

58-F-296C

Hwy. # 24

Hwy. 401 OVERPASS

BH799

TROW, SODERMAN AND ASSOCIATES

SITE INVESTIGATIONS
AND
SOIL MECHANICS CONSULTATION

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Project: C108/J263

Sept. 17, 1958.

Mr. A. M. Toye,
Bridge Engineer,
Dept. of Highways of Ontario,
280 Davenport Road,
Toronto, Ont.

Attention: Mr. J. McAllister

58-F-296C

Foundation Investigation
Hwy. #24 Overpass of Highway #401
West of Hespeler, Ontario

Dear Sirs:

Enclosed herewith is our report on the soil conditions underlying the proposed intersection of Hwy. 24 and Hwy. 401.

No foundation problem exists at this location and abutments can be founded at or below a depth of 3 feet from present ground surface. A safe bearing stress of 4 tons per square foot is quite permissible. The ground water table is 23 feet below the surface, in dense gravel.

We hope that the contents of this report assist you in the design of this structure. Please do not hesitate to call if clarification of any matter is required.

Yours very truly,

W. Trow

William A. Trow (P. Eng.)

WAT/lt
Encls.

DEPARTMENT OF HIGHWAYS OF ONTARIO
280 DAVENPORT ROAD,
TORONTO, ONTARIO.

FOUNDATION INVESTIGATION
HWY. #24 OVERPASS OF HIGHWAY #401
WEST OF HESPELER, ONTARIO

C108/J263

Trow Soderman & Associates

Sept. 17 1958

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FOUNDATION INVESTIGATION
HWY. #24 OVERPASS HWY. #401
WEST OF HESPELER ONTARIO

This report contains the results of an investigation consisting of 4 borings performed recently at the above noted highway crossing. Comments concerning foundation requirements have been given.

Description of Site

The above-noted intersection of Highways 24 and 401 lies in a gently sloping field approximately one mile south-west of Hespeler, Ont. About 1000 feet to the west, along Hwy. 401 centre line, is the excavated face of a gravel pit operated by the Preston Sand and Gravel Co. Examination of the pit face shows dense deposits of rounded gravel up to 6 inches in size with some thin layers of sand. The gravel particles are essentially in contact and the sand matrix which fills the pore spaces is less predominant. The present approximately 25 feet depth of the pit has been determined by the ground water table. Workmen advise that future plans call for the depression of this ground water to permit the removal of gravel at greater depths. Another gravel pit lies about one-half mile to the south along a side road to Preston, Ont.

Swampy ground comprising the valley of the Speed River begins some 1000 feet to the north of the Preston Sand and Gravel Pit. The bed of this river contains large gravel.

Field Investigation Methods

The investigation at this site was performed in its entirety using continuous flight auger equipment. Because of the permeable gravelly nature of the subsoil, it was feared that the use of conventional boring methods would be very slow and would provide no more information than was obtainable by augering. In addition, the inspection of the adjacent gravel pit to the west left little doubt concerning the foundation materials to be encountered.

Because the uncased borings tended to cave in this coarse gravel, the performance of standard penetration tests and disturbed sampling was generally restricted to a depth of 15 to 20 feet. However, the difficulty in augering to greater depths definitely confirmed that similar dense material extended below these limits. Three of the four borings were limited to a depth of 20 to 25 feet at which level stresses from surface abutment footings would be quite dissipated.

In order to confirm the gravel to greater depths and hence to ensure that embankment stability and deep seated settlement would be of no concern, efforts were made to auger deeper in hole No. 3. Unfortunately however, refusal to the augers was met in boulders at 31 feet. Since a cone penetration test was impossible in this gravel,

attempts were made to drive a 1-5/8 inch A rod to greater depths. This was accomplished with extreme difficulty to a depth of 42 feet at which level the boring was terminated. Forty-two feet of dense gravel cover appeared sufficient to carry the bridge crossing and approach abutments safely.

Observations of the augers and drill rods indicated that the water table in this boring lay at a depth of 23 feet or at elevation 952 feet. This level coincided approximately with the ground water in the adjacent gravel pit.

As in the other investigations in this area all boreholes were backfilled at the completion of work.

Description of Soil Types

The soil underlying this site can be described very briefly. The predominant soil type is a very dense mixture of gravel and sand which extends from a depth of 3 feet to at least 42 feet below ground surface. Above this material is a thin veneer of fine brown sand overlain by about one foot of sandy topsoil.

Foundation Consideration and Conclusions

Because of the uniformity and extreme density of the gravel deposit at this site, a discussion of foundation conditions can be very brief.

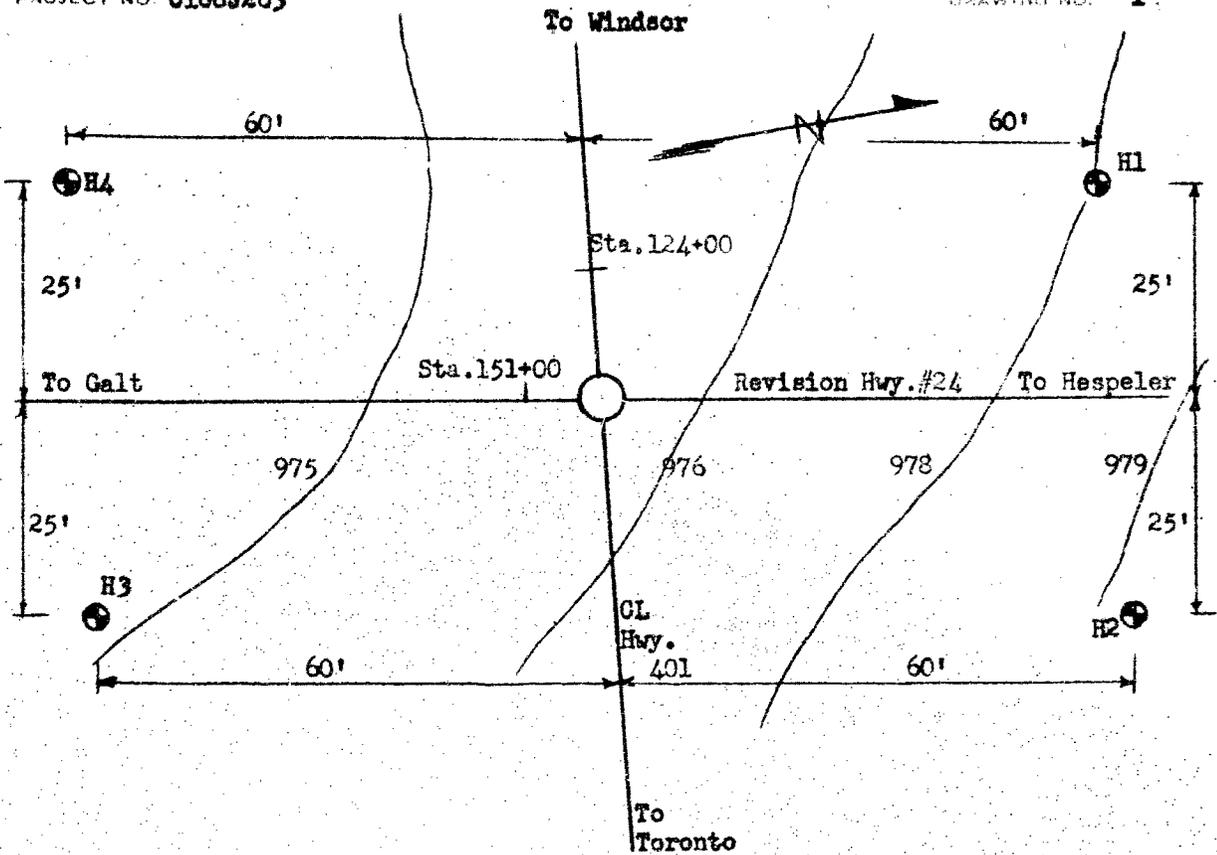
It is apparent that abutment footings can be carried at any level below 3 feet from the present ground surface. The safe bearing value in the gravel and sand below this shallow depth is at least equal to 4 tons per square foot. The coefficient of friction between the gravel and the abutment footing bases is at least equal to 0.8 and hence the force helping to resist the abutment fill thrust is almost equal to the abutment reactions.

No stability problem exists for the 25 foot embankments at this site and sufficient gravel is available for use as embankment fill. The existence of gravel and the dense soil below a depth of 42 feet is extremely likely. However, even if soft clay were to underlie this level, any resulting settlement would be widespread and should not induce differential movement in the bridge structure.

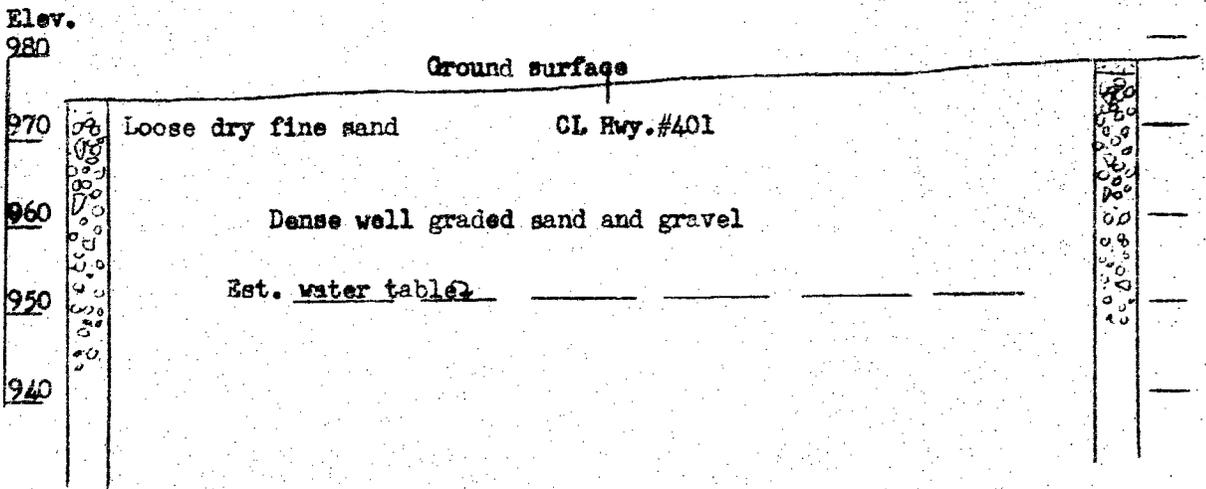
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SKETCH OF PROPOSED OVERPASS CROSSING SHOWING BORING LOCATIONS
 Overlay of DHO Dwg. E 2958-1 Scale 1" = 20'



PROFILE ALONG CENTRE LINE OF HWY. 24 REVISION SHOWING
 SUBSOIL STRATIGRAPHY

TROW SODERMAN AND ASSOCIATES

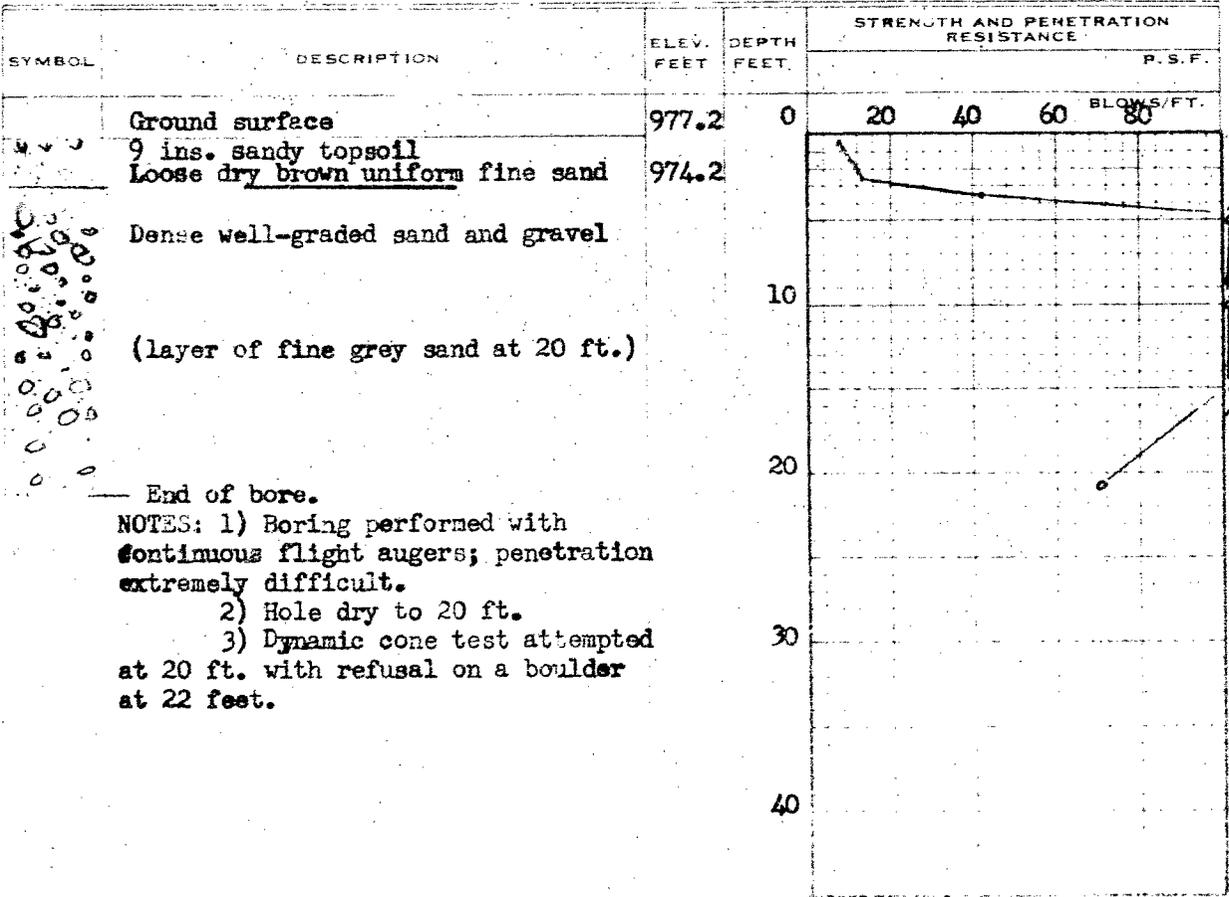
SITE INVESTIGATIONS AND SOIL MECHANICS CONSULTATION

PROJECT Hwy. #24 Overpass of Hwy. 401
 LOCATION Waterloo Township - 1 mi. west of Hesperia
 HOLE LOCATION See Dwg. 1
 HOLE ELEVATION AND DATUM 977.2

BOREHOLE NO. 1
 FIELD SUPERVISOR WAT
 DRILLER PV
 PREP. WT

LEGEND

- 2" DIA. SPLIT TUBE
- 2" SHELBY TUBE
- 2" SPLIT TUBE
- 2" DIA. CONE
- CASING
- 2" SHELBY
- 1/2 UNCONFINED COMPRESSION (QU)
- VANE TEST (C) AND SENSITIVITY (S)
- NATURAL MOISTURE AND LIQUIDITY INDEX
- LIQUID LIMIT
- PLASTIC LIMIT



CONSISTENCY		SAMPLE UNIT WT.	NATURAL P. C. F.
MOIST. CONTENT - % DRY WT.			
		1	
		2	
		3	
		4	

NOTES: 1) Boring performed with continuous flight augers; penetration extremely difficult.
 2) Hole dry to 20 ft.
 3) Dynamic cone test attempted at 20 ft. with refusal on a boulder at 22 feet.

TROW SODERMAN AND ASSOCIATES

SITE INVESTIGATIONS AND SOIL MECHANICS CONSULTATION

PROJECT Hwy. #24 Overpass of Hwy. 401
 LOCATION Waterloo Township - 1 mi. west Hespeler
 HOLE LOCATION See Dwg. 1
 HOLE ELEVATION AND DATUM 974.5

BOREHOLE NO. 4
 FIELD SUPERVISOR WT
 DRILLER PV
 PREP. WT

LEGEND
 2" DIA. SPLIT TUBE
 2" SHELBY TUBE
 2" SPLIT TUBE
 2" DIA. CONE
 CASING
 2" SHELBY
 1/2 UNCONFINED COMPRESSION (QU)
 VANE TEST (C) AND SENSITIVITY (S)
 NATURAL MOISTURE AND
 LIQUIDITY INDEX
 LIQUID LIMIT
 PLASTIC LIMIT

SYMBOL	DESCRIPTION	ELEV. FEET	DEPTH FEET	STRENGTH AND PENETRATION RESISTANCE		CONSISTENCY	SAMPLE	NATURAL UNIT WT. P.C.F.
				P.S.F.				
	Ground surface	974.5	0	20	40	60		
	Approx. 1 ft. topsoil then dry fine sand to 3 feet.							
	Dense well-graded mixture of sand and gravel.							
	(Augered to refusal in a boulder at 22 ft.)							
	NOTES: 1) Boring performed with continuous flight augers, penetration difficult at all depths. 2) Sampling not possible below 15 ft. 3) Boring dry to 22 ft.							
			10				1	
							2	
							3	
			20					