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G.I.-30 SEPT. 1976

GEOCRES No. 30M11-194

DIST. 6 REGION

W.P. No. 186-94-01/02
GWP 609-89-00

CONT. No.

W. O. No.

STR. SITE No. 37-0823

HWY. No. 427

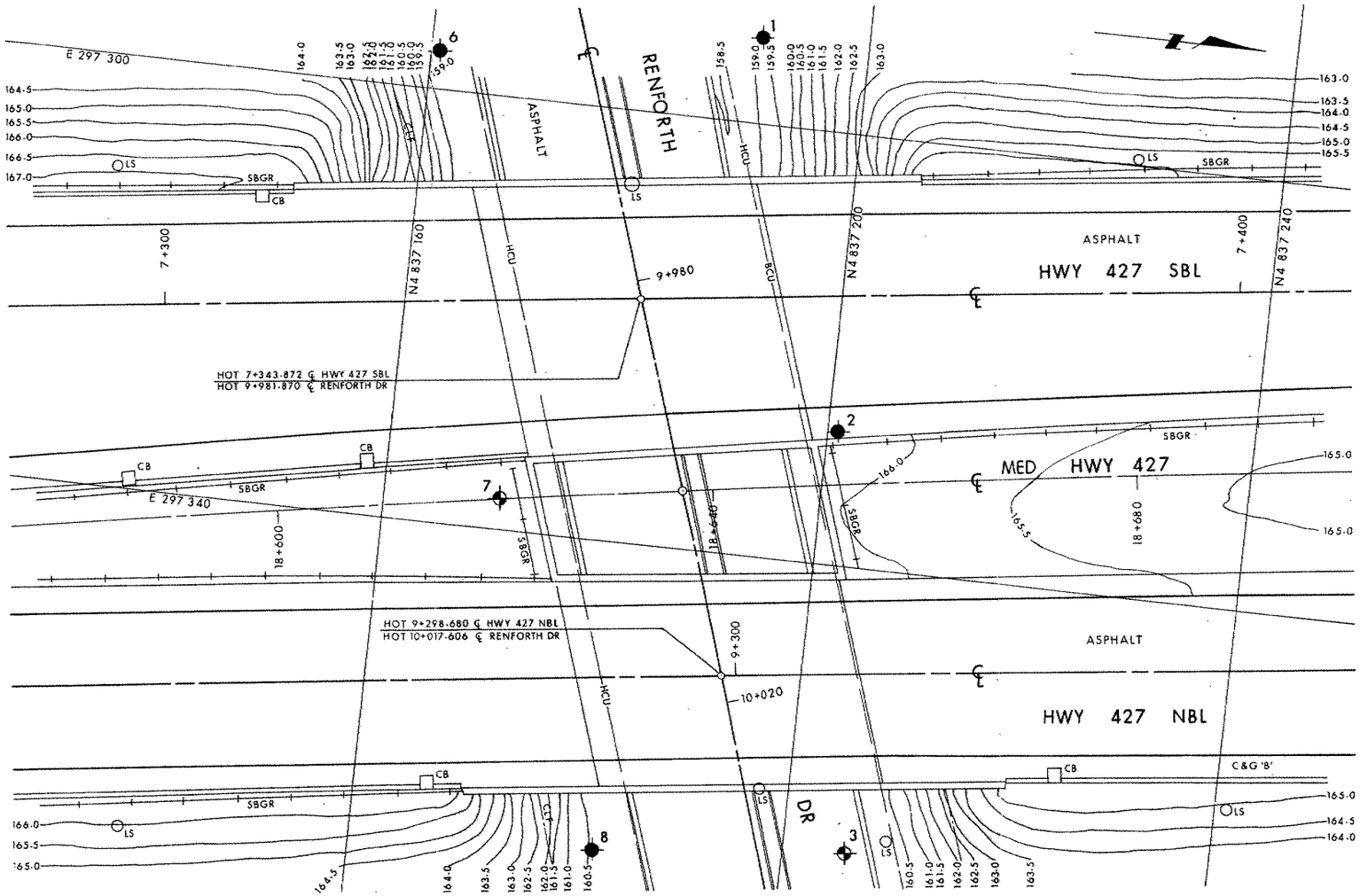
LOCATION Renforth Dr Overpass
Widening NBL & SBL

No of PAGES - —

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

MINISTRY OF TRANSPORTATION, ONTARIO PH-0-207 88 10



PLAN
SCALE
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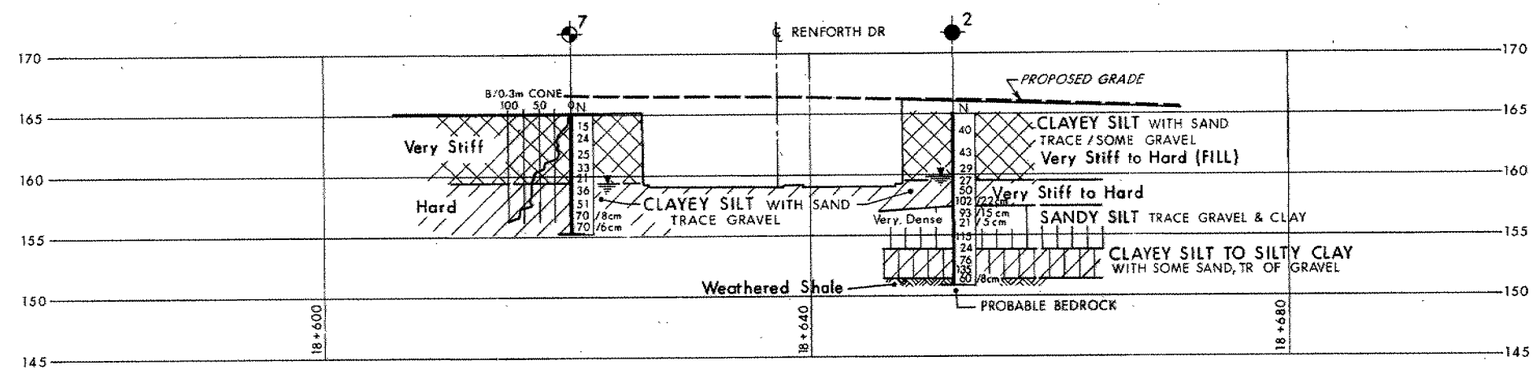


℄ PROFILE MED HWY 427
SCALE
5m 0 5m

Ref No E-80-427-7, 1992 05

METRIC

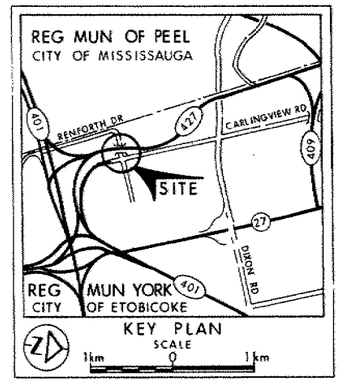
DIMENSIONS ARE IN METRES AND/OR MILLIMETRES UNLESS OTHERWISE SHOWN. STATIONS IN KILOMETRES + METRES.

CONT No
WP No 186-94-01/02

RENFORTH DR OVERPASS

BORE HOLE LOCATIONS & SOIL STRATA

SHEET



LEGEND

- Bore Hole
- Dynamic Cone Penetration Test (Cone)
- Bore Hole & Cone
- N Blows/0.3m (Std Pen Test, 475 J/blow)
- CONE Blows/0.3m (60° Cone, 475 J/blow)
- W L at time of investigation 1969 04

No	ELEVATION	CO-ORDINATES NORTH	EAST
1	159.5	4 837 190.3	297 292.0
2	165.1	4 837 200.9	297 327.8
3	160.0	4 837 205.8	297 366.5
6	159.6	4 837 160.7	297 296.4
7	165.2	4 837 170.8	297 337.2
8	161.5	4 837 182.7	297 368.7

NOTE
For Soil Details of BH's 1, 3, 6 & 8 Refer to Record of Borehole Sheets

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

NOTE: The complete foundation investigation and design report for this project and other related documents may be examined at the Engineering Materials Office, Downsview. Information contained in this report and related documents is specifically excluded in accordance with the conditions of Section GC 2.01 of OPS Gen Cond

REV.	DATE	BY	DESCRIPTION

Geocres No 30M11-194

HWY No 427			DIST CR
SUBM'D KA	CHECKED	DATE 1995 07 14	SITE 37-0823
DRAWN DT	CHECKED RS	APPROVED	DWG 186940102-A

MEMORANDUM

Ontario

To: V. Boehnke, P.Eng.
Head, Structural Section
Central Region

September 26, 1994

Attn: J. Lam, P.Eng
Sr. Structural Engineer

From: Foundation Design Section
Room 315, Central Bldg.

Tel: (416) 235-3731
Fax: (416) 235-5240

Re: Preliminary Foundation Recommendations for Renforth Drive Overpass
Hwy 427 Widening from Highway 401 to S. of Hwy 409
G.W.P. 609-89-00, District 6, Toronto

It is proposed to widen the existing Highway 427 between Highway 401 and Highway 409. This will be achieved by incorporating the existing median that separates the northbound and southbound lanes, a width of approximately 12.2m. At present, Highway 427 crosses over Renforth Drive via two rigid frame structures. The widening of Highway 427 will require that an additional structure adjoin the existing bridges.

This memo outlines the general subsurface conditions encountered at this site and the preliminary foundation recommendations for the proposed structure widening. Subsurface information available for the existing structures provides sufficient data for the proposed widening at this time. The recommendations are preliminary in nature and final recomomendations will be provided once more design details become available.

General Site and Subsurface Conditions

The site is located on Highway 427 approximately 1.0 km north of Highway 401 in the City of Etobicoke. The area is highly developed with industrial and commercial land use. The terrain is gently undulating in relief.

The site falls within the physiographic region known as the Peel Plain which is glacial in origin. The characteristic deposit of this region is a ground moraine composed of cohesive glacial till that is underlain by shale bedrock.

The subsurface investigation for the existing structures was carried out in April 1969, with additional filedwork carried out in July, 1974. In total, eight boreholes were advanced at the structures.

A surficial deposit of firm to hard clayey silt with sand and trace gravel was encountered along the Highway 427 alignment. The existing Highway 427 follows the old Airport Road alignment which, in the vicinity of Renforth Road is founded on fill that extends for depths up to 6.5 m. Beneath the surficial deposit, the subsurface material consists largely of a very stiff to hard glacial till comprised of a clayey silt, with sand and trace gravel. This glacial deposit is

/...2

intersected by a non-cohesive stratum of sandy silt to silty sand that was encountered below El. 158.2 and varied up to 7.0 m in thickness. Weathered shale bedrock was identified at six locations and ranged in elevation from 149.4 to 152.3 m.

Groundwater levels recorded at the time of the investigations were measured between El. 159.0 and 160.0 m.

Discussion and Recommendations

Two 25.6 m single span rigid frame structures carry the northbound lanes and southbound lanes of Highway 427 over Renforth Drive. Both structures are supported by spread footings founded at El. 157.6 +/-. The grade elevation of Renforth Drive is approximately 160.0 m. The existing grade elevation of Highway 427 is 165.5 m +/-. The following recommendations assume that widening will occur in the median and that there will be no significant changes to the profile grades.

Structure Foundations

The structure widening may be founded on spread footings at the approximate elevation of the existing footings, i.e. El. 157.6 m. It is recommended that the footing depths not vary from this elevation to minimize disturbance to the existing foundations. The following design values, as proposed for the original structure, apply:

North Abutment	
Factored Bearing Resistance at ULS	475 kPa
Bearing Resistance at SLS	325 kPa
South Abutment	
Factored Bearing Resistance at ULS	475 kPa
Bearing Resistance at SLS	325 kPa

It is anticipated that the magnitude of settlement will be less than 25mm given the competent nature of the glacial till provided that softening of the footing base during excavation does not occur. It is recommended that a 150 mm thick working slab of lean concrete be poured within 8 hours of the completion of footing excavation.

The footing excavations may intersect the non-cohesive sandy silt to silty sand stratum. This material is susceptible to boiling under conditions of unbalanced hydrostatic head. Because of the presence of existing footings it is essential that a proper dewatering scheme be provided. The dewatering component is a critical element and a NSSP for this item is required in the contract documentation.

A 1.2 m earth cover is required for spread footings.

The sliding resistance between the base of the footing and the glacial till and/or sandy silt to silty sand may be computed using an unfactored friction coefficient of tan 21°.

Temporary excavations carried out for the footings may be constructed at 1.5H:1V or flatter. to

/...3

a maximum depth of 6.0 m. Excavations deeper than 6.0 m require a 2.0m mid-height bench. Permanent slopes should be constructed at 2H:1V.

Because of the nature of the subsurface material, the Contractor should be made aware that cobbles/boulders may be encountered during excavation.

It is noted that an oil pipeline is present at the North Abutment and located at the elevation of the footing. Its presence should be accommodated in the design of the proposed North Abutment footing.

Roadway Protection

Excavations adjacent to the existing structures will require temporary shoring. The soil parameters for the calculation of earth pressures are as follows:

		ϕ	γ
North Abutment			
El. 165.5 - 160.0	Fill - local borrow assumed	28°	20.0 kN/m^3
El. 160.0 - 158.2	Cohesive glacial till	30°	21.0 kN/m^3
Below El. 158.2	Sandy Silt to Silty Sand	35°	21.5 kN/m^3
South Abutment			
El. 165.5 - 160.0	Fill - local borrow assumed	28°	20.0 kN/m^3
El. 160.0 - 156.4	Cohesive glacial till	30°	21.0 kN/m^3
Below El. 156.4	Sandy Silt to Silty Sand	35°	21.5 kN/m^3

An at-rest condition may be assumed to apply.

Caissons

Caissons could also be considered at the abutments. This alternative minimizes the need for temporary shoring at the existing structures as well as reducing the dewatering requirements. The following recommendations apply for caissons socketed into the weathered shale:

	North Abutment	South Abutment
Est. Bedrock Elev.	150.9	150.6
Factored Resistance @ U.L.S.	2 200 kPa	2 200 kPa
Axial Resistance @ S.L.S.	will not govern	will not govern

The depth of socketing should be equal to twice the caisson diameter.
It is suggested that the caissons be installed with liners. With the liners in place, any water encountered can be removed from the excavated caisson by pumping prior to the placement of concrete. Tremie concrete may also be considered.

A NSSP for caisson installation, developed by the Pavements & Foundations Section, should be included in the contract documents.

/...4

Lateral Earth Pressure

Backfill to the abutments should consist of granular material in accordance with MTO Standard Special Provision 109F03. Computation of earth pressures should be carried out as per Section 6-7.4.5 of the OHBDC, 3rd Ed.. Design parameters of the acceptable granular backfill are as follows.

	Granular "A"	Granular "B"
Angle of Internal Friction (ϕ)	35°	30°
Unit Weight (kN/m^3)	22.8	21.2

If a rigid frame structure and/or caissons are considered then the at-rest condition should be assumed. An active condition may be assumed if soil movement behind the wall is permitted.

If there any questions or comments regarding these recommendations, please advise.

Betty Bennett, P.Eng.
Foundation Engineer