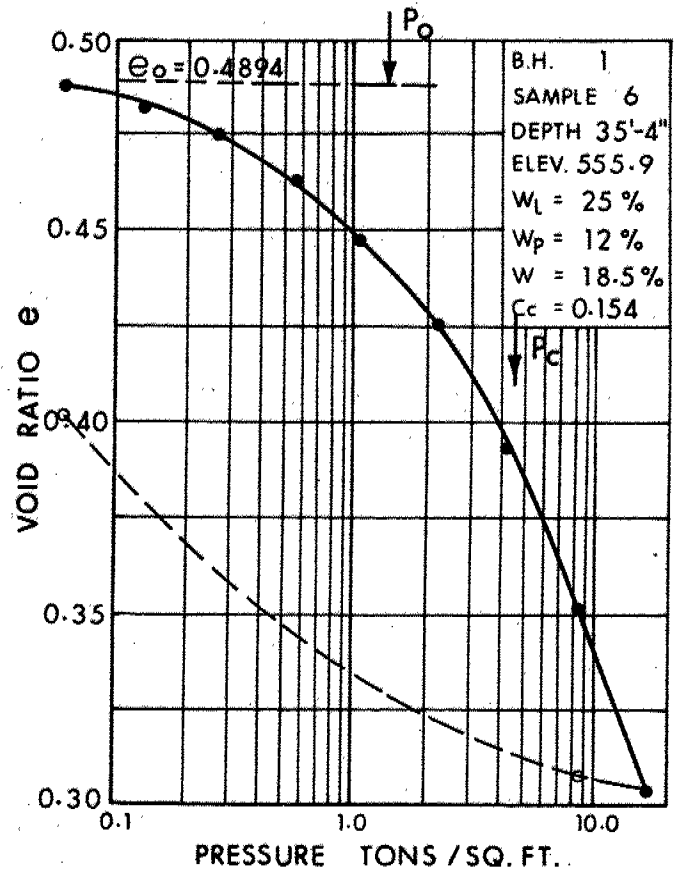
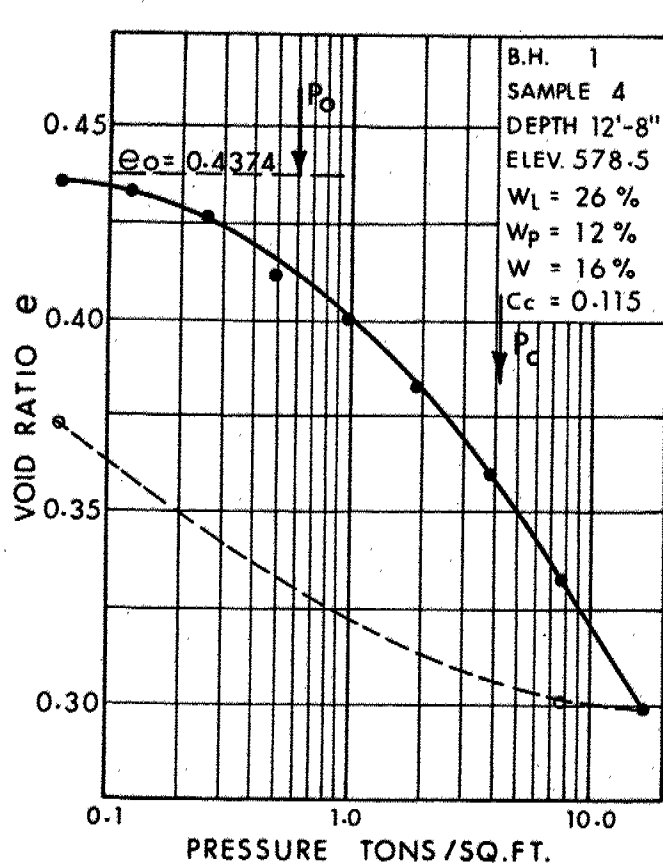
PLASTICITY CHART

- ▲ SILTY CLAY
- CLAYEY SILT, TRACE OF SAND & GRAVEL

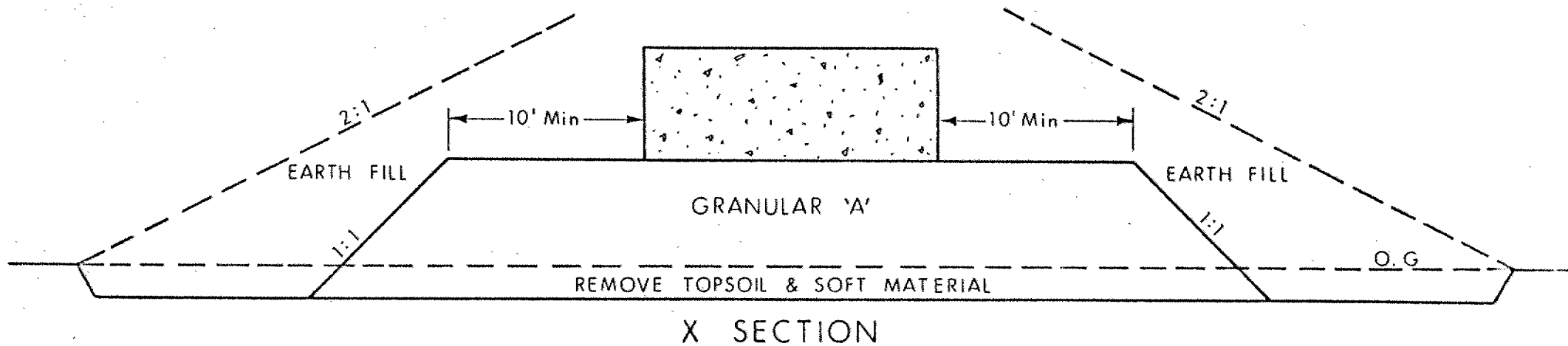
FIG No 1

W P 259-66-06

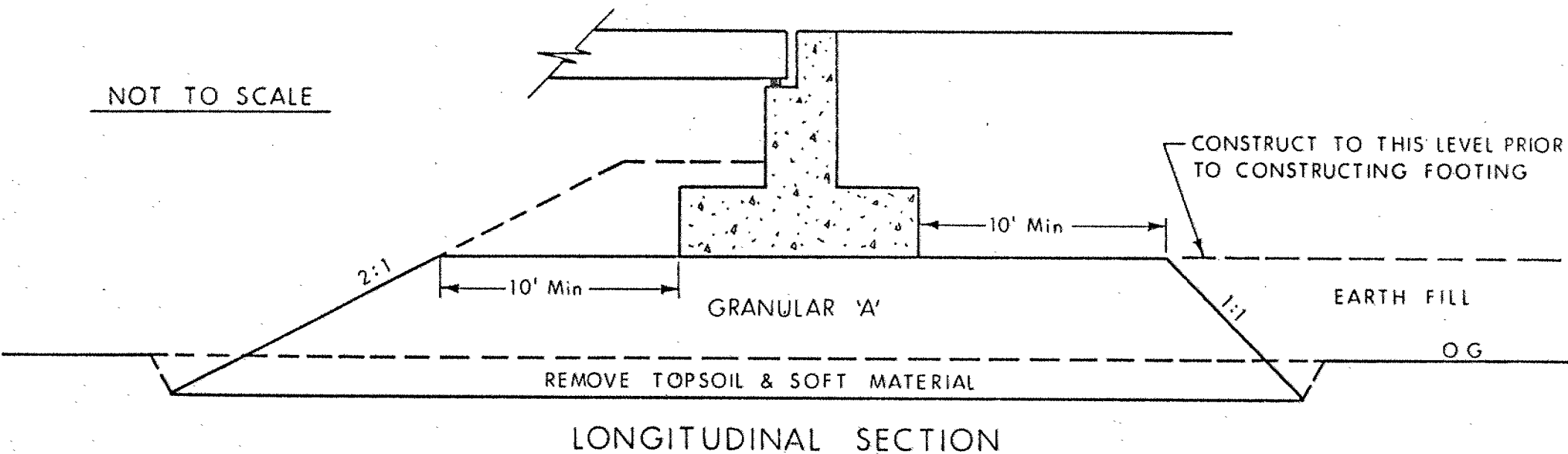
VOID RATIO-PRESSURE CURVES



ABUTMENT ON COMPACTED FILL SHOWING GRANULAR 'A' CORE



NOT TO SCALE



NOTE:

REMOVE TOPSOIL & OR SOFT SUBSOIL UNDER AREA OF COMPACTED GRANULAR 'A' AND EARTH FILL.

EXPLANATION OF TERMS USED IN REPORT

'N' VALUE: AN INDICATOR OF SUBSOIL QUALITY. IT IS OBTAINED FROM THE STANDARD PENETRATION TEST (CSA STD. A119.1). SPT 'N' VALUE IS THE NUMBER OF BLOWS REQUIRED TO CAUSE A STANDARD 2 INCH O.D. SPLIT-BARREL SAMPLER TO PENETRATE 12 INCHES INTO UNDISTURBED GROUND IN A BOREHOLE WHEN DRIVEN BY A HAMMER WEIGHING 140 POUNDS, FALLING FREELY A DISTANCE OF 30 INCHES. FOR PENETRATIONS OF LESS THAN 12 INCHES 'N' VALUES ARE INDICATED AS THE NUMBER OF BLOWS FOR THE PENETRATION ACHIEVED. 'N' VALUES CORRECTED FOR OVERBURDEN PRESSURE ARE DENOTED THUS N_c .

DYNAMIC CONE PENETRATION TEST (CSA STD. A119.3): CONTINUOUS PENETRATION OF A CONICAL STEEL POINT (2" O.D. 60 CONE ANGLE) DRIVEN BY 350 FT-LB IMPACTS ON "A" SIZE DRILL RODS. THE RESISTANCE TO CONE PENETRATION IS MEASURED AS THE NUMBER OF BLOWS FOR EACH 12 INCH ADVANCE OF THE CONICAL POINT INTO THE UNDISTURBED GROUND.

SOIL QUALITY: SOILS ARE DESCRIBED BY THEIR COMPOSITION AND CONSISTENCY OR DENSITY.

CONSISTENCY: COHESIVE SOILS ARE DESCRIBED ON THE BASIS OF THEIR UNDRAINED SHEAR STRENGTH AS FOLLOWS:

S_u (PSF)	0 - 250	250 - 500	500 - 1000	1000 - 2000	2000 - 4000	> 4000
	VERY SOFT	SOFT	FIRM	STIFF	VERY STIFF	HARD

DENSENESS: COHESIONLESS SOILS ARE DESCRIBED ON THE BASIS OF SPT 'N' VALUES AS FOLLOWS:

'N' (BLOW/FT)	0 - 5	5 - 10	10 - 30	30 - 50	> 50
	VERY LOOSE	LOOSE	COMPACT	DENSE	VERY DENSE

ROCK QUALITY: ROCKS ARE DESCRIBED BY THEIR COMPOSITION AND STRUCTURAL FEATURES AND/OR STRENGTH.

RECOVERY: SUM OF ALL RECOVERED ROCK CORE PIECES FROM A CORING RUN EXPRESSED AS A PERCENT OF THE TOTAL LENGTH DRILLED IN THAT CORING RUN.

MODIFIED RECOVERY: SUM OF THOSE NATURALLY FRACTURED CORE PIECES, 4" IN LENGTH EXPRESSED AS A PERCENT OF THE LENGTH OF THE CORING RUN. THE ROCK QUALITY DESIGNATION (RQD), FOR MODIFIED RECOVERY, IS:

RQD (%)	0 - 25	25 - 50	50 - 75	75 - 90	90 - 100
	VERY POOR	POOR	FAIR	GOOD	EXCELLENT

JOINTING AND BEDDING:

SPACING	2"	2" - 12"	1' - 3'	3' - 10'	> 10'
JOINTING	VERY CLOSE	CLOSE	MOD. CLOSE	WIDE	VERY WIDE
BEDDING	VERY THIN	THIN	MEDIUM	THICK	VERY THICK

ABBREVIATIONS & SYMBOLS

LABORATORY TESTING

TRIAxIAL TESTS ARE DESCRIBED IN TERMS OF WHETHER THEY ARE CONSOLIDATED (C) OR NOT (U) ISOTROPICALLY (I) OR NOT (A) AND SHEARED DRAINED (D) OR UNDRAINED (U) WITH PORE PRESSURE MEASUREMENTS (BAR OVER SYMBOLS) EG. $\bar{C}U$ = CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENT UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

FIELD SAMPLING

SS SPLIT SPOON
WS WASH SAMPLE
ST SLOTTED TUBE SAMPLE
BS BLOCK SAMPLE
CS CHUNK SAMPLE
TW THINWALL OPEN
TP THINWALL PISTON
OS OSTERBERG SAMPLE
FS FOIL SAMPLE
RC ROCK CORE
FH T.W. ADVANCED HYDRAULICALLY
PM T.W. ADVANCED MANUALLY

EARTH PRESSURE TERMS

μ COEFFICIENT OF FRICTION
 δ ANGLE OF WALL FRICTION
 k_o COEFFICIENT OF EARTH PRESSURE AT REST
 k_A COEFFICIENT OF ACTIVE EARTH PRESSURE
 k_P COEFFICIENT OF PASSIVE EARTH PRESSURE
 i ANGLE OF INCLINATION OF SURCHARGE
 w SLOPE ANGLE-BACKFACE OF WALL
 β ANGLE OF SLOPE
 N_γ, N_q, N_c BEARING CAPACITY FACTORS
 D_f DEPTH OF FOOTING
 B, L FOOTING DIMENSIONS

INDEX PROPERTIES

γ UNIT WEIGHT OF SOIL (BULK DENSITY)
 γ_w UNIT WEIGHT OF WATER
 γ_d UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
 γ' UNIT WEIGHT OF SUBMERGED SOIL
 G_s SPECIFIC GRAVITY OF SOLIDS
 e VOIDS RATIO
 e_o INITIAL VOIDS RATIO
 e_{max} e IN LOOSEST STATE
 e_{min} e IN DENSEST STATE
 D_r RELATIVE DENSITY = $\frac{e_{max} - e}{e_{max} - e_{min}}$
 n POROSITY
 w WATER CONTENT
 w_L LIQUID LIMIT
 w_P PLASTIC LIMIT
 w_S SHRINKAGE LIMIT
 I_P PLASTICITY INDEX = $w_L - w_P$
 I_L LIQUIDITY INDEX = $\frac{w - w_P}{I_P}$
 I_c CONSISTENCY INDEX = $\frac{w_p - w}{I_P}$
 A_c ACTIVITY = $\frac{I_P \text{ of soil}}{I_P \text{ of 25\% Soil Fraction}}$
 Om ORGANIC MATTER CONTENT
 S_r DEGREE OF SATURATION
 S SENSITIVITY = $\frac{S_u \text{ (undisturbed)}}{S_u \text{ (remoulded)}}$

STRENGTH PARAMETERS

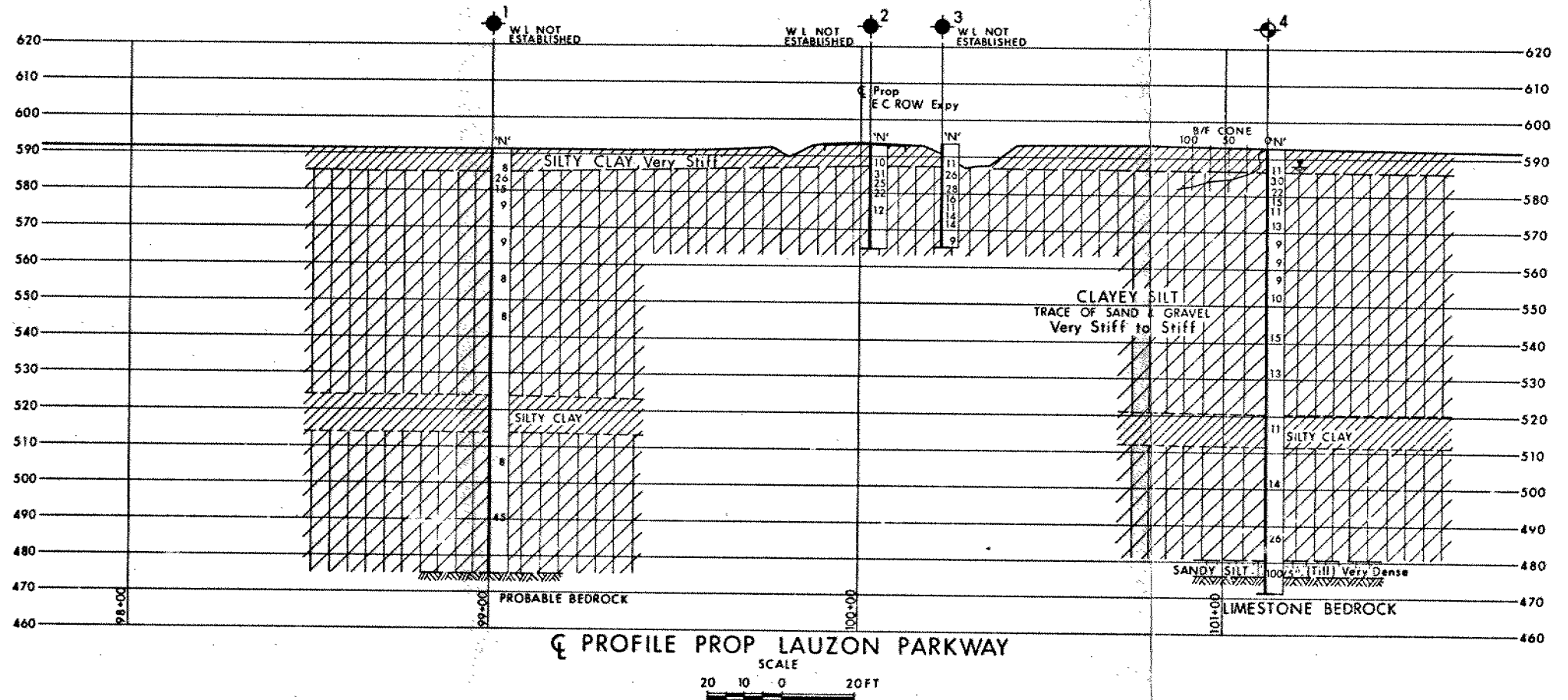
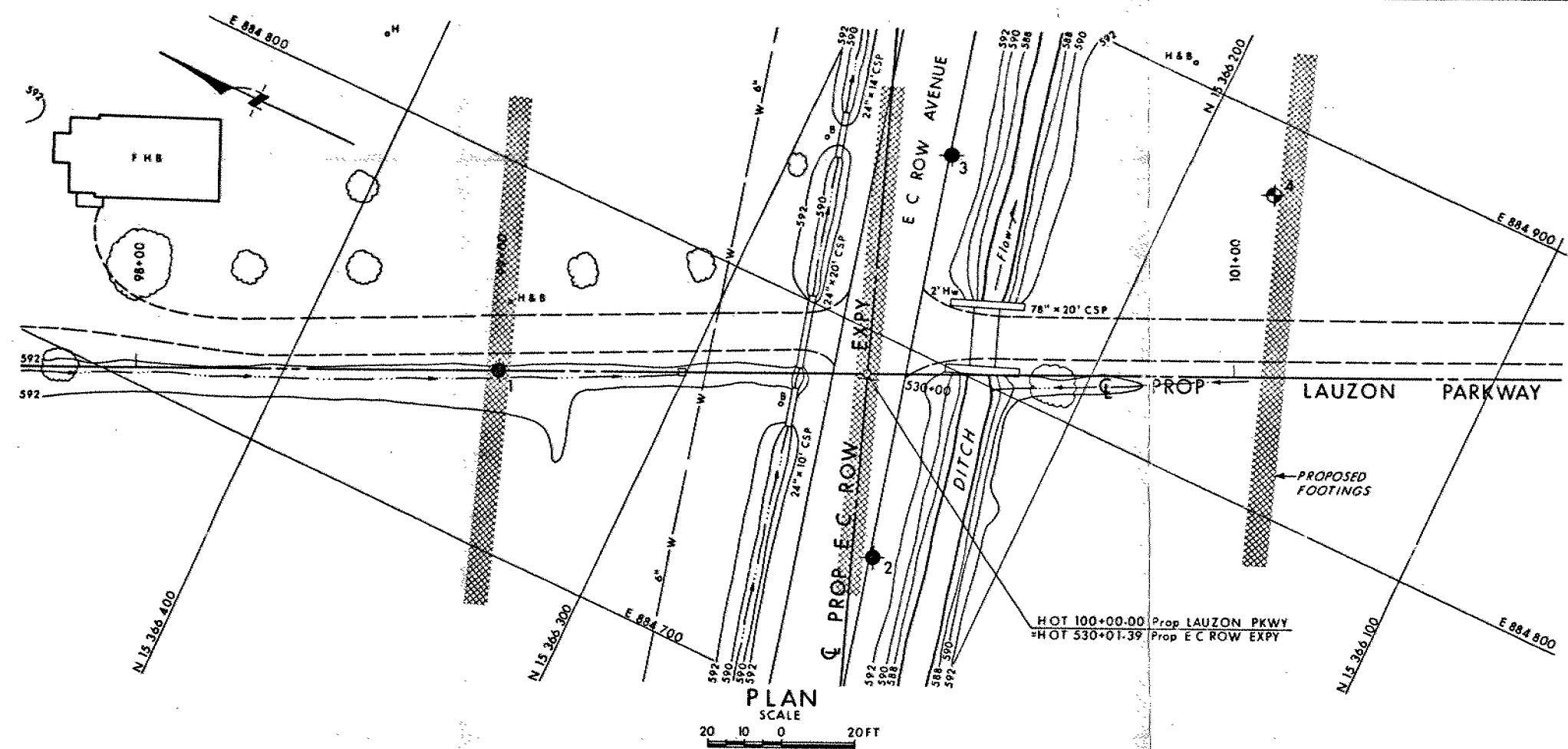
ϕ ANGLE OF SHEARING RESISTANCE
 τ_f PEAK SHEAR STRENGTH
 τ_R RESIDUAL SHEAR STRENGTH
 c COHESION INTERCEPT
 $\sigma_1, \sigma_2, \sigma_3$ NORMAL PRINCIPAL STRESSES
 u PORE WATER PRESSURE
 u_e EXCESS u
 r_u PORE PRESSURE RATIO
 q_u UNCONFINED COMPRESSIVE STRENGTH
 s_u UNDRAINED SHEAR STRENGTH
 ϵ LINEAR STRAIN
 γ SHEAR STRAIN
 ν POISSON'S RATIO
 E MODULUS OF ELASTICITY
 G MODULUS OF SHEAR DEFORMATION
 k_s MODULUS OF SUBGRADE REACTION
 m, n STABILITY COEFFICIENTS
 A, B PORE PRESSURE COEFFICIENTS

NOTE: EFFECTIVE STRESS PARAMETERS ARE DENOTED BY USE OF APOSTROPHE ABOVE THE SYMBOL, THUS:
 ϕ' = EFFECTIVE ANGLE OF SHEARING RESISTANCE;
 σ' = EFFECTIVE NORMAL STRESS

HYDRAULIC TERMS

h HYDRAULIC HEAD OR POTENTIAL
 q RATE OF DISCHARGE
 v VELOCITY OF FLOW
 i HYDRAULIC GRADIENT
 j SEEPAGE FORCE PER UNIT VOLUME
 η COEFFICIENT OF VISCOSITY
 k COEFFICIENT OF HYDRAULIC CONDUCTIVITY
 k_h k IN HORIZONTAL DIRECTION
 k_v k IN VERTICAL DIRECTION
 m_v COEFFICIENT OF VOLUME CHANGE
 c_v COEFFICIENT OF CONSOLIDATION
 C_c COMPRESSION INDEX
 C_r RECOMPRESSION INDEX
 d DRAINAGE PATH DISTANCE
 T_v TIME FACTOR
 U DEGREE OF CONSOLIDATION
 O_c OVERCONSOLIDATION RATIO (OCR)

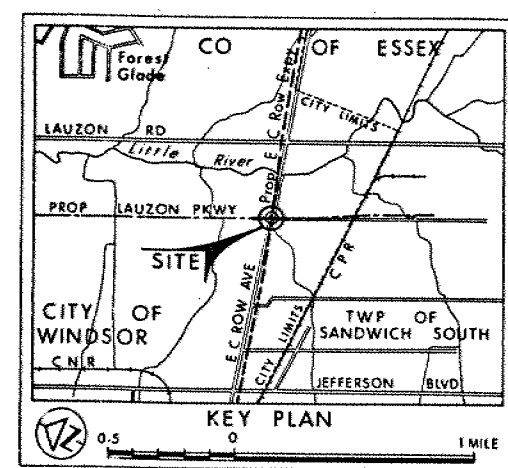
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO
DB-MT-308 RD-73



CONT No
WP No 259-66-06

LAUZON PARKWAY U'PASS
(2.4 Miles West of Hwy 2)
BORE HOLE LOCATIONS & SOIL STRATA

SHEET



LEGEND			
●	Bore Hole		
⊕	Dynamic Cone Penetration Test (Cone)		
⊙	Bore Hole & Cone		
N'	Blows/ft (Std Pen Test 350ft lbs energy)		
CONE	Blows/ft (60° Cone, 350ft lbs energy)		
↓	WL at time of investigation Dec 1978		
✱	WL NOT Established in Bore Holes		
✱ 1, 2 and 3			

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	591.2	15 366 346	884 746
2	593.4	15 366 233	884 744
3	593.4	15 366 260	884 853
4	592.6	15 366 176	884 881

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

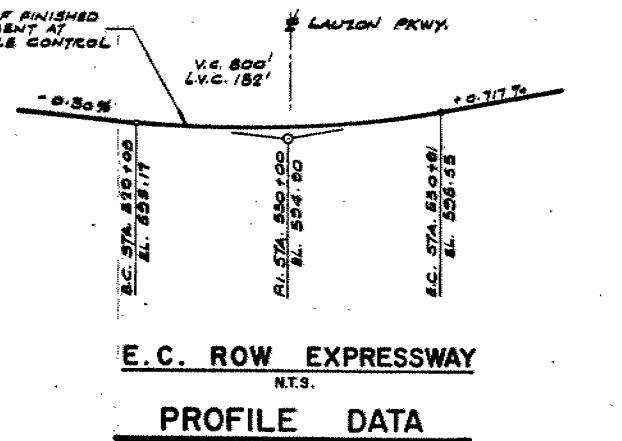
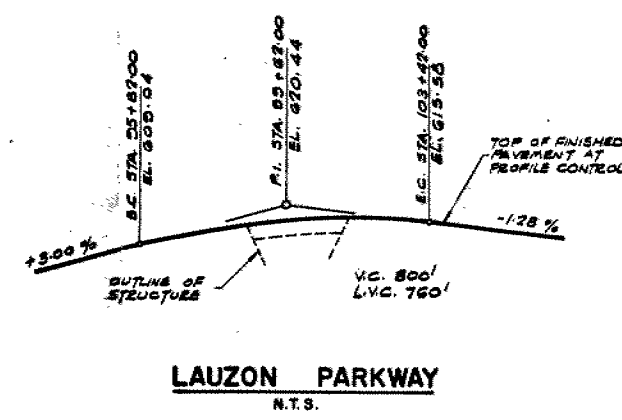
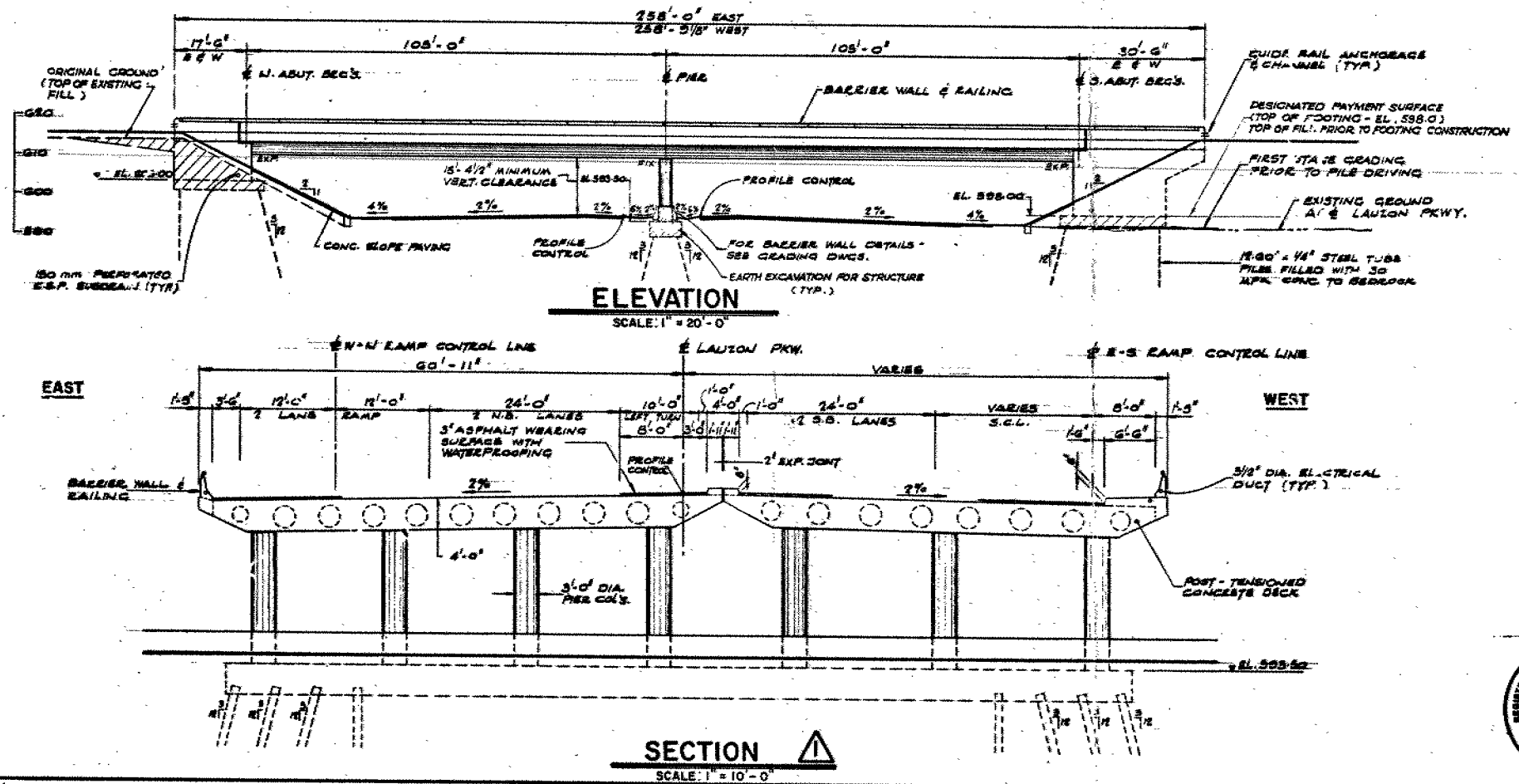
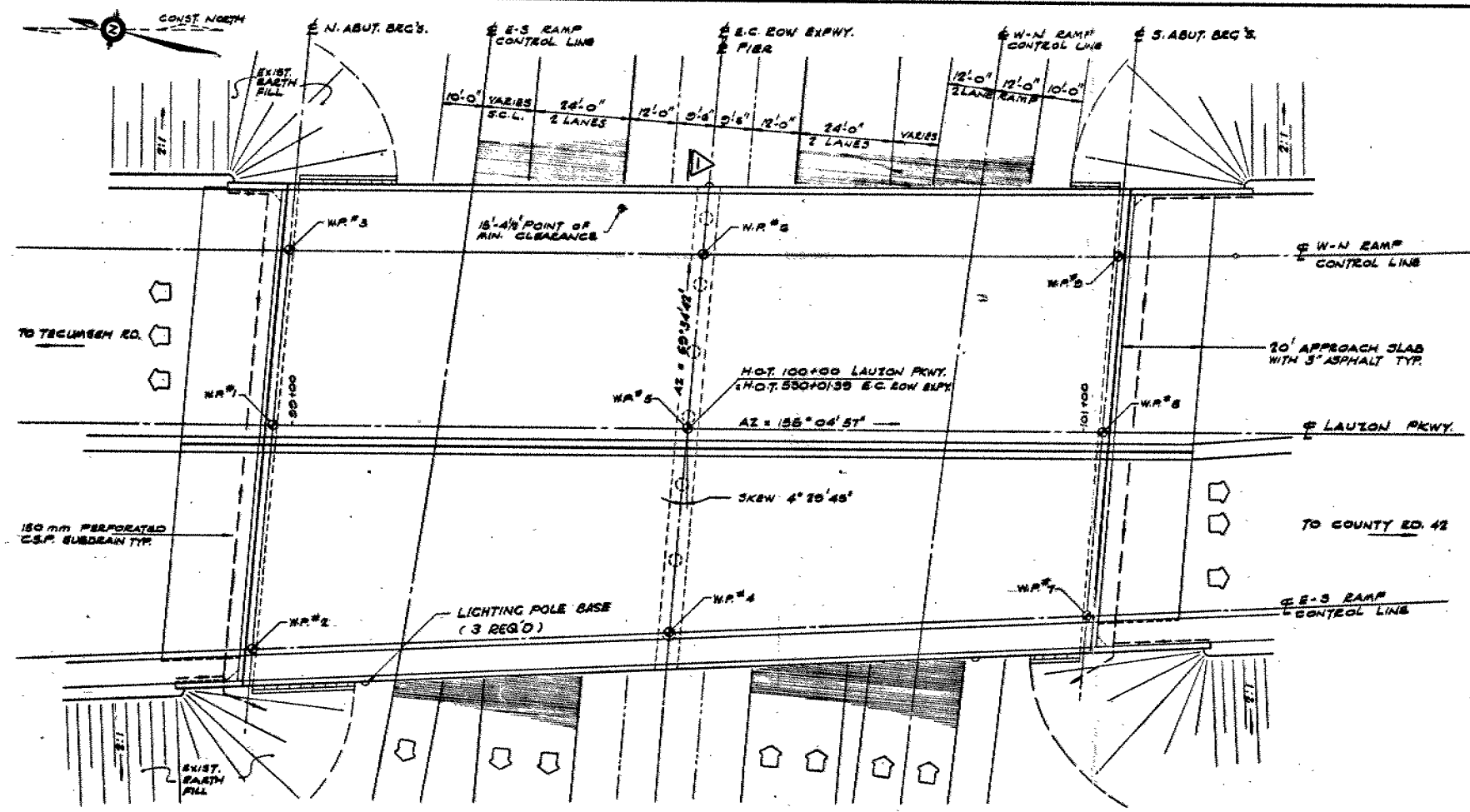
REVISIONS	DATE	BY	DESCRIPTION

Geocres No 4017-16

HWY No Prop E.C. ROW EXPY DIST 1

SUBMITTAL CHECKED DATE April 3, 1979 SITE 6-296

DRAWN BY ONE CASE APPROVED DWG 2596606-A



LIST OF DRAWINGS

1. GENERAL ARRANGEMENT
2. BOREHOLE LOCATIONS & SOIL STRATA
3. FOUNDATION LAYOUT
4. NORTH-WEST ABUTMENT
5. SOUTH-WEST ABUTMENT
6. SOUTH-EAST ABUTMENT
7. NORTH-EAST ABUTMENT
8. PIER
9. DECK LAYOUT
10. LONGITUDINAL CABLE DETAILS
11. TRANSVERSE CABLE DETAILS
12. EAST DECK REINFORCING
13. WEST DECK REINFORCING
14. EAST BARRIER WALL
15. WEST BARRIER WALL
16. STEEL RAILING (SINGLE TUBES)
17. APPROACH SLABS
18. CONCRETE SLOPE PAVING
19. AS CONSTRUCTED ELEV. & DIM.
20. STANDARDS
21. STANDARDS
22. STANDARDS
23. STANDARDS
24. STANDARDS
25. EMBEDDED WORK (LIGHTING) - LAYOUT
26. EMBEDDED WORK (LIGHTING) - STANDARDS DETAILS I
27. EMBEDDED WORK (LIGHTING) - STANDARDS DETAILS II
28. CHESAPEAKE & OHIO RAILWAYS PILE TEST

DIST. No 1
CONT No
WP No 259-66-06

E.C. ROW EXPRESSWAY
LAUZON PARKWAY UNDERPASS
GENERAL ARRANGEMENT

SHEET

MCCORMICK RANKIN
CONSULTING ENGINEERS

D.H.O. PRECISE B.M. # 533-66 Elev. 595.365

TABLET IN SOUTH ABUTMENT OF CONCRETE BRIDGE CARRYING LAUZON RD. OVER LITTLE RIVER 1.75 MILE SOUTH OF HWY. NO. 30.

GENERAL NOTES:

- CLASS OF CONCRETE
- COLUMNS, DECKS, SIDEWALK & MEDIAN - 35 MPa
BARRIER WALLS - 30 MPa
REMAINDER - 20 MPa
- REINFORCING STEEL CLEAR COVER
- FOOTINGS, ABUTMENTS AND PIERS - 3"
DECKS - BOT. 1 1/2", TOP - 2"
PIERS AS NOTED
- REINFORCING STEEL SHALL BE C.S.A. G30-12M SERIES GRADE 400 OR AS NOTED. REINFORCING BARS WITH THE DESIGNATION 'C' AT THE END OF BAR MARKS SHALL BE EPOXY COATED BARS.
- TO ACHIEVE THE MIN. CLEAR COVER OF 2" SPECIFIED, THE TOP LAYER OF DECK REINFORCING SHALL BE PLACED PRIOR TO CONCRETING, WITH A CLEAR COVER OF 2 1/2" ± 1/2" TOLERANCE.

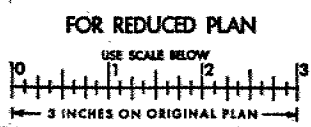
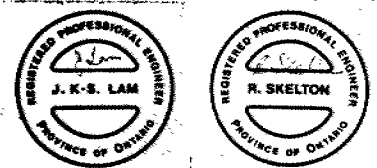
CONSTRUCTION NOTES

THE CONTRACTOR IS RESPONSIBLE FOR FINISHING THE BEARING SEATS DEAD LEVEL TO THE SPECIFIED ELEVATIONS WITH A TOLERANCE OF ± 1/8". NO CONCRETE SHALL BE PLACED ABOVE THE ABUTMENT BEARING SEATS UNTIL THE CONCRETE IN THE DECK HAS BEEN PLACED, STEESSED AND CURED.

CONCRETE QUANTITIES

(FOR LUMP SUM TENDER ITEMS)

PIER, ABUTMENTS & MINIWALLS	438	CY.
PRESTRESSED CONC. BRIDGE DECK	7815	CY.
BARRIER WALLS	41	CY.
SLOPE PAVING	98	CY.
APPROACH SLABS	142	CY.



REVISIONS	DATE	BY	DESCRIPTION
DESIGN	J.L.	CHECK R.S.	LOADING H320-44
DRAWING	M.B.	CHECK R.S.	SITE No 6-236

DATE: SEPT 79

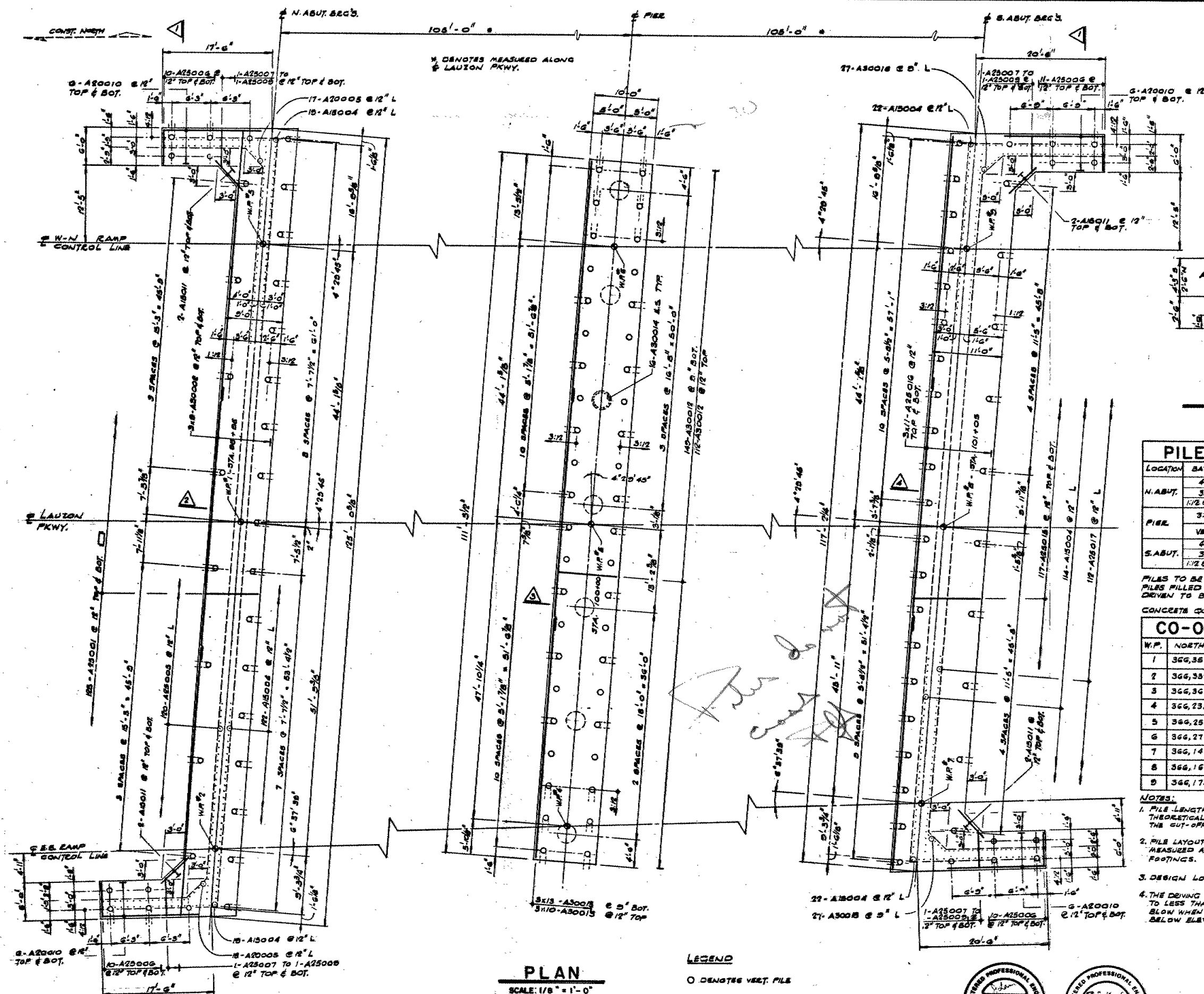
QWG

DIST. No 1
CONT No
WP No 259-66-06

E.C. ROW EXPRESSWAY
LAUZON PARKWAY UNDERPASS
FOUNDATION LAYOUT

SHEET

MCCORMICK RANKIN
CONSULTING ENGINEERS



SECTION 1

SCALE: 1/4" = 1'-0"

SECTION 2

SCALE: 1/4" = 1'-0"

PILE DATA

LOCATION	BATTER	QTY.	LENGTH
N. ABUT.	4:12	4	134'
	3:12	17	131'
	1:2 & VERT.	14	127'
PIER	3:12	28	119'
	VERT.	16	116'
	4:12	4	128'
S. ABUT.	3:12	21	122'
	1:2 & VERT.	16	122'

FILES TO BE 12.00" DIA STEEL TUBE
FILES FILLED WITH CONCRETE (30 MPa)
DRIVEN TO BEDROCK

CONCRETE QUANTITY = 435 CU. YD.

CO-ORDINATES

W.P.	NORTHING	EASTING
1	366,360.521	884,744.356
2	366,352.454	884,695.830
3	366,365.922	884,785.718
4	366,238.600	884,743.753
5	366,255.295	884,785.594
6	366,270.638	884,825.956
7	366,144.746	884,791.676
8	366,160.049	884,832.852
9	366,175.468	884,785.718

- NOTES:
1. PILE LENGTHS SHOWN ARE THE THEORETICAL LENGTHS BELOW THE CUT-OFF ELEV.
 2. PILE LAYOUT DIMENSIONS ARE TO BE MEASURED AT THE UNDERSIDE OF FOOTINGS.
 3. DESIGN LOAD = 120 TONS
 4. THE DRIVING ENERGY SHALL BE REDUCED TO LESS THAN 30,000 FT-LBS. PER BLOW WHEN THE TIP OF THE PILE IS BELOW ELEV. 482.0.

SECTION 3

SCALE: 1/4" = 1'-0"

SECTION 4

SCALE: 1/4" = 1'-0"

PLAN

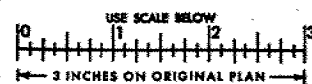
SCALE: 1/8" = 1'-0"

LEGEND

- O DENOTES VERT. FILE
- Q DENOTES BATTERED FILE



FOR REDUCED PLAN



REVISIONS	DATE BY	DESCRIPTION
1	J.L.	LOADING HS20-44
2	J.B.	CHECK R.S. SITE No 6-296
3	J.B.	CHECK R.S. SITE No 6-296

DATE SEPT 79

Mr. A.P. Watt
Head, Structural Section
Southwestern Region, London

Soil Mechanics Section
Engineering Materials Office
Room 315, Central Building
Downsview

79 01 29

Re: Foundation Recommendations for
The E.C. Row Expressway
W.P.s 259-66-02/04/05/06/08 and
257-66-08, District 1, Chatham

Foundation investigation reports were requested for the above structure sites on the E.C. Row Expressway in Windsor. Due to the urgency of the design schedule, it was also requested that preliminary recommendations should be made in an interim report. Recommendations will be made at this time for all 6 sites although further fieldwork will be required to confirm these recommendations for Central Avenue and Jefferson Blvd. because the line has been shifted since fieldwork was done for these structures.

Subsurface Conditions

Subsoil consists of from 120 to 150 feet of clayey silt overlying relatively flat limestone bedrock. The upper 10 to 20 feet of the clayey silt forms a desiccated crust which is brown in colour and has a moisture content of approximately 15 percent. The remaining 100+ feet of clayey silt is grey in colour with moisture contents ranging from 15 to 20 percent. The undrained shear strength ranges from 2000 to 5000 psf in the crust but decreases to as low as 1000 psf in the underlying soil.

Summary

1. Piers may be supported on spread footings in the crust with design loads of from 2 to 3 tons per square foot. Settlements of from 1 to 3 inches are predicted depending on the location.
2. Perched abutments may be supported by short tube piles driven into the crust with design loads of 25 tons per pile. Alternatively, spread footings on compacted granular cores with design loads of 3 tons per square foot may be considered. In both of these cases large settlements will result from the loads imposed by the embankments. Depending

cont'd.....

on the height and width of the embankment, these settlements will range from 4 inches to 8 inches. These values could be reduced by the use of stage construction.

3. Any or all of the structure footings may be supported on piles to bedrock. In this case settlements will not exceed 1 inch. Either 12 3/4 x 1/4" tube piles or H piles with a 74 pound section will carry a design load of 120 tons per pile. The H piles should be fitted with standard flange plates to prevent damage on boulders and to increase the contact area bearing on the rock. The driving energy for tube piles would have to be reduced to less than 30,000 ft-lb per blow when the pile is within 7 feet of bedrock.
4. Reinforced earth structures should be considered for the 2 railway crossings. These structures would consist of reinforced earth walls with a deck supported on spread footings placed in the granular material back of the wall facing and would be loaded to 2 tons per square foot. The ability of reinforced earth to withstand settlement; its speed of construction; and the cost of a deep piling alternative, suggests reinforced earth will compare favourably both in cost and time of construction with more conventional alternatives.

Recommendations

E.C. Row and CPR, W.P. 259-66-02

A single span structure is proposed.

1. Spread footings
 - 3 tons/sq. ft. at 598
 - adhesion of 2000 lb/sq. ft.
 - maximum settlement = 10 in.
 - = differential settlement 3" in 50 ft.
2. Piles to bedrock at elevation 476.
3. Reinforced earth walls with a deck supported on spread footings loaded at 2 tons per square foot.

E.C. Row and Little River, W.P. 259-66-04

1. Spread footings
 - 2 tons per square foot at 583
 - adhesion of 2000 lb/sq. ft.
 - settlement - 2 in.
2. Piles to bedrock at elevation 470.

*572 agreed to by
KGS + J Keen*

cont'd.....

E.C. Row and Jefferson Blvd., W.P. 259-66-05

1. Piers

- spread footings at 3 tons/sq. ft. at elev. 598
- adhesion of 2000 psf
- settlement - 2 in.

2. Abutments

- compacted granular at 3 tons/sq. ft.
- settlement - 6 in.
- tube piles to elevation 590 with loads of 25 tons per pile
- settlement 6 in.

3. Piles to bedrock at elevation 460+ 10

E.C. Row and Lauzon, W.P. 259-66-06

1. Center Pier

- spread footing at 487 at 2 tons/sq. ft.
- adhesion of 2000 lb/sq. ft.
- settlement of 2 in.

2. Abutment

- compacted granular at 3 tons/sq. ft.
- settlement of 6 in.
- tube piles to elevation 584 with a design load of 25 tons per pile
- settlement of 6 in.

3. Piles to bedrock at elev. 475

Lauzon Parkway and CPR, W.P. 259-66-08

A 3 span structure is proposed.

1. Piers

- spread footings at 2 tons per sq. ft. at 587
- adhesion of 2000 lb/sq. ft.
- settlement - 3 in.

2. Abutments

- tube piles to 585 with a design load of 25 tons per pile
- settlement - 8 in.

3. Piles to bedrock at elevation 478

4. A single span reinforced earth structure as outlined in the summary.

cont'd.....

E.C. Row and Central Ave., W.P. 257-66-08

1. Piers

- spread footings at 3 tons per sq. ft. at elev. 610
- adhesion of 2000 lb/sq. ft.
- settlement of 2 in.

2. Abutments

- compacted granular at 3 tons/sq. ft.
- settlement - 4 in.
- tube piles to elev. 605 with a design load of 25 tons per pile
- settlement - 4 in.

3. Piles to bedrock at elev. 495 \pm 10



P.J. Stuart
Project Engineer

PJS/gs

cc: J. Keen
A. Crowley
J. Anderson
Files /