

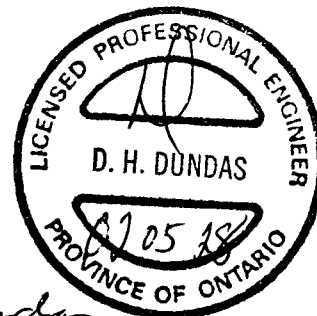
CONT 2002-2018

GEOCRES No:  
30M12-264

**Subsurface Information  
for  
Retained Soil System and High Mast Lighting  
Hwy 403 WB: Winston Churchill Blvd. To Hwy 407  
WP 2460-02-00 Central Region**

The following borehole data in the vicinity of the proposed Retained Soil System and High Mast Lighting is provided for information and bidding only. For bidding purposes, the contractor shall assume that the subsurface conditions at the proposed structures are the same as those at the nearest borehole presented in this package. The original Foundation Investigation Report is provided for the existing Winston Churchill Blvd. Underpass. Table 1 lists the reference boreholes applicable to each structure. The approximate borehole locations are plotted on the attached plans.

In some cases, imperial units of measure are used on the Record of Borehole sheets. The original ground elevations shown on the borehole logs may differ from present day elevation as a result of construction.



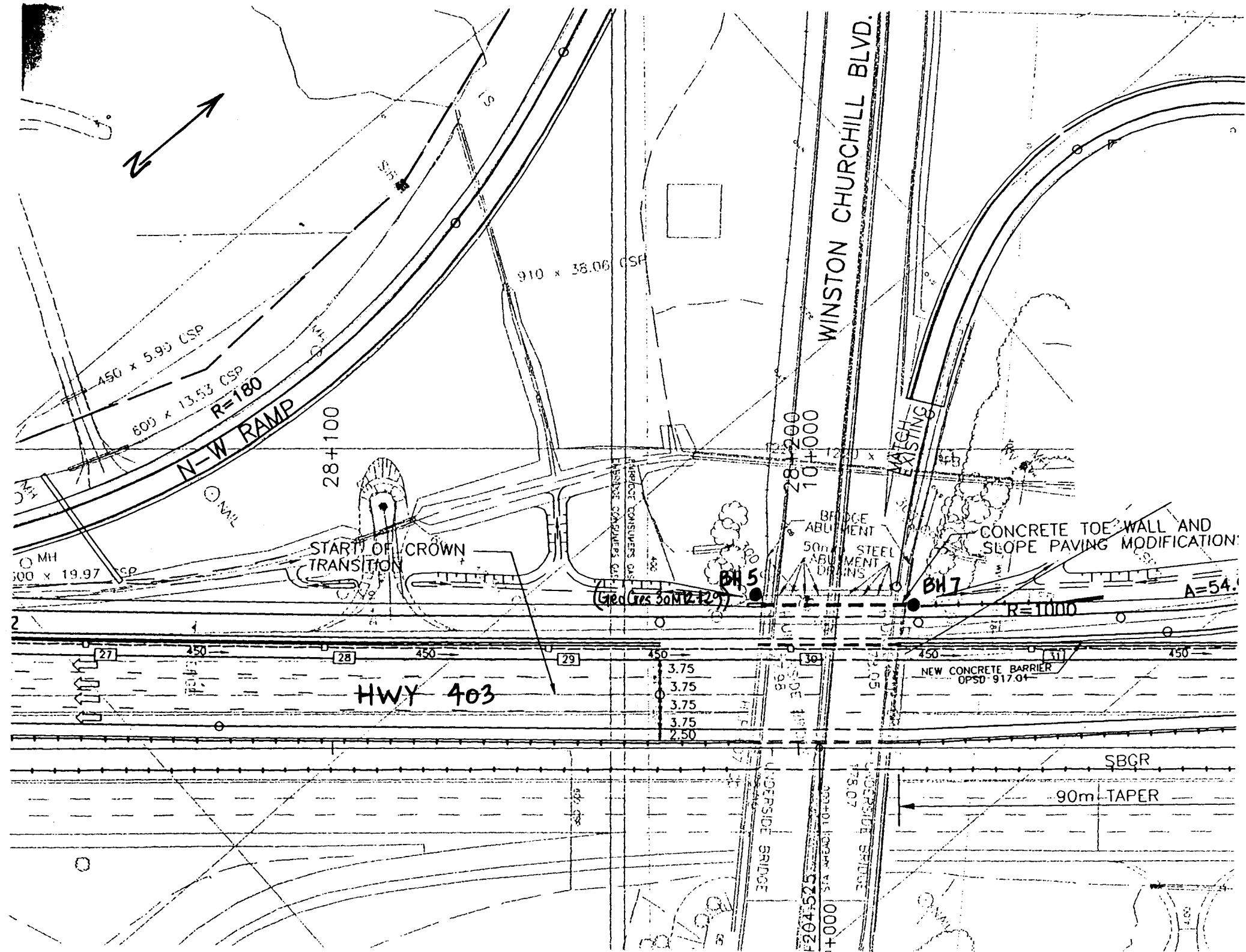
*D. Dundas*  
D. Dundas, P.Eng.

Sr. Foundation Engineer

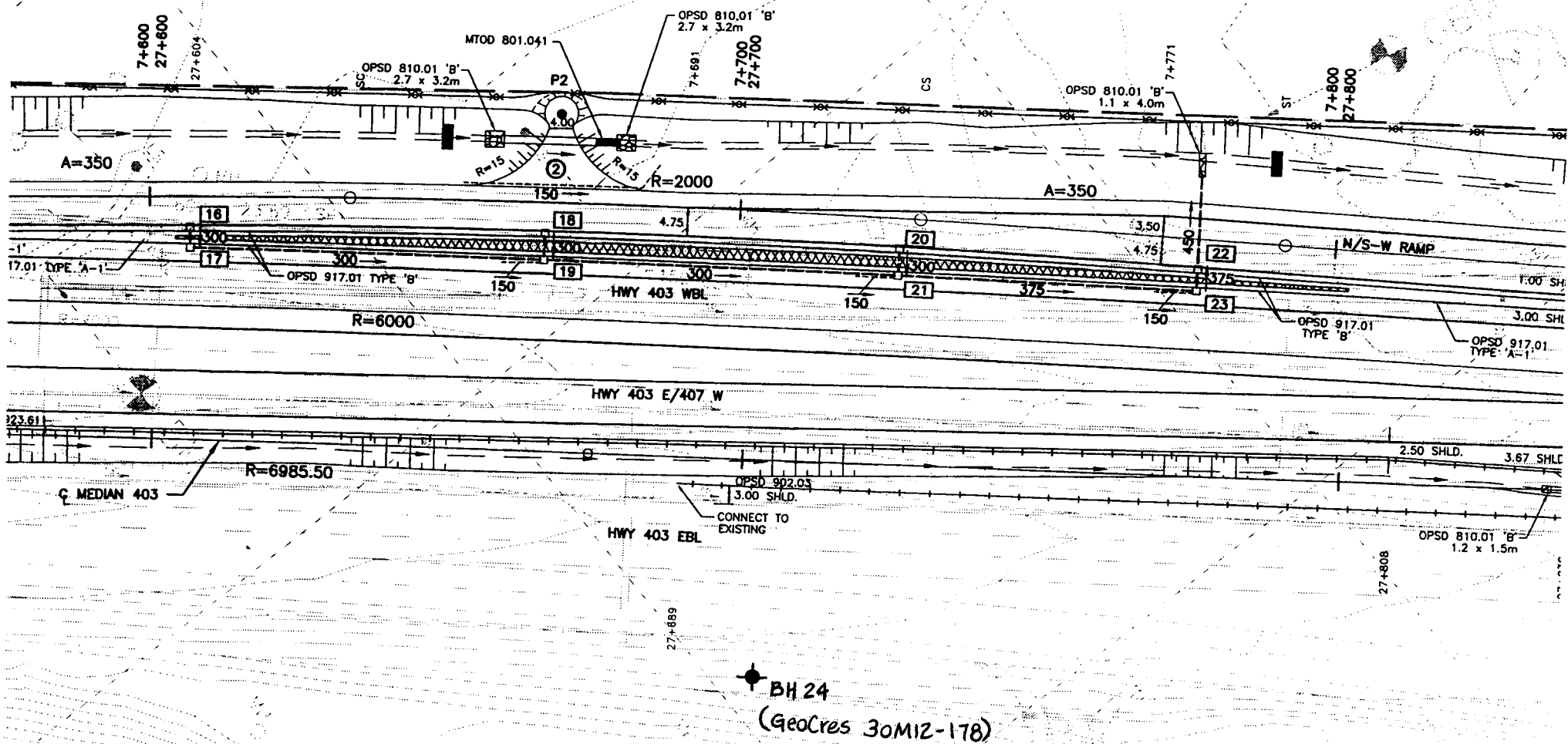
**WP 2460-02-00 Hwy 403 WB: Winston Churchill Blvd to Hwy 407**

<b>Structure</b>	<b>Approx. Location</b>	<b>Borehole</b>
RSS	Winston Churchill Blvd North Abutment	WP 158-75-03 Geocres 30M12-129 BH's 5 and 7
HML	Sta 27 + 670, o/s 55 m Lt	WP 197-77-00 Geocres 30M12-178 BH 24

**Table 1**



CITY OF MISSISSAUGA  
REGIONAL MUNICIPALITY OF PEEL



ENGINEERING MATERIALS OFFICE  
SOIL MECHANICS SECTION

WP 158-75-03

DIST 4

*CONT 80-20*

HWY 403

STR SITE 24-384

Winston Churchill Blvd. Underpass

DISTRIBUTION

G.C.E. Burkhardt (3)  
R.D. Gunter  
M.R. Ernesaks  
D.E. Thrasher (2)

C. Grebski  
G.A. Wrong  
B.J. Giroux  
R.S. Pillar

R. Hore

R. Fitzgibbon )  
J. Anderson )  
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SAMPLE DISPOSITION NOTICE		
TYPE	DISCARD AFTER	RECOMM. BY
JARS	77 10 20	<i>MD</i>
TUBES		
ROCK CORES		

FOUNDATION INVESTIGATION REPORT  
For  
Winston Churchill Blvd. Underpass  
W.P. 158-75-03, Site No. 24-384  
District 4, Hamilton

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INTRODUCTION

This report contains the results of a foundation investigation carried out at the site of the above mentioned project during the period of August 15 to August 17, 1977. The fieldwork consisted of seven sampled boreholes advanced by means of a continuous flight auger machine equipped with hollow stem (3¼" I.D.) augers.

The boreholes ranged in depths from 20.5 to 60.0 feet below the ground surface.

SITE DESCRIPTION AND GEOLOGY

The site is located about one mile north of Burnhamthorpe Road in the City of Mississauga, Regional Municipality of Peel.

The topography of the area is flat to gently undulating. The land is developed for farming purposes. Physiographically, the site is situated in the region of "South Slope". The characteristic deposit in the vicinity of the area under investigation is composed of cohesive glacial till and granular deposits. The overburden is underlain by shale bedrock of Meaford - Dundas formation, Ordovician Period.

This physiographic region is well drained by the Credit, Oakville and Etobicoke Creeks, which have cut deep valleys into the overburden. However, in many of the interstream areas drainage is still imperfect.

SUBSURFACE CONDITIONS

General

The subsurface conditions were found to be quite uniform over the site. Under a thin layer of topsoil is a stratum of cohesive glacial till which is underlain by a layered deposit of clayey silt and silt with trace of sand. Detailed descriptions of the various soil types encountered in each borehole are given in the Record of Borehole Sheets. The estimated stratigraphical profile and sections shown in Drawing No. 1587503 A are based upon this information. From around

### Glacial Till

Underlying a thin (max. 12") layer of topsoil a deposit of cohesive glacial till was encountered at all locations over the site. The glacial till varies in thickness from 24.0 to 31.0 feet. The cohesive glacial till is comprised of a heterogeneous mixture of clayey silt, sand and gravel. The Standard Penetration Tests gave 'N' values ranging from 20 blows to over 100 blows per foot, indicating that the glacial till has a very stiff to hard consistency, but, generally hard.

The physical properties of the glacial till as determined from laboratory testing are summarized below:

	<u>Range</u>
Liquid Limit ( $W_L$ ) %	21-28
Plastic Limit ( $W_p$ ) %	12-15
Moisture Content (W) %	9-15

The results of the Atterberg Limit Tests are shown on Plasticity Chart (Fig. 1) and the typical grain size distribution curves are presented in an envelope form in Fig. 2 which are included in the Appendix of this report.

The Atterberg Limits indicate that the cohesive stratum is inorganic and of low plasticity.

At one location a distinct 3 foot thick layer of dense silty sand was sandwiched immediately beneath the glacial till deposit and above the layered clayey silt stratum.

### Clayey Silt With Trace of Sand and Seams of Silt (Layered)

Underlying the cohesive glacial till stratum is a deposit of clayey silt with trace of sand and seams of silt in a layered condition. The material is made up of irregular layers of clayey silt and silt with traces of sand. The Standard Penetration Tests for the overall deposit gave 'N' values well over 100 blows per foot indicating that the layered stratum has a hard consistency in the cohesive portion and very dense relative density in the noncohesive portion of the deposit.

The physical properties of the cohesive portion of the deposit as determined from laboratory testing gave the following results:

	<u>Range</u>
Liquid Limit ( $W_L$ ) %	22-28
Plastic Limit ( $W_p$ ) %	15-18
Moisture Content ( $W$ ) %	11-21

The results of the Atterberg Limit Tests are shown on Plasticity Chart (Fig. 1) and the typical grain size distribution curves are presented in an envelope form in Fig. 3 which are included in the Appendix of this report.

The Atterberg Limits indicate that the clayey silt layers of the deposit are inorganic and of low plasticity.

#### Groundwater

The groundwater levels were observed by measuring in the open borehole during and after the completion of the foundation investigation. The groundwater levels were found to vary between elevations 567 (B.H. 3) and 541 (B.H. 5) which corresponds to depths of 3 feet to 26 feet below the existing ground surface.

The erratic variation of the water levels in the boreholes was attributed primarily due to the presence of irregular layers of silt in the lower layered deposit of clayey silt.

The groundwater levels are shown on the Record of Borehole Sheets, as well as on Drawing No. 1587503 A.



## DISCUSSION AND RECOMMENDATIONS

As part of the new Hwy. 403 construction an underpass structure has been proposed at the crossing of the new Hwy. 403 and the existing Winston Churchill Blvd. It is understood that the Winston Churchill Blvd. will be widened to a four lane road in this area.

In the vicinity of the proposed structure the existing grade of the Winston Churchill Blvd. varies from 567.0 (south side) to 568.0 (north side). The revised grade of the Winston Churchill Blvd. will be at elevation 589.0. The proposed grade of Hwy. 403 will be at elevation 568.0. This will necessitate fills up to 22 feet.

A two span structure (110'-110') consisting of closed type abutments with a centre pier are presently being considered at this crossing.

### Pier Foundations

The pier may be founded on spread footings located within competent glacial till stratum at or below elevation 565.0 with an allowable load of up to 4 t.s.f. A minimum earth cover of 4 feet from the base of the footings should be provided for frost protection requirements.

No major dewatering problems are anticipated for the construction of foundations since the subsoil is relatively impervious. Furthermore, the groundwater level was found to be well below the footing foundation level, except in the area of the east side of the footing location. It is believed that any seepage or surface run-off into the excavation could be controlled by pumping from sumps. It should be noted that the foundation excavation base should be kept dry at all times prior to the placing of concrete.

### Abutment Foundations

In case closed type abutments are contemplated, the recommendations will be similar to those of pier foundations.

However, if perched abutments are contemplated they should be supported on a core of well compacted granular 'A' material above the natural subsoil as per our current practices. An allowable load of 2.5 t.s.f. may be used for design purposes. All the topsoil should be removed to the full base width of the granular core.

Approaches

No stability problems are anticipated for the proposed approach fills if constructed with 2:1 slopes.

Related Conditions

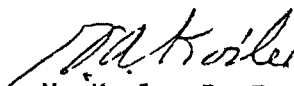
The abutments should be designed to withstand a lateral earth pressure exerted by the backfill and this pressure is dependent on the deformation characteristics of the retaining structure. If some movement of the top of the wall is permitted, then a coefficient of active earth pressure ( $K_a$ ) of 0.35 can be used. On the other hand, if the structure is designed as rigid frame, then a coefficient of earth pressure at rest ( $K_o$ ) of 0.5 should be used. To compute the sliding resistance between the rough concrete footing base and cohesive subsoil, an adhesion value of 2000 p.s.f. should be used.

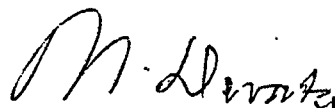
MISCELLANEOUS

The fieldwork was carried out during August 15 to 17, 1977 under the supervision of Mr. V. Korlu, Project Engineer, who also prepared this report.

The drilling equipment was owned and operated by D.S.I.L. Drilling Inc. of Toronto.

This report was reviewed by Mr. M. Devata, Supervising Engineer.

  
V. Korlu, P. Eng.  
Project Engineer

  
M. Devata, P. Eng.  
Supervising Engineer



MD/VK/gs  
October, 1977

## APPENDIX

## FIELD AND LABORATORY WORK

Seven sampled boreholes, each accompanied by a dynamic cone penetration test, were carried out at this site. The six boreholes (1, 2, 3, 5, 6 and 7) were carried out during recent field investigation while one borehole (No. 4) was carried out earlier during a preliminary investigation.

The borings were advanced by a continuous flight auger machine (commercially known as C.M.E. 75, H.S.M.V.) adapted for soil sampling purposes.

Samples of the overburden were obtained in a 2" O.D. split spoon sampler at required depths. The sampler was hammered into the soil according to the specifications of the Standard Penetration Test.

Groundwater level observations were carried out during the time of investigation in the open boreholes. The soil and groundwater conditions encountered at the boring locations are presented in the Record of Borehole Sheets. The locations and elevations of the various boreholes were provided by personnel from Construction Office, Central Region. The elevations in this report are referred to a Geodetic Datum. Boring locations and elevations are shown on Drawing No. 1587503 A.

All samples were subjected to careful visual examination in the field and subsequently in the laboratory. Following this examination laboratory tests were carried out on selected representative samples to determine the physical properties of the various soil types encountered, namely:

- Natural Moisture Content
- Atterberg Limits
- Grain Size Distribution

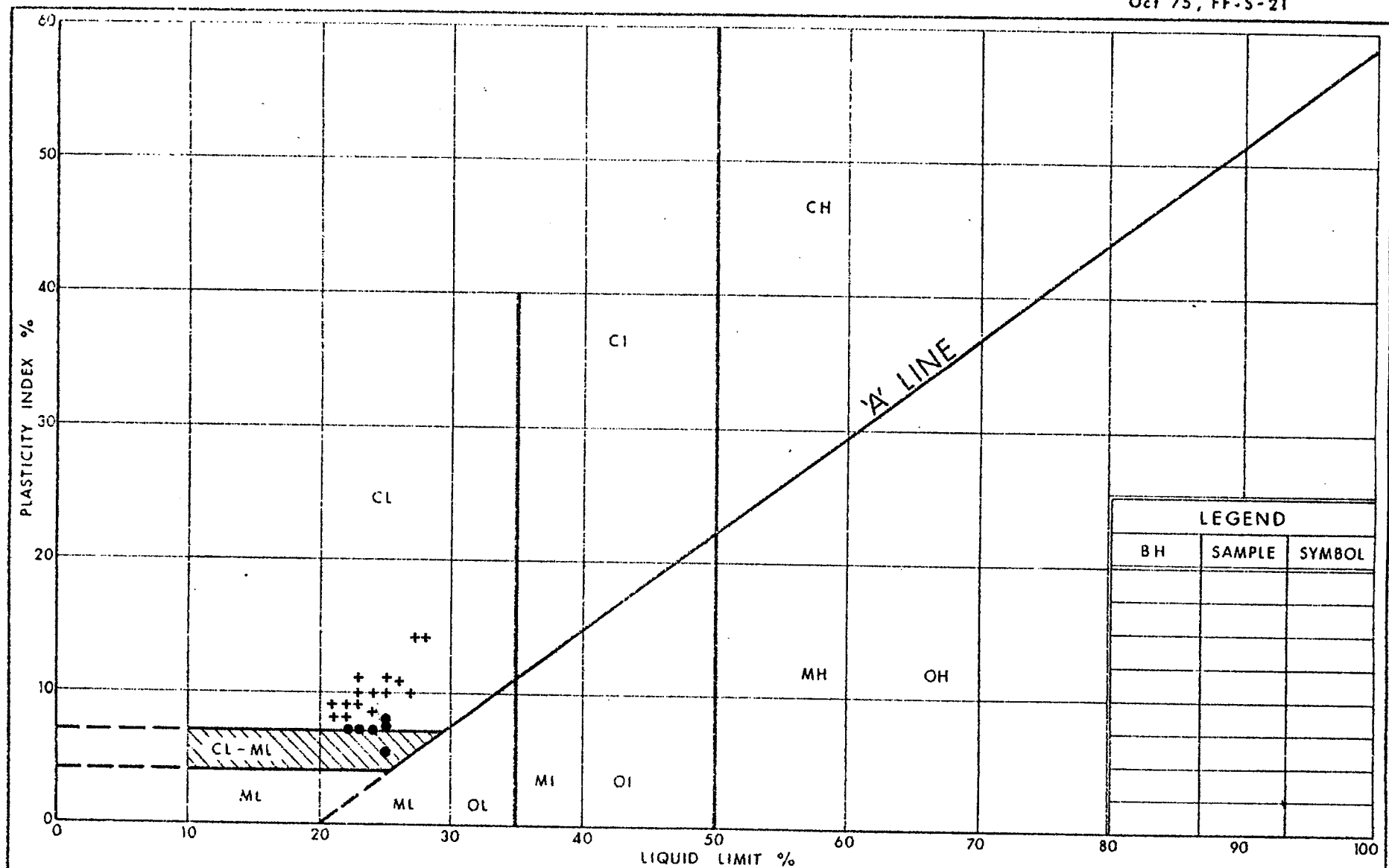
The results of this testing are plotted on the Record of Borehole Sheets and summarized on Fig. 1 to 3, all contained in Appendix 1 of this report.



# RECORD OF BOREHOLE No 7

W P 158-75-03 LOCATION Co-ords N. 15,821,595; E. 944,349 ORIGINATED BY V.K.  
DIST 4 HWY 403 BOREHOLE TYPE 3 1/4" H.S. Auger & Cone Test COMPILED BY V.K.  
DATUM Geodetic DATE August 16, 1977 CHECKED BY RS

[illegible]

Ministry of  
Transportation and  
Communications

## PLASTICITY CHART

- + COHESIVE GLACIAL TILL
- CLAYEY SILT WITH SEAMS OF SILT

FIG No 1

W P 158 - 75 - 03



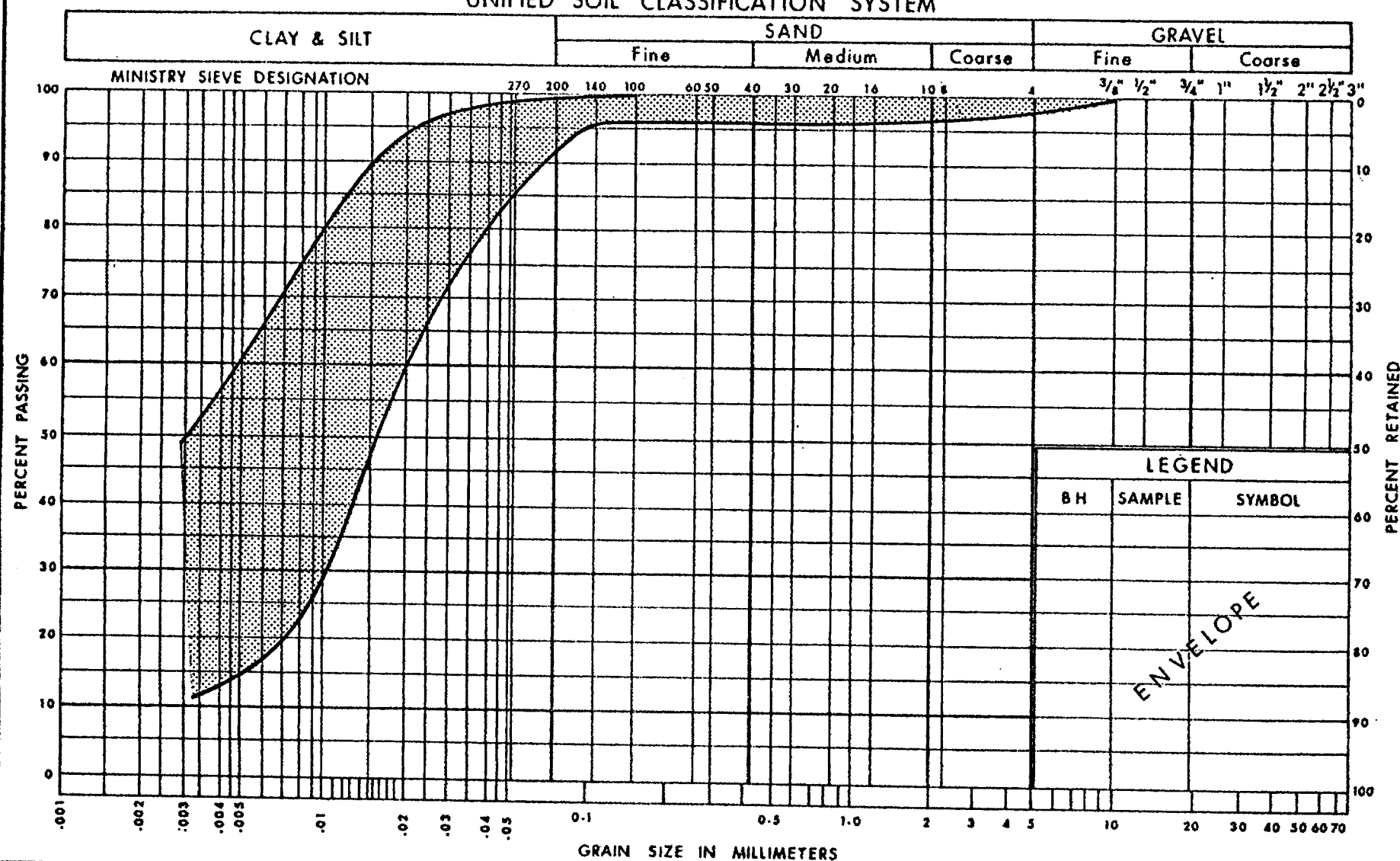
**Ministry of  
Transportation and  
Communications**

GRAIN SIZE DISTRIBUTION  
GLACIAL TILL  
HET MIX OF CLAYEY SILT, SAND & GRAVEL

FIG No 2

W P 158 - 75 - 03





**Ministry of  
Transportation and  
Communications**

GRAIN SIZE DISTRIBUTION  
CLAYEY SILT  
WITH SEAMS OF SILT & TRACE OF SAND

FIG No 3

W P 158-75-03

## 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 OVERTURBULENCE 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 1" 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	MODERATE	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.  $\bar{C}IU$  = CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL WITH PORE PRESSURE MEASUREMENT UNLESS OTHERWISE SPECIFIED IN REPORT ALL TESTS ARE IN COMPRESSION

### FIELD SAMPLING

S S SPLIT SPOON  
W S WASH SAMPLE  
S T SLOTTED TUBE SAMPLE  
B S BLOCK SAMPLE  
C S CHUNK SAMPLE  
T W THINWALL OPEN  
T P THINWALL PISTON  
O S OSTERBERG SAMPLE  
F S FOIL SAMPLE  
R C ROCK CORE  
P H T.W. ADVANCED HYDRAULICALLY  
P M T.W. ADVANCED MANUALLY

### EARTH PRESSURE TERMS

$\mu$  COEFFICIENT OF FRICTION  
 $\delta$  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  
 $\omega$  SLOPE ANGLE-BACKFACE OF WALL  
 $\beta$  ANGLE OF SLOPE  
 $N_q, N_c$  BEARING CAPACITY FACTORS  
 $D_f$  DEPTH OF FOOTING  
B.L. FOOTING DIMENSIONS

### INDEX PROPERTIES

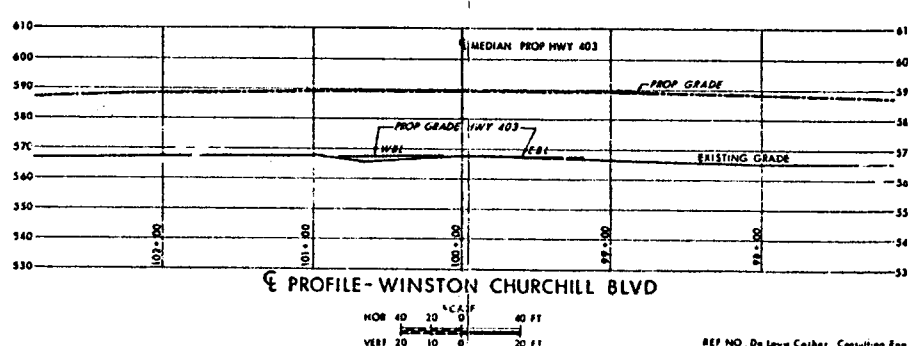
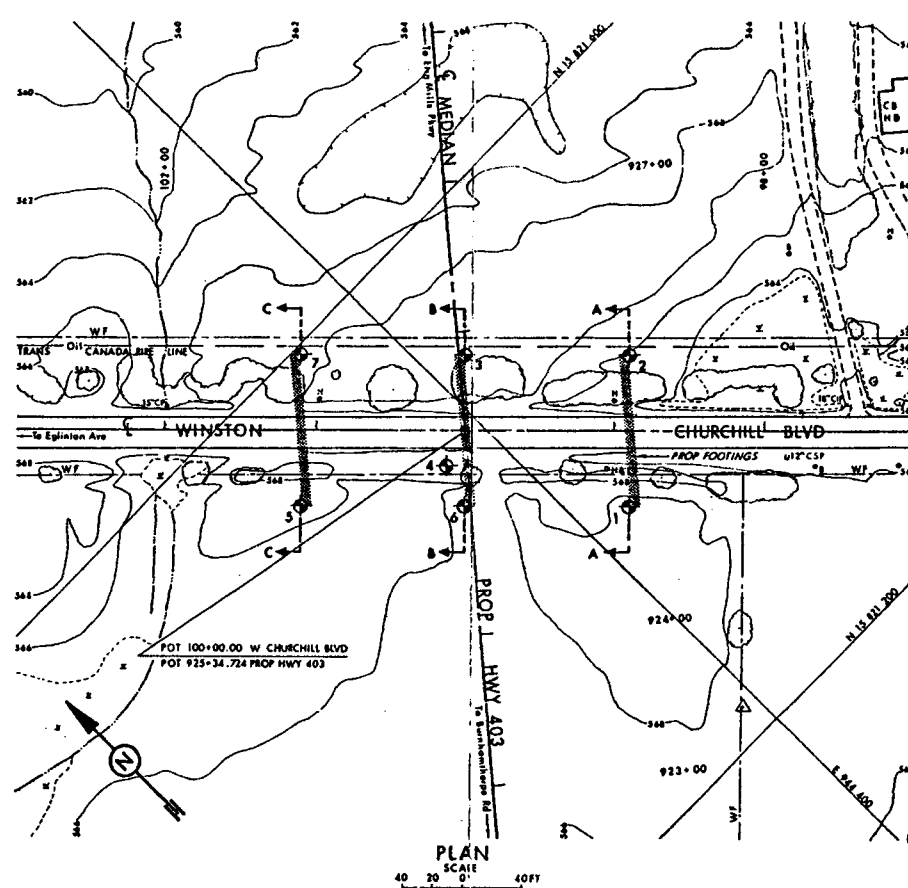
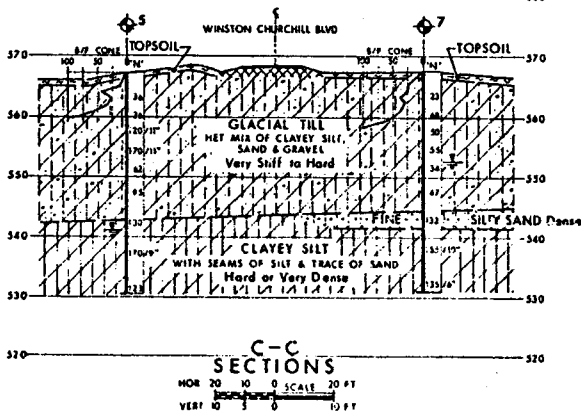
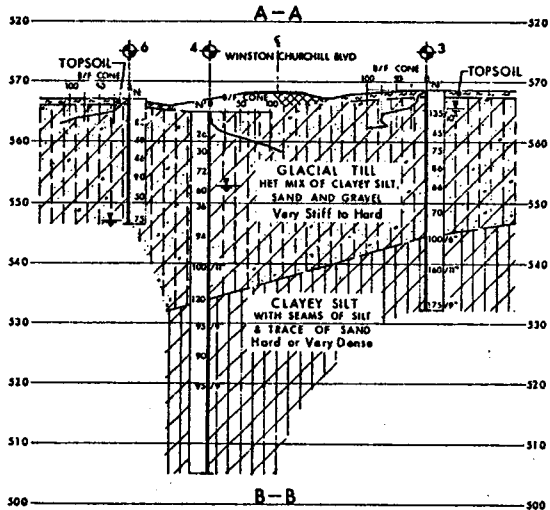
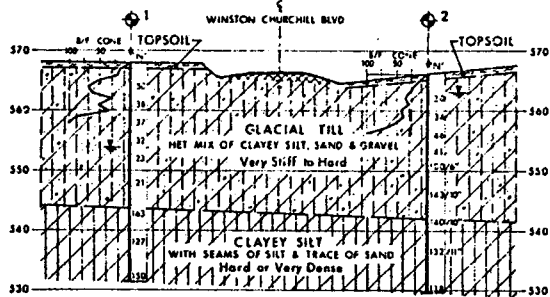
$\gamma$  UNIT WEIGHT OF SOIL (BULK DENSITY)  
 $\gamma_w$  UNIT WEIGHT OF WATER  
 $\gamma_d$  UNIT DRY WEIGHT OF SOIL (DRY DENSITY)  
 $\gamma'$  UNIT WEIGHT OF SUBMERGED SOIL  
 $G_s$  SPECIFIC GRAVITY OF SOLIDS  
 $e$  VOIDS RATIO  
 $e_o$  INITIAL VOIDS RATIO  
 $e_{max}$   $e$  IN LOOPEST STATE  
 $e_{min}$   $e$  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 =  $\frac{w - w_P}{I_P}$   
 $C_u$  COMPRESSION INDEX =  $w_L - w_P$

### STRENGTH PARAMETERS

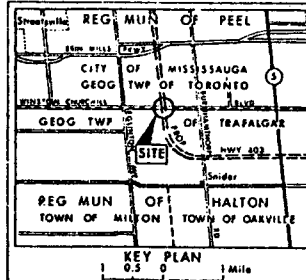
$\phi$  ANGLE OF SHEARING RESISTANCE  
 $\tau_c$  PEAK SHEAR STRENGTH  
 $\tau_p$  RESIDUAL SHEAR STRENGTH  
 $c$  COHESION INTERCEPT  
 $\sigma_1, \sigma_2, \sigma_3$  NORMAL PRINCIPAL STRESSES  
 $u$  PORE WATER PRESSURE  
 $u_o$  EXCESS  $u$   
 $r_u$  PORE PRESSURE RATIO  
 $q_u$  UNCONFINED COMPRESSIVE STRENGTH  
 $s_u$  UNDRAINED SHEAR STRENGTH  
 $\epsilon$  LINEAR STRAIN  
 $\gamma$  SHEAR STRAIN  
 $\nu$  POISSON'S RATIO  
 $E$  MODULUS OF ELASTICITY  
 $G$  MODULUS OF SHEAR DEFORMATION  
 $k_s$  MODULUS OF SUBGRADE REACTION  
 $\phi, \alpha$  STABILITY COEFFICIENTS

### HYDRAULIC TERMS

$h$  HYDRAULIC HEAD OR POTENTIAL  
 $q$  RATE OF DISCHARGE  
 $v$  VELOCITY OF FLOW  
 $i$  HYDRAULIC GRADIENT  
 $j$  SEEPAGE FORCE PER UNIT VOLUME  
 $\eta$  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



CONT No  
WP No 158-75-03  
WINSTON CHURCHILL BLVD U/PASS  
BORE HOLE LOCATIONS & SOIL STRATA



**LEGEND**

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- Blows/ft (Std Pen Test 350 ft/s energy)
- CONE Blows/ft (60° Cone, 350 ft/s energy)
- WL at time of investigation Aug 1977
- WL for Bore Hole No 4 July 1976

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	568.0	15 821 368	944 431
2	566.2	15 821 438	944 503
3	568.7	15 821 517	944 425
4	565.0	15 821 474	944 365
5	567.1	15 821 525	944 277
6	567.0	15 821 447	944 354
7	567.7	15 821 595	944 349

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

REVISIONS

NO	DATE	BY	DESCRIPTION
1			

DATE: 215-2000-24

REF NO: De Lave Caribor, Consulting Eng's & Planners  
Project no. 71-911 DWG no 911-101  
SHEET 8  
DATE: 20-1977  
DRAWN BY: [Signature]  
CHECKED BY: [Signature]

ENGINEERING MATERIALS OFFICE  
PAVEMENT & FOUNDATION DESIGN SECTION

WP 197-77-08 DIST  
HWY 403/407 STR SITE -  
Interchange Complex

CONT 84-65  
Outfall Storm Sewer

DISTRIBUTION

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J. Smrcka (2)  
K. Bassi  
B.J. Giroux  
R. Hore

R. Fitzgibbon (Cover Only)  
T.J. Kovich (Cover Only)  
Files

## SUBSURFACE CONDITIONS

### General

The subsoil along the proposed storm sewer alignment and at the associated detention areas was found to consist of cohesive and non-cohesive glacial deposit followed by a weathered shale zone. The boundaries of the different strata, together with the obtained field and laboratory test results are shown on the Record of Borehole Sheets contained in the Appendix of this report. The stratigraphical profiles of Drawings No. 1977708-A and B are based upon this information. A description of the different strata encountered is given below.

### Heterogeneous Mixture of Silty Clay Sand and Gravel (Glacial Till)

Immediately below a thin layer of topsoil (about 10-12 cm) a till-like cohesive type zone was encountered at every boring location. The thickness varies from borehole to borehole. References should be made to the Record of Borehole Sheet for boundary elevations at a particular location. In some Boreholes, this stratum was not fully penetrated. The material in the deposit was found to consist of a heterogeneous mixture of silty clay, sand and gravel. The matrix of this till is basically cohesive in nature - i.e., silty clay binding coarser particles. There are random localized zones where the matrix is only slightly cohesive. A plot of Plasticity Index versus Liquid Limit (Figure #1) shows the majority of the points to fall within the CL zone. There are occasional silty sand layers within the main deposit.

Physical properties of the material as determined from laboratory tests are summarized as follows:

	<u>Range</u>	<u>Average</u>
Natural moisture content (%)	6-17	11
Liquid limit (%)	14-31	22
Plastic limit (%)	8-23	14

FOUNDATION INVESTIGATION REPORT  
For  
OUTFALL STORM SEWER  
HWY. #403/407 INTERCHANGE COMPLEX  
W.P. 197-77-08; Site: NIL  
District #4 (Hamilton)

INTRODUCTION

This report contains the results of the Foundation Investigation carried out at the aforementioned site on 83 02 03 to 83 02 15 and 83 03 08 to 83 03 10. Some borings which were drilled for other projects in this area are also incorporated in this report. A total of 32 boreholes were carried out during the course of the fieldwork. The borings were advanced by continuous flight auger machines mounted on muskeg vehicles and equipped either with 83 mm I.D. hollow stem augers or solid augers.

SITE DESCRIPTION

The proposed storm sewer will be located in a quadrant bounded by Ninth Line Road, Eglinton Avenue, Winston Churchill Blvd. and Burnhamthorpe Road in the Municipalities of the Town of Oakville and the City of Mississauga.

The surrounding terrain, with the exception of the existing road network is relatively flat. Up to 7.5 m high stock-piled surplus materials are also placed within the existing Hwy. 403 Right of Way.

Physiographically the site is located in the region referred to as the Peel Plain.

The results of the grain-size distribution tests are shown in an envelope form on Figure #2 of the Appendix.

Standard Penetration Tests carried out within the deposit give 'N' values to range from 12 to over 100 blows per 30 cm. The consistency of the overall deposit varies from stiff to hard.

Sandy Silt to Silty Sand, Traces  
of Gravel and Clay (Glacial Till)

This stratum was encountered in those borings which were advanced below the above described cohesive deposit. For thickness, references should be made to the Record of Borehole Sheets. The material in the deposit consists of sands and silts with varying proportions and also traces of gravel and clay. Occasional cohesive layers (silty clay) were also intercepted in the lower part of the deposit.

The natural moisture content ranges from 3% to 18%. The Average value is in the order of 9%. The results of grain-size analyses performed on selected samples are plotted in an envelope form on Figure #3 of the Appendix.

Standard Penetration Tests, carried out within the deposit, gave 'N' values from 39 to over 100 blows per 30 cm, but the great majority is over the 100 blows per 30 cm mark. Based on these values, the overall deposit may be classified as being dense to very dense.

Weathered Shale

This zone was encountered at the following Borehole locations: 2, 11, 12, 13, 16, 17, 18, 19, 20, 22, 26, 29, 201 and 202. The upper boundaries vary between el. 162 & el. 170. It is believed that this stratum exists not just at the above-mentioned locations, but throughout the entire area investigated. The basic component

of the material is silty clay to clay and reddish in colour. Most part of the deposit is extremely weathered or reworked and was penetrated by conventional drilling such as augering.

#### Groundwater Conditions

Groundwater levels observations were carried out in the open boreholes during the course of the fieldwork. The encountered groundwater levels are plotted on the Record of Borehole Sheets and on the Foundation drawings (1977708-A and B). In most of the borings, the groundwater levels were found to be at or close to the ground surface. In Boreholes No. 1, 12, 19, 21, 22, 23, 26, 27, 29 and 203, the groundwater was not observed.



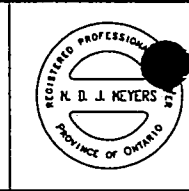
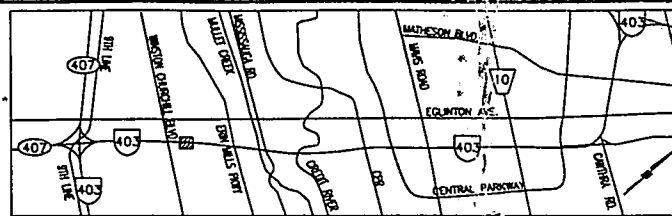
# RECORD OF BOREHOLE No 24

METRIC

W P 197-77-08 LOCATION Co-ords N 4 821 995; E 287 562 ORIGINATED BY BR  
 DIST 4 HWY 403/407 BOREHOLE TYPE Cont. Flight Auger (S.A.) COMPILED BY PP  
 DATUM Geodetic DATE 83 02 10 CHECKED BY 22

SOIL PROFILE			SAMPLES			GROUND WATER CONDITIONS	ELEVATION SCALE	DYNAMIC CONE PENETRATION RESISTANCE PLOT				PLASTIC LIMIT W <sub>p</sub>	NATURAL MOISTURE CONTENT W	LIQUID LIMIT W <sub>L</sub>	UNIT WEIGHT γ	REMARKS & GRAIN SIZE DISTRIBUTION (%)
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	'N' VALUES			20	40	60	80	100				
174.0	Ground Level															
0.0	Heterogeneous mixture of silty clay, sand and gravel Hard Glacial till		1	SS	48		172									
171.4			2	SS	100	12 cm										
2.6	Sandy silt to silty sand some gravel trace of clay V. Dense Glacial till		3	SS	100	15 cm										
			4	SS	100	15 cm	170									
			5	SS	100	15 cm										
			6	SS	140	15 cm										
			7	SS	100	15 cm										
			8	SS	120	3 cm	168									
			9	SS	100	6 cm										
			10	SS	100	15 cm										
			11	SS	120	15 cm	166									
165.5			12	SS	100	15 cm										
8.5	Heterogeneous mixture of silty clay sand and gravel Hard Glacial till		13	SS	105	15 cm	164									
161.7			14	SS	125	15 cm	162									
12.3	End of Borehole															

OFFICE REPORT ON SOIL EXPLORATION



METRIC

CONTRACT NO. 613-89-01  
WP

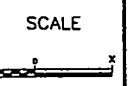
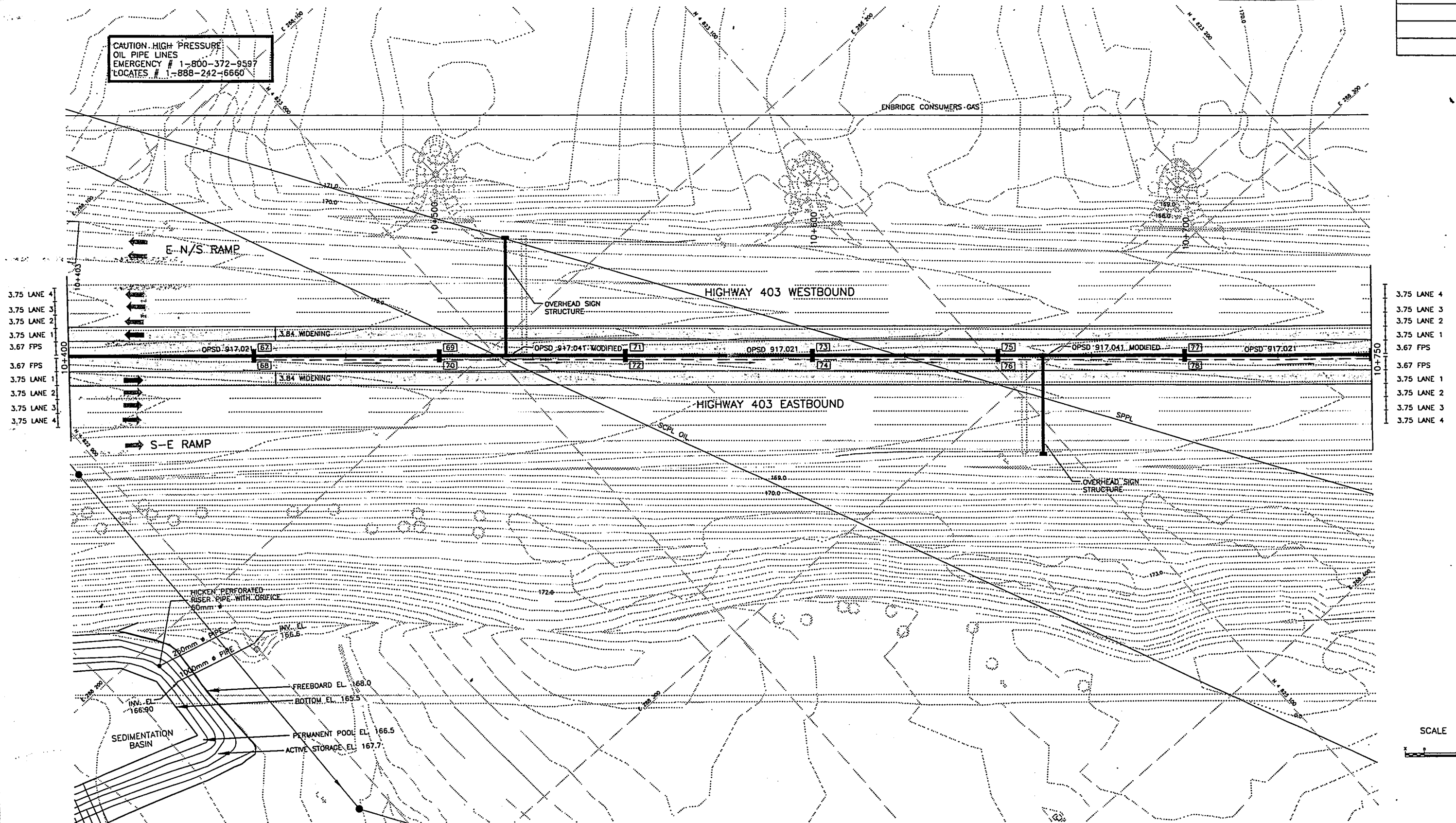
NEW CONSTRUCTION  
STA 10+400 TO STA 10+750  
Survey Revised

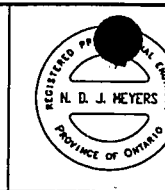
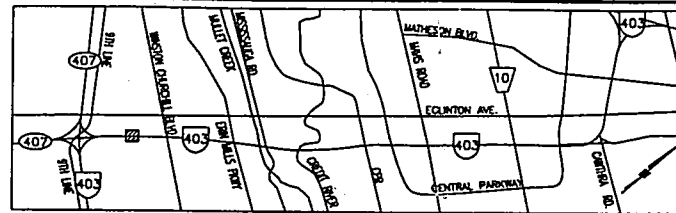
THE GREER GALLOWAY GROUP INC.  
ENGINEERS + PLANNERS  
PETERBOROUGH • BANCROFT • BELLEVILLE • PEMBROKE



SHEET  
79

CAUTION: HIGH PRESSURE  
OIL PIPE LINES  
EMERGENCY # 1-800-372-9597  
LOCATES # 1-888-242-6660






METRIC

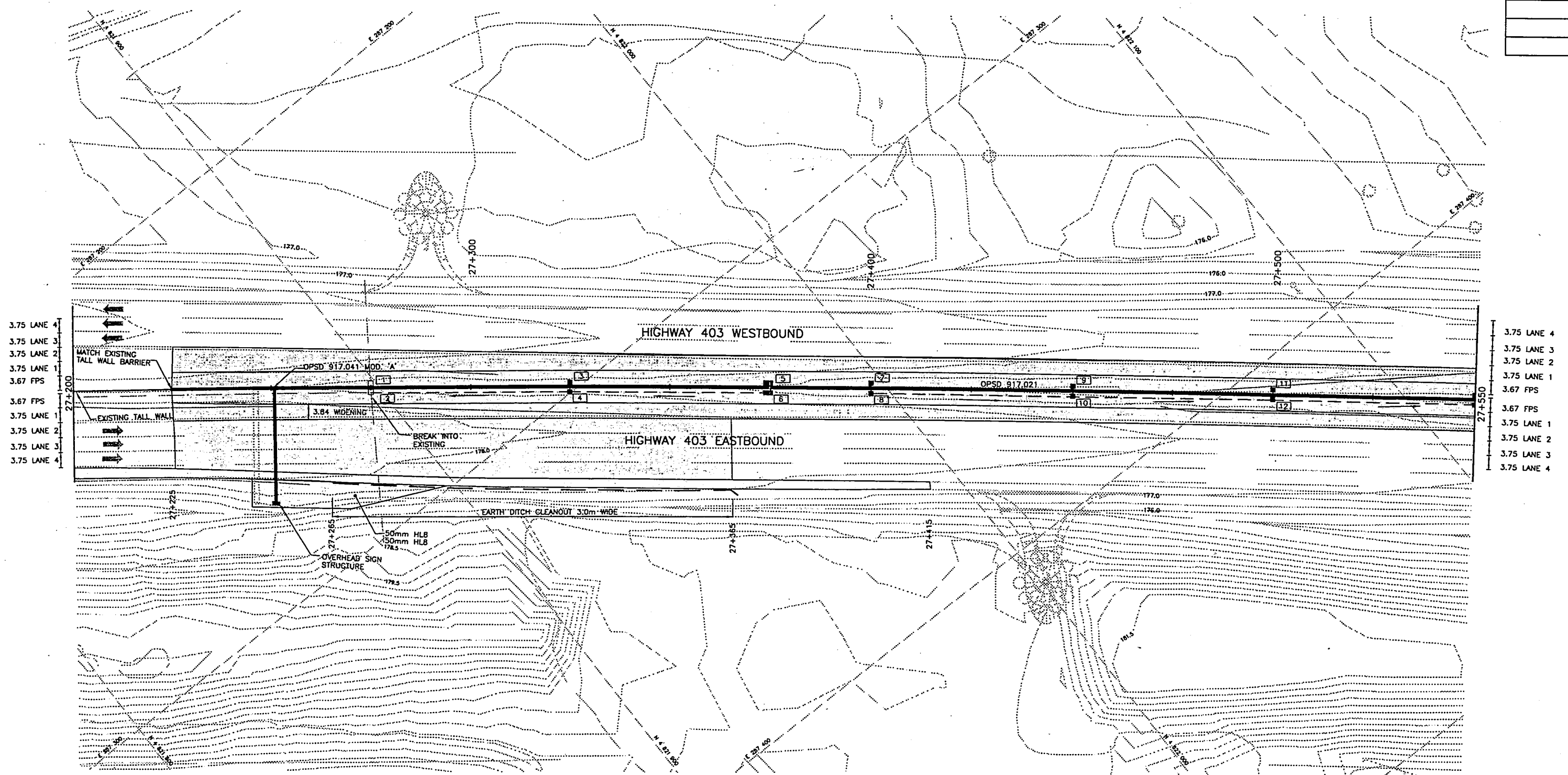
CONT No  
WP No 613-89-01

NEW CONSTRUCTION  
STA 27+200 TO STA 27+550  
Survey \_\_\_\_\_ Revised \_\_\_\_\_

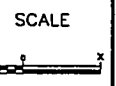
 THE GREER GALLOWAY GROUP INC.  
ENGINEERS + PLANNERS  
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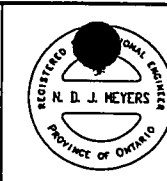
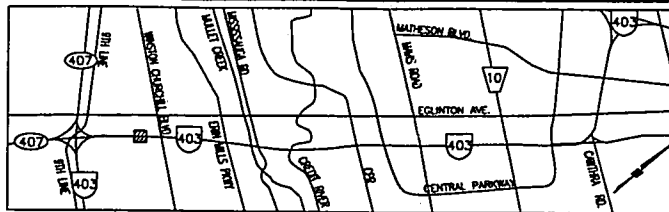


SHEET  
75



450





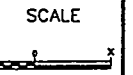
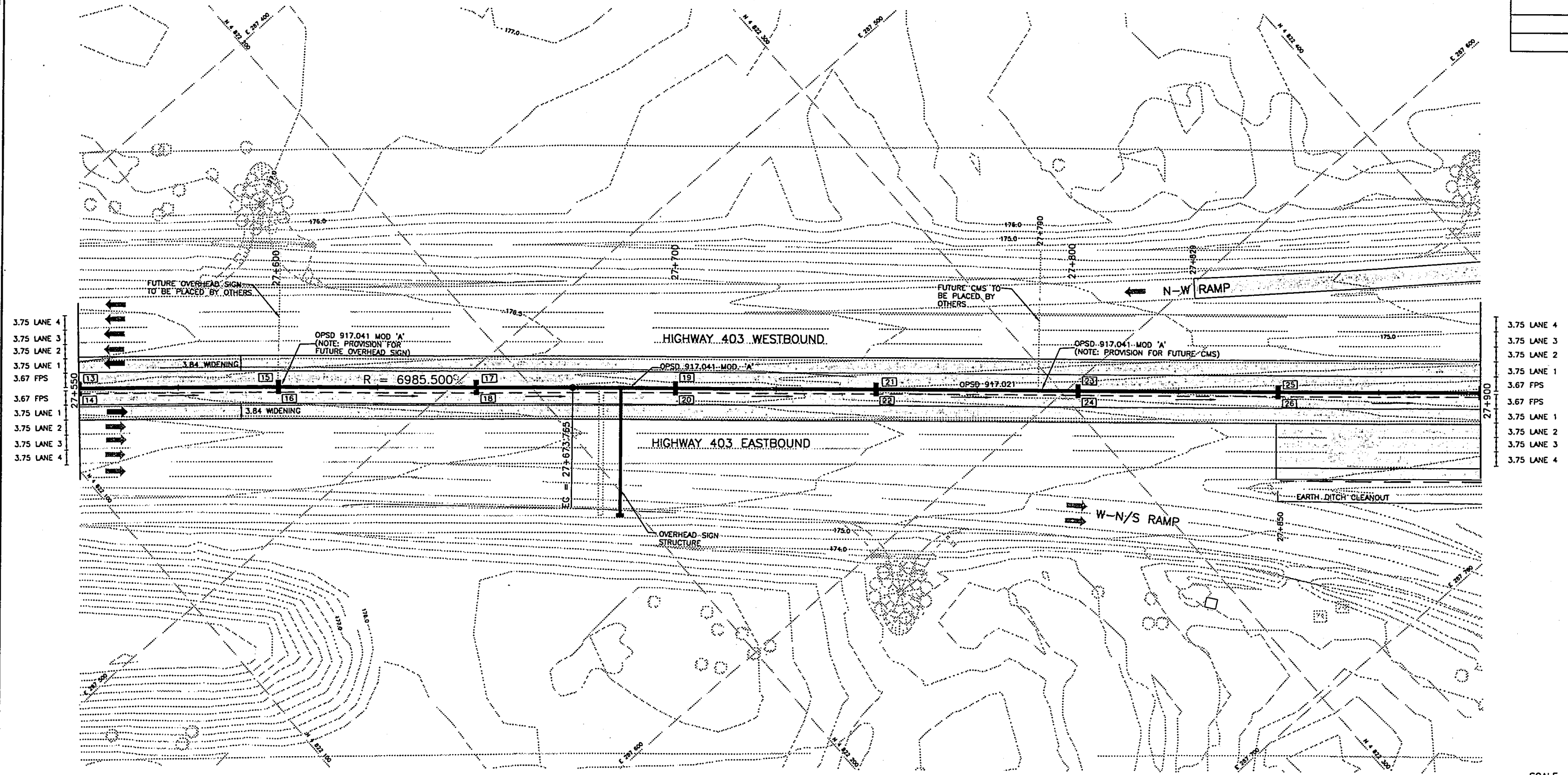
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DIMENSIONS ARE IN METRES  
AND/OR MILLIMETRES  
UNLESS OTHERWISE SHOWN

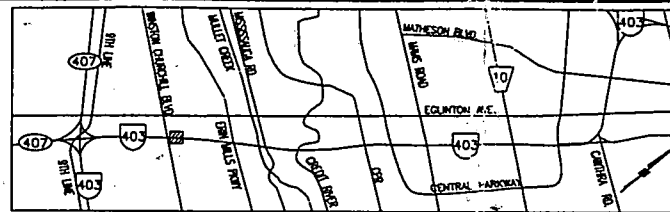
CONT No  
WP No 613-89-01

NEW CONSTRUCTION  
STA 27+550 TO STA 27+900  
Survey \_\_\_\_\_ Revised \_\_\_\_\_

THE GREER GALLOWAY GROUP INC.  
ENGINEERS + PLANNERS  
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SHEET
76






METRIC

CONT No  
WP No 613-89-01

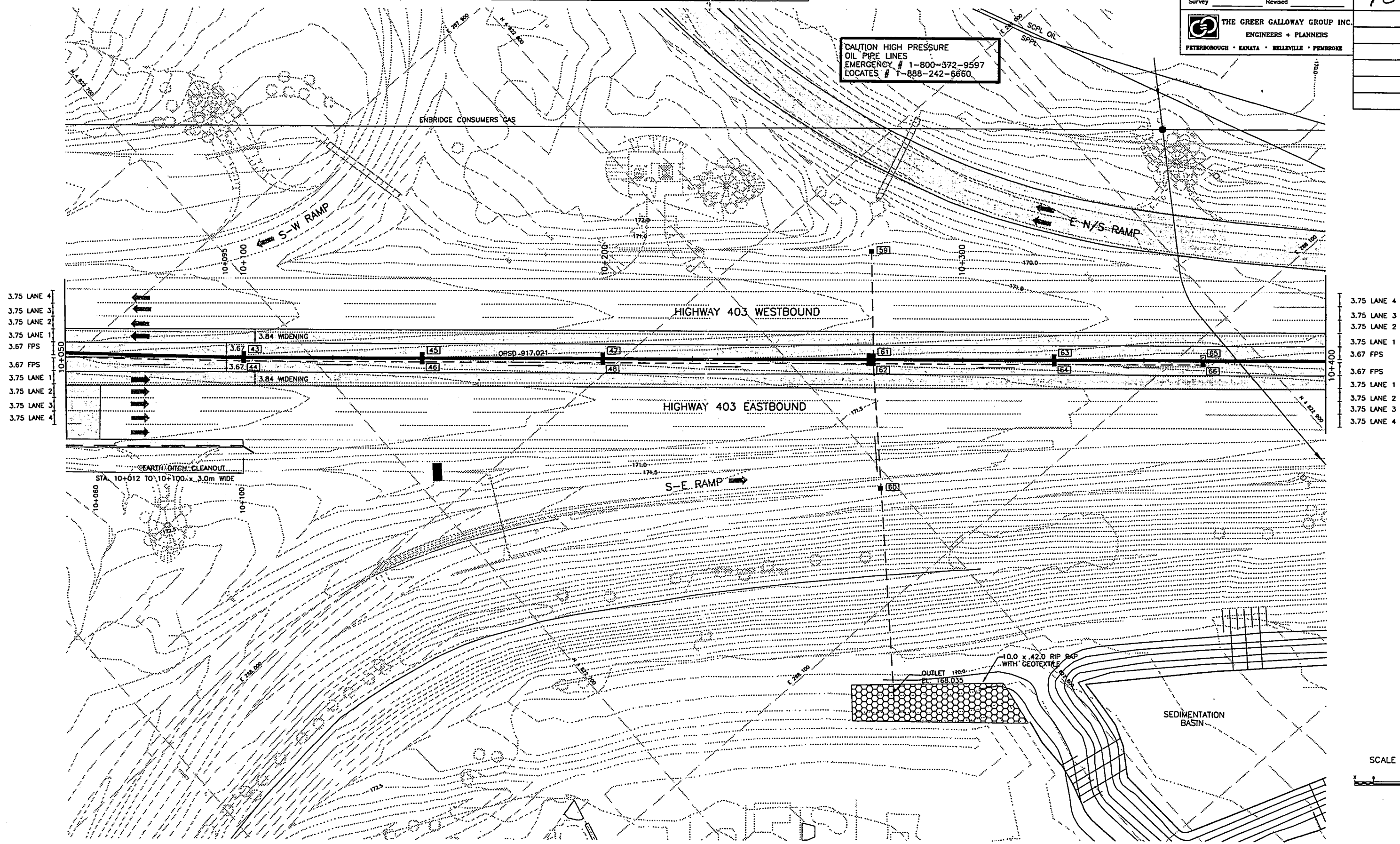
NEW CONSTRUCTION  
STA 10+050 TO STA 10+400  
Survey \_\_\_\_\_ Revised \_\_\_\_\_

 THE GREER GALLOWAY GROUP INC.  
ENGINEERS + PLANNERS  
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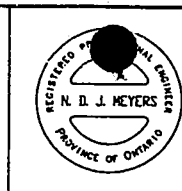
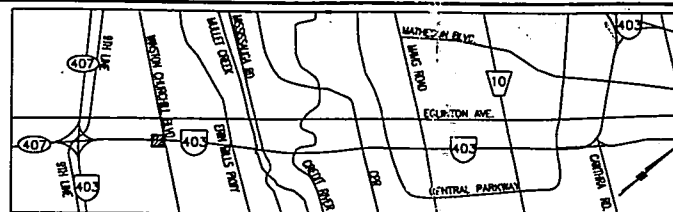


SHEET  
78

CAUTION HIGH PRESSURE  
OIL PIPE LINES  
EMERGENCY # 1-800-372-9597  
LOCATES # 1-888-242-6660








METRIC

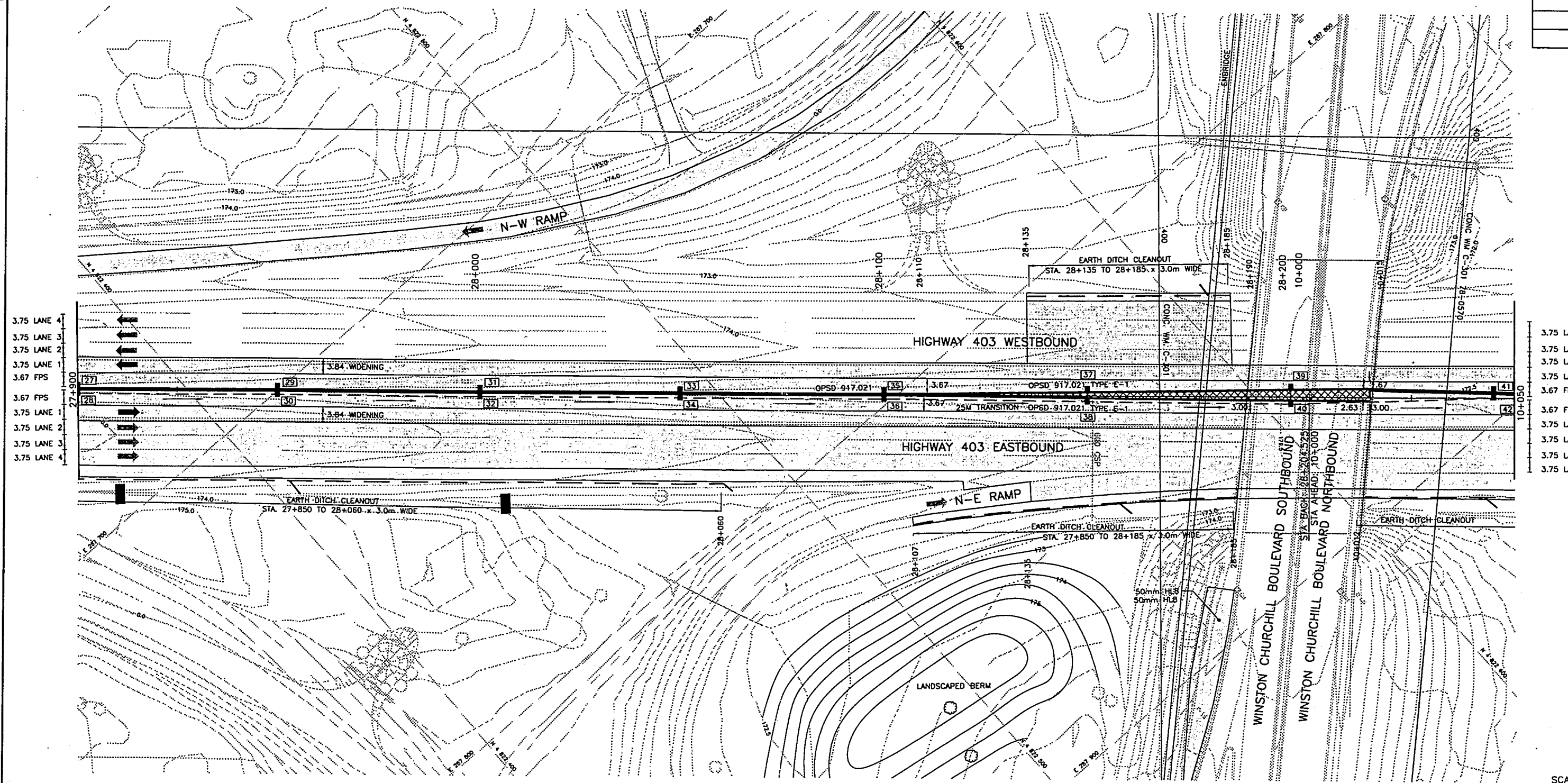
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Survey \_\_\_\_\_ Revised \_\_\_\_\_

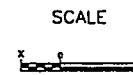
 THE GREER GALLOWAY GROUP INC.  
ENGINEERS + PLANNERS  
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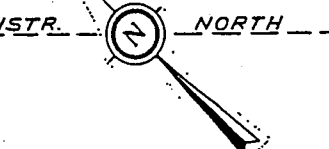
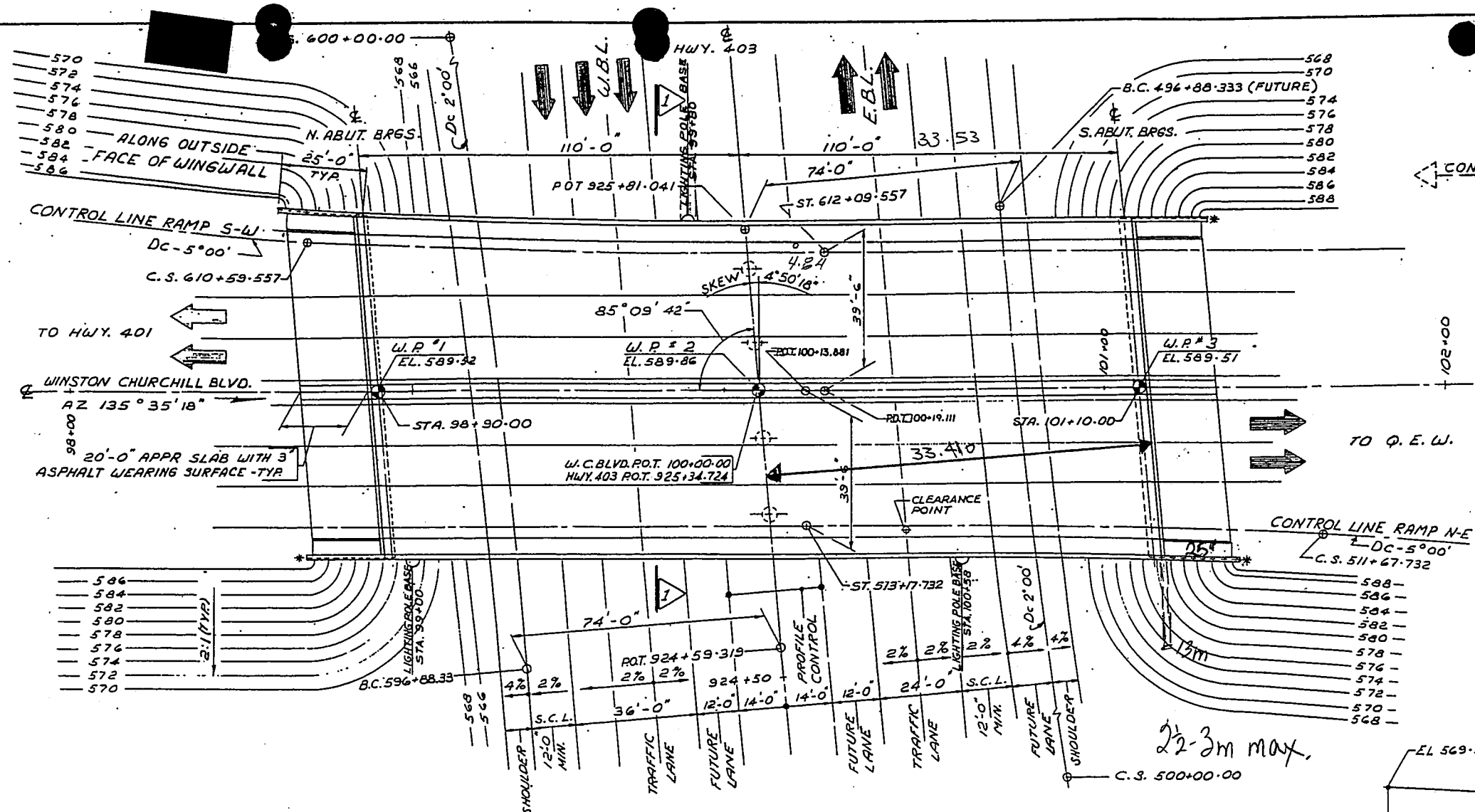


SHEET  
77



3.75 LANE 4  
3.75 LANE 3  
3.75 LANE 2  
3.75 LANE 1  
3.67 FPS  
3.75 LANE 1  
3.75 LANE 2  
3.75 LANE 3  
3.75 LANE 4

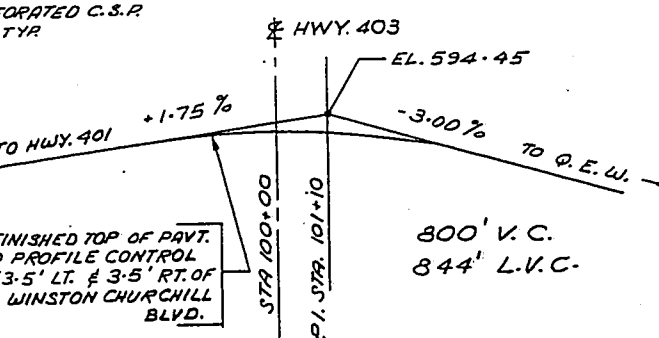
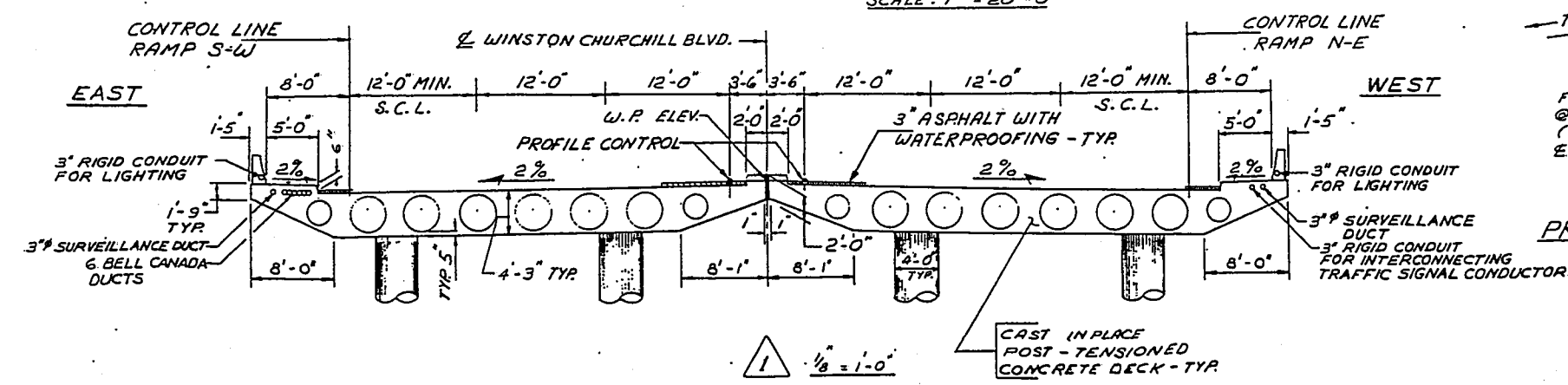
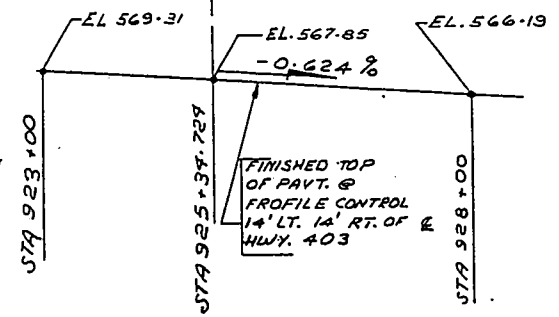
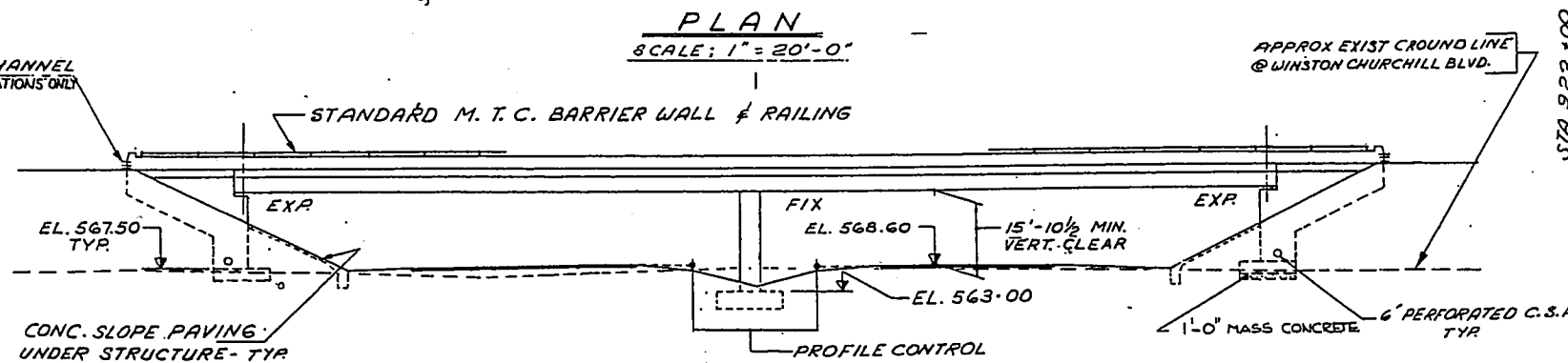




**NOTES**  
 1) W.P. DENOTES WORKING POINT  
 2) REFER TO GRADING DRAWINGS FOR CATCH BASINS OFF STRUCTURE.  
**SKEW.**  
 SIN. 0.0843445  
 COS. 0.9964367  
 TAN. 0.0846461

**GENERAL NOTES**  
**CLASS OF CONCRETE**  
 DECK, SIDEWALK & PIER COLUMNS 35 MPa  
 BARRIER WALLS 30 MPa  
 REMAINDER 20 MPa  
**REINFORCING STEEL GRADE**  
 C.S.A. STANDARD G30.12-M1977 GRADE 400MPa  
**CLEAR COVER ON REINFORCING STEEL**  
 FOOTINGS & ABUTMENTS 3"  
 PIER COLUMNS 2 1/2"  
 DECK TOP 2"  
 DECK BOTTOM 1 1/2"  
 APPROACH SLABS AND/OR AS NOTED ON DRAWINGS.  
**CONSTRUCTION NOTES**  
 THE CONTRACTOR SHALL FINISH 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, STRESSED AND GROUTED.  
 REINFORCING WITH BAR MARK SUFFIX 'C' TO BE EPOXY COATED.

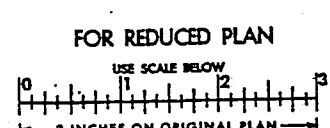
- LIST OF DRAWINGS**
- 24-384-1. GENERAL PLAN
  - 2. BOREHOLE LOCATIONS & SOIL STRATA
  - 3. FOOTING LAYOUT & DETAILS
  - 4. FOOTING REINFORCEMENT
  - 5. WEST & EAST ABUTMENTS
  - 6. PIER COLUMNS
  - 7. DECK LAYOUT, SCREED ELEV. AND BEARINGS
  - 8. CABLE DETAILS I
  - 9. CABLE DETAILS II
  - 10. DECK REINFORCEMENT I
  - 11. DECK REINFORCEMENT II
  - 12. BARRIER WALL WITH SIDEWALK
  - 13. STEEL RAILING (SINGLE TUBE)
  - 14. 20 FT. APPROACH SLAB
  - 15. DETAILS OF CONC. SLOPE PAVING
  - 16. AS CONSTRUCTED ELEV. & DIM.
  - 17. STANDARD DETAILS I
  - 18. STANDARD DETAILS II
  - 19. STANDARD DETAILS III
  - 20. STANDARD DETAILS IV
  - 21. EMBEDDED DETAILS I
  - 22. EMBEDDED DETAILS II
  - 23. EMBEDDED DETAILS III



**CONCRETE QUANTITIES**

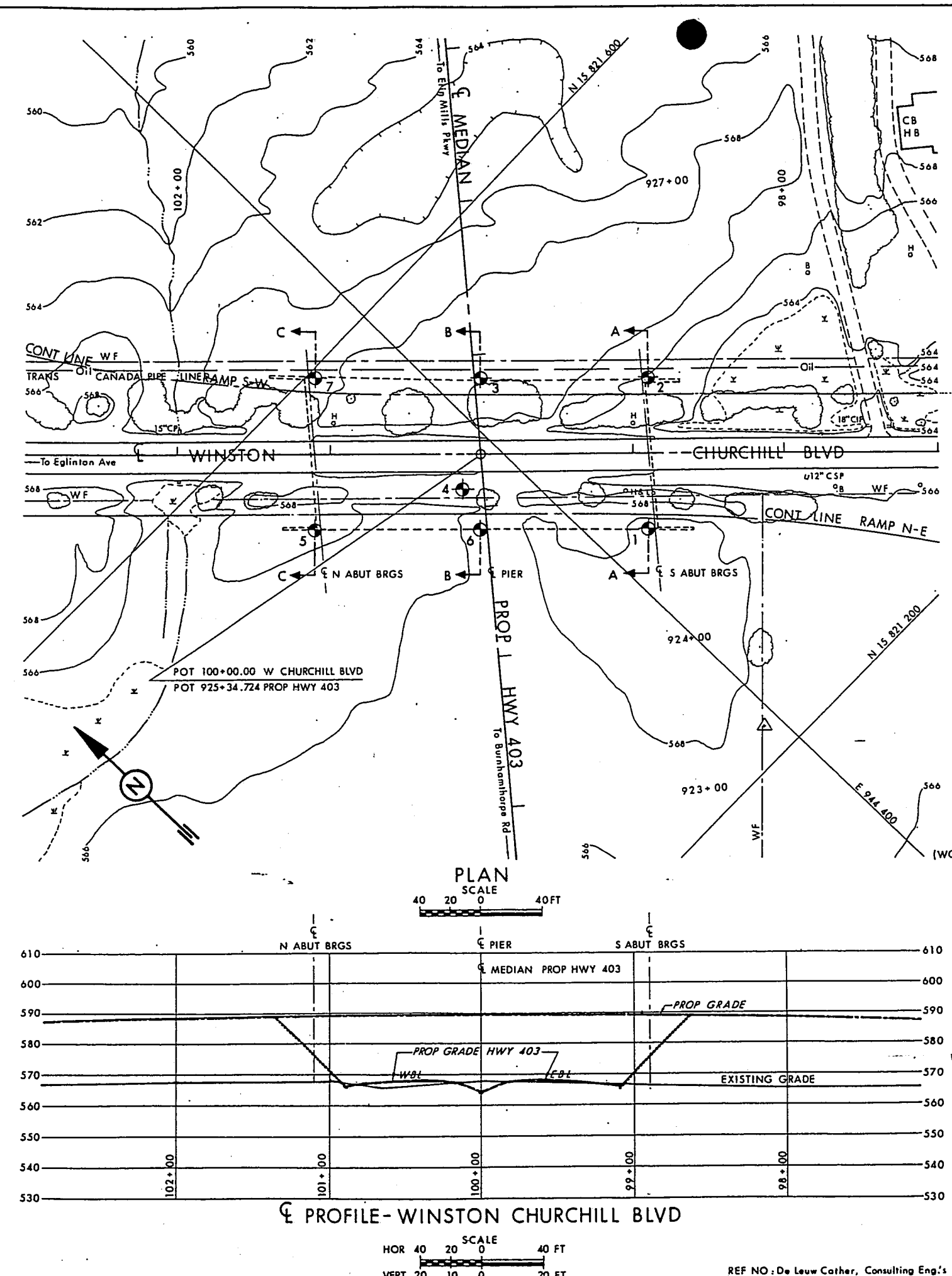
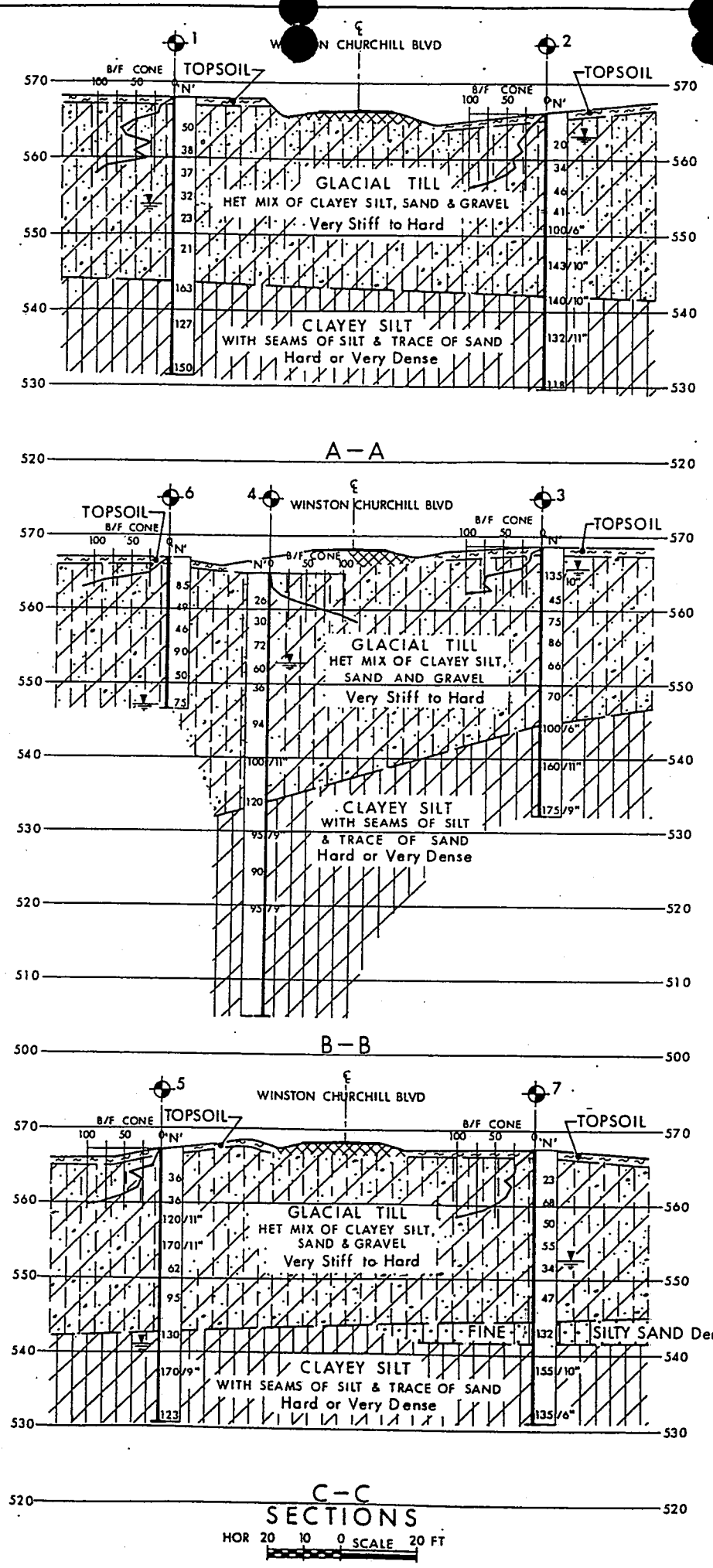
CONCRETE QUANTITIES ARE LISTED BELOW FOR APPROPRIATE CONCRETE LUMP SUM ITEMS.

ITEM	QUANTITY	UNIT
1. CONCRETE IN PIERS, ABUTMENTS AND WINGWALLS	556	C.Y.
2. PRESTRESSED CONCRETE BRIDGE DECK	2393	C.Y.
3. CONCRETE IN BARRIER WALLS	41	C.Y.
4. CONCRETE IN APPROACH SLABS	120	C.Y.
5. CONCRETE IN SLOPE PAVING	79	C.Y.



**REVISIONS**

DATE	BY	DESCRIPTION
DESIGN G.S.	CHECK S.C.	LOADING HS20-44 DATE JUL. 78
DRAWING J.A.	CHECK G.S.	SITE No 24-364 DWG 1



**CONT No 80-20**  
**WP No 158-75-03**

**WINSTON CHURCHILL BLVD U'PASS**  
**BORE HOLE LOCATIONS & SOIL STRATA**

**SHEET**  
**154**

**KEY PLAN**

1 0.5 0 1 Mile

**LEGEND**

- Bore Hole
- ⊕ Dynamic Cone Penetration Test (Cone)
- ⊗ Bore Hole & Cone
- 'N' Blows/ft (Std Pen Test 350 ft lbs energy)
- CONE Blows/ft (60" Cone, 350 ft lbs energy)
- W WL at time of investigation Aug 1977
- W WL for Bore Hole No 4 July 1976

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	568.0	15 821 368	944 431
2	566.2	15 821 438	944 503
3	568.7	15 821 517	944 425
4	565.0	15 821 474	944 365
5	567.1	15 821 525	944 277
6	567.0	15 821 447	944 354
7	567.7	15 821 595	944 349

**NOTE**

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

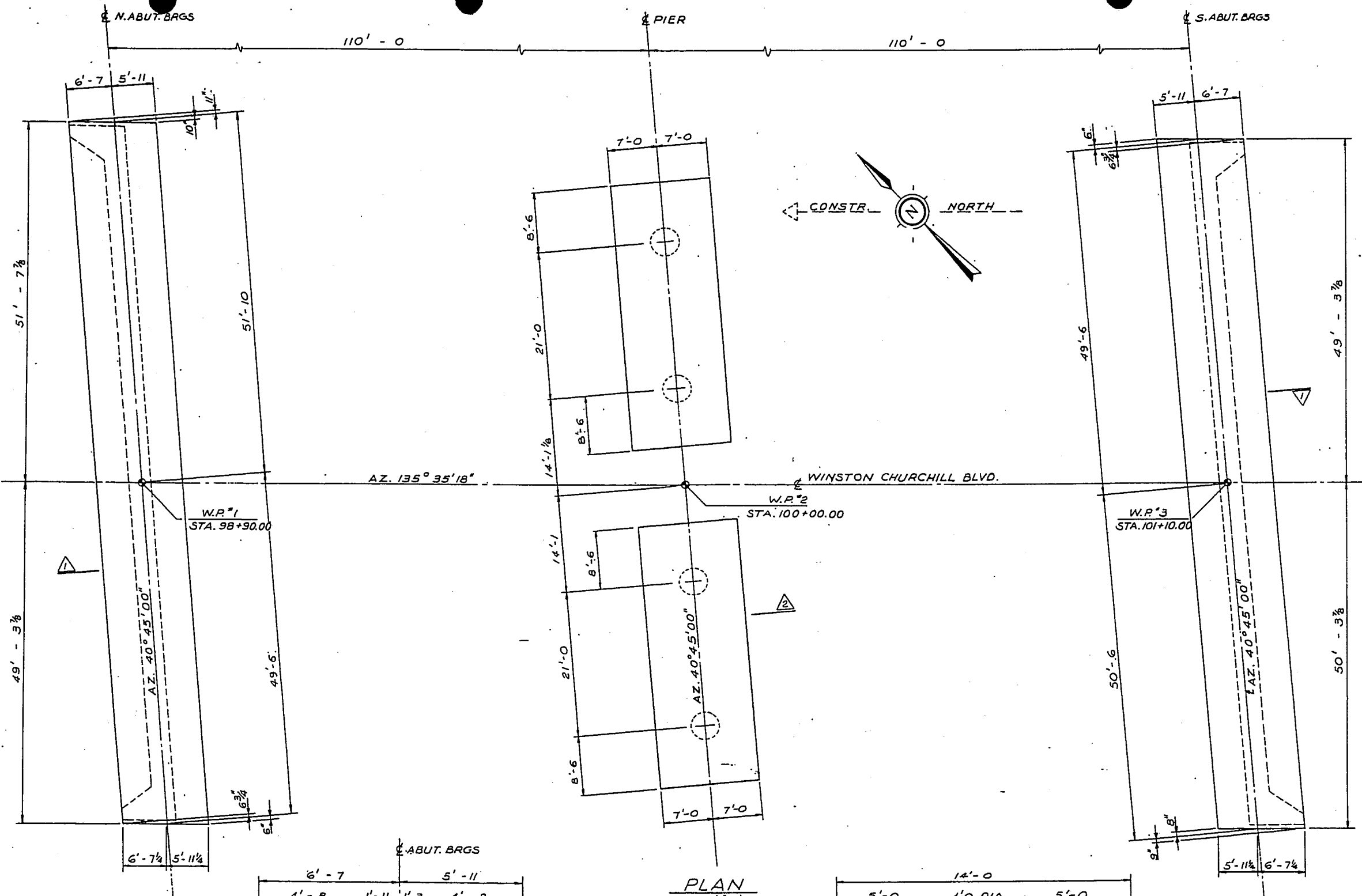
**REVISIONS**

DATE	BY	DESCRIPTION

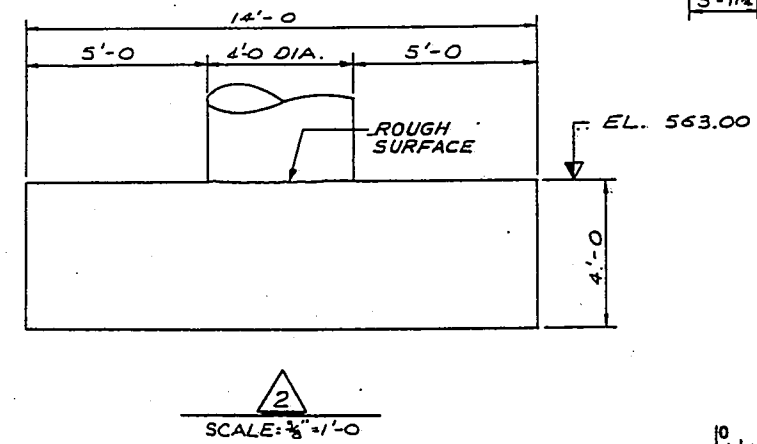
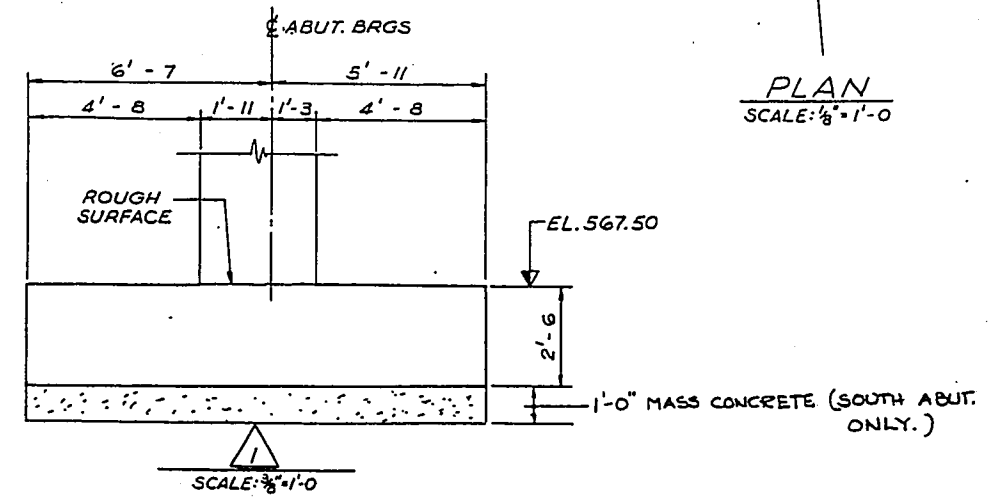
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**SUBMITTAL No 158-75-03**  
**DATE Sept 26, 1977**  
**SITE 24-384**

REF NO: De Leuw Cather, Consulting Eng's & Plan's  
 Project No: 71-911 DWG No: 911-701





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



CONT No 80-20

WP No 158-75-03

WINSTON CHURCHILL BLVD U'PASS

FOOTING LAYOUT & DETAILS

SHEET 155

De Leuw Cather CONSULTING ENGINEERS AND PLANNERS

COORDINATES		
W.P.	NORTH	EAST
1	821560.970	944313.789
2	821482.394	944390.768
3	821403.818	944467.747



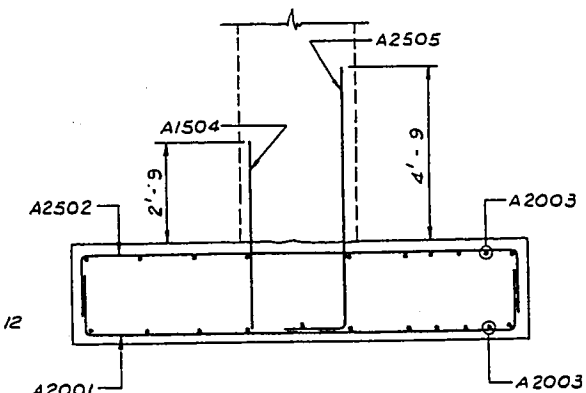
FOR REDUCED PLAN

USE SCALE BELOW

3" INCHES ON ORIGINAL PLAN

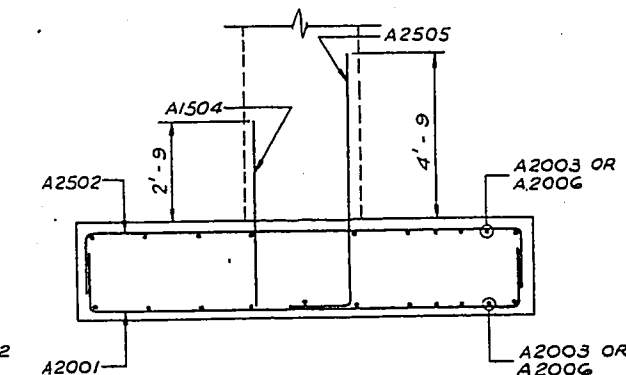
REVISIONS


DATE	BY	DESCRIPTION
DESIGN G.S.	CHECK S.C.	LOADING HS 20-44 DATE JUL. 78
DRAWING KAS	CHECK B.M.	SITE No 24-384 DWG 3



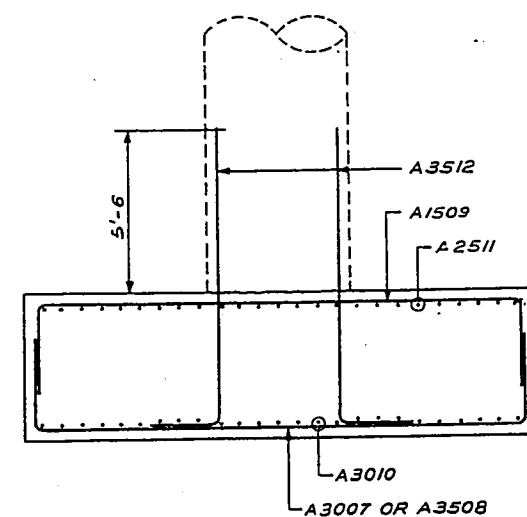
  
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SCALE:  $\frac{3}{16}'' = 1' - 0$



  
 SCALE:  $\frac{3}{8}" = 1' - 0$

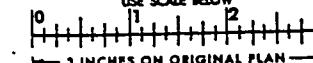
SCALE:  $\frac{3}{16}'' = 1' - 0$



  
 SCALE  $\frac{3}{8}'' = 1'-0$

SCALE  $\frac{3}{8}'' = 1'-0''$

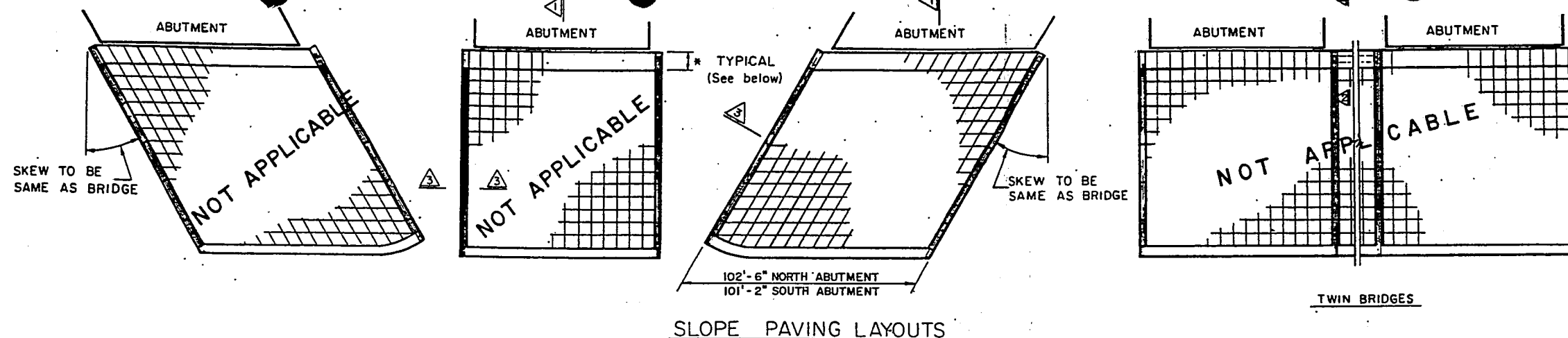
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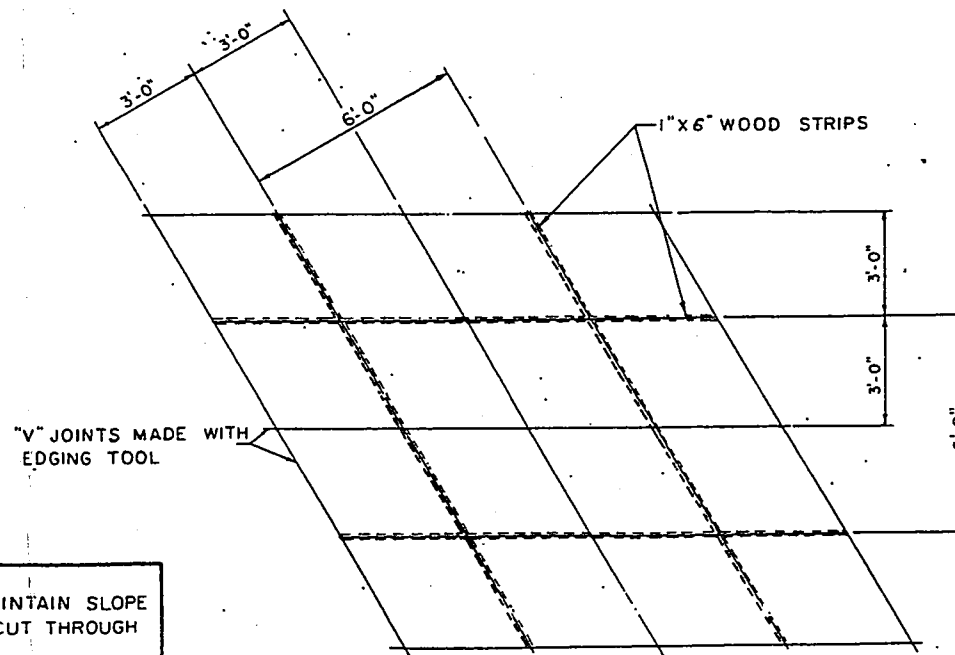
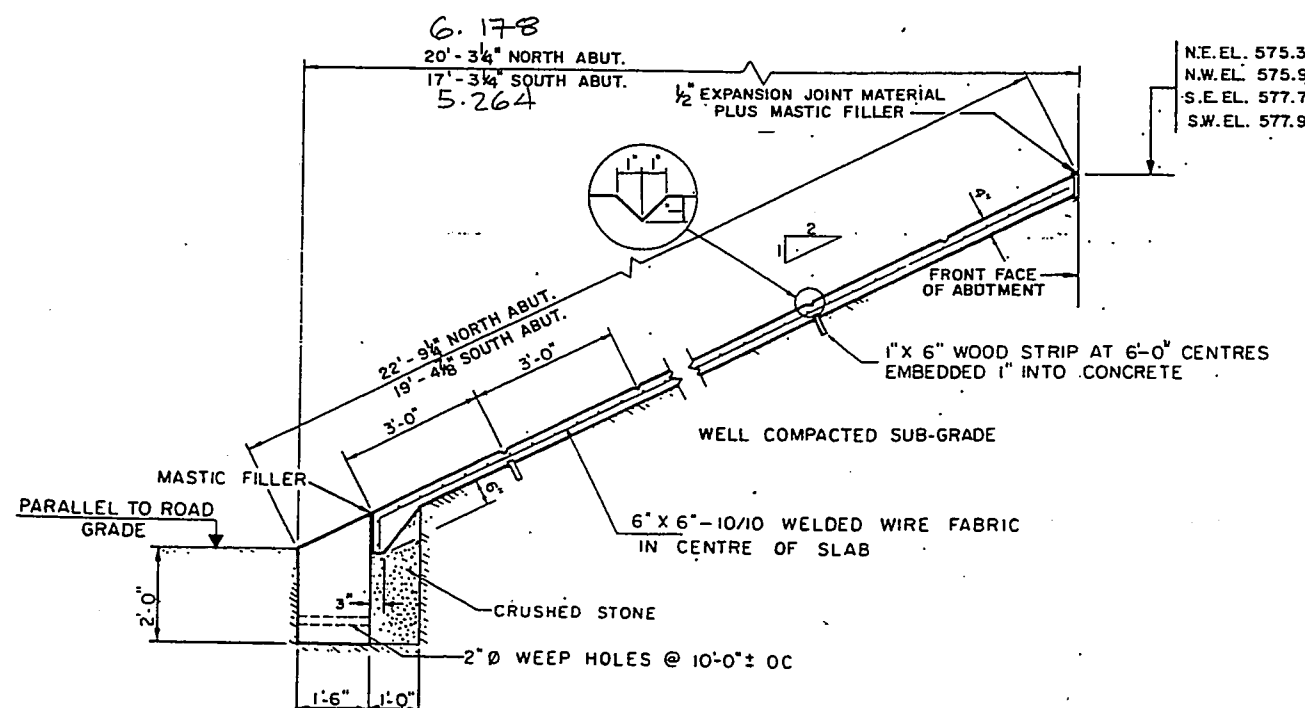
3 INCHES ON ORIGINAL PLAN

3	REVISIONS								
		DATE BY	DESCRIPTION					DATE	
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		DRAWING G.H.	CHECK AM	SITE No 24-384				DWG 5	



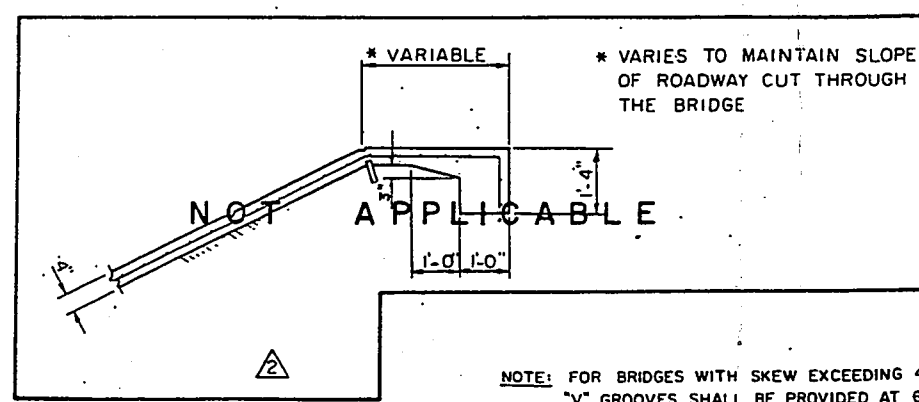
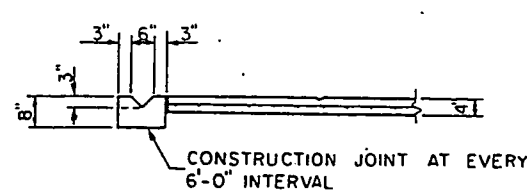
NOTES

- CLASS OF CONCRETE 3,000 PSI-INSITU.
- THE GROOVES SHALL BE PARALLEL TO THE ROAD GRADE IN ONE DIRECTION AND PARALLEL TO THE SKEW IN THE OTHER DIRECTION.



NOTE

SECTIONS AND DETAILS TYPICAL FOR ALL LAYOUTS



NOTE: FOR BRIDGES WITH SKEW EXCEEDING 45° "V" GROOVES SHALL BE PROVIDED AT 6' 0" C OVER WOOD FRAME STRIPS ONLY

REVISIONS	DATE	BY	DESCRIPTION
DESIGN	STD	CHECK	—
DRAWING	G.H.	CHECK	B.M.
LOADING	HS20-44	DATE	JUL '78
SITE	No 24-384	DWG	15