THE TROW GROUP
CONSULTING ENGINEERS

WILLIAM TROW ASSOCIATES (HAMILTON) LTD.
Soil Mechanics Consultants

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C. D. Thompson, M.Sc., M.E.I.C., P.Eng.
Manager

C. C. PARKER AND ASSOCIATES LIMITED
REC'D Jan 16 [illegible]
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REP'D BY
DATE
ROUTING

Project: H2131

January 15, 1975

40I 16 - 16
GEOCRES No.

C. C. Parker & Associates Ltd.
688 Queensdale Avenue East
Hamilton, Ontario

Attention: Mr. D. Cramm

Foundation Investigation
Proposed Young Creek Bridge Reconstruction
Port Ryerse, Ontario

Dear Sirs,

We have now completed our foundation investigation for the above project. This investigation was authorized by you on December 17, 1975.

Our findings, interpretation and recommendations for this project are contained in the attached copy of our report.

We trust that the information provided meets with your requirements. If any questions arise, please do not hesitate to contact this office.

Yours very truly,
WILLIAM TROW ASSOCIATES (HAMILTON) LTD.

C. D. Thompson, P. Eng.

/ml
Encl.
Dist: C. C. Parker & Associates Ltd. (6)

Mr. Bob Lewis,
C. C. Parker & Associates Ltd.
6 Main St. North, Jarvis, Ont. (1)

STRUCTURE SITE No. 20-

FOUNDATION INVESTIGATION
PROPOSED YOUNG CREEK BRIDGE RECONSTRUCTION
PORT RYERSE, ONTARIO

Prepared for:

C. C. PARKER AND ASSOCIATES LTD.

WILLIAM TROW ASSOCIATES (HAMILTON) LTD.
1870 Barton Street East
Hamilton, Ontario L6H 2Y6
Telephone: 547-6385
Direct Toronto Line: 368-6293

Project: H2131
January 15, 1975

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DESIGN OF TEMPORARY FLEXIBLE CLOSED SHEET PILE WALL

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Project: H2131 January 15, 1975

Foundation Investigation
Proposed Young Creek Bridge Reconstruction
Port Ryerse, Ontario

SUMMARY

A foundation investigation was undertaken at the site of the proposed bridge reconstruction over Young Creek on the road from Port Ryerse to Fishers Glenn in the Township of Woodhouse, Norfolk County, Ontario. This investigation was authorized by C.C. Parker and Associates Ltd., on December 17 , 1974. The purpose of the investigation was to make foundation design and construction recommendations from a soil mechanics standpoint.

The surficial soil at the site is some very loose to loose fill and organic silt or silty sand which extends to a depth of 4 to 5 feet (Elevation 570 feet). The predominant soil at the site is dense to very dense silt which extends to the entire depth investigated (Elevation 548 to 551 feet). The standard penetration resistance of this stratum varies from 34 to 73 blows per foot. The groundwater table at the site is 5 inches to 1 foot below the existing groundsurface, i.e. Elevation 574 feet.

The geotechnical conditions at the site are well suited to the construction of the bridge on spread and strip footings. Footings founded in the very dense silt stratum 4 feet below the depth of scour (at Elevation 566 feet approximately) may be designed for an allowable bearing capacity of 5 tsf. The settlements of the footings under this loading are expected to be well within the normally tolerated limits of 1 inch total and 3/4 inch differential movements.

Excavations at the site for construction of the footings will extend 7 to 8 feet below the groundwater table. These excavations may be undertaken within the confines of interlocking steel sheet piling driven deep enough to prevent a 'base heave' type of failure of the excavations.

INTRODUCTION

A foundation investigation was undertaken at the site of the proposed bridge over Young Creek on the road from Port Ryerse to Fishers Glenn in the Township of Woodhouse, Norfolk County, Ontario, at the authorization of C.C. Parker and Associates Ltd., of December 17, 1974.

It is understood that the reconstructed bridge will have a single span and will be approximately 40 feet long and 30 feet wide. It will replace an existing single lane bridge. The widened portion of the bridge will be located towards the upstream side (north) of the existing bridge.

The investigation was undertaken to: (a) establish the geotechnical profile at the site; (b) make recommendations regarding the most suitable type of foundations, the founding depth and the allowable bearing capacity of founding soils; (c) examine excavation conditions anticipated and, (d) discuss other design and construction aspects from a soil mechanics standpoint.

PROCEDURE

The fieldwork was undertaken with a skid mounted diamond drill by Canadian Longyear Ltd., under the direction and supervision of William Trow Associates (Hamilton) Ltd., between December 31, 1974 and January 3, 1975. It consisted of undertaking two boreholes to 24½ feet and 26½ feet depth respectively. The locations of the boreholes are shown on Site Plan, Drawing 1. It was proposed to drill both the boreholes on the north side of the existing bridge, one on either bank of the river. However, it was not possible to put down a borehole on the east side of the river as the groundsurface in this area slopes down sharply to the river bank. This borehole was therefore located on the south side of the bridge. Standard penetration tests were undertaken in both the boreholes and soil samples were obtained by split barrel soil sampler. Water level observations were taken in all the boreholes during the fieldwork.

The locations and elevations of the boreholes were determined by representatives of William Trow Associates (Hamilton) Ltd. A temporary bench mark, the top of the bolt set in the north wing wall of the east abutment of the existing bridge, was used for taking the levels. Its elevation (Elevation 592.32 feet) refers to the Geodetic datum and was obtained from representatives of C.C. Parker and Associates Ltd.

All the soil samples were visually examined in the laboratory for their textural classification. Natural moisture content tests were performed on all the samples, while unit weight tests were undertaken on selected samples. In addition, three grain size analyses were also performed on the sand and silt samples obtained from Boreholes 1 and 2.

SITE AND SOIL DESCRIPTION

The site of the proposed bridge reconstruction over Young Creek is located on the road from Port Ryerse to Fishers Glenn in the Township of Woodhouse, Norfolk County, Ontario. In this area, the Young Creek flows in a north to south direction with a stream velocity of approximately 120 feet per minute at the time of the fieldwork. At the existing bridge location the width of the stream is 18 feet. The stream is 23 feet wide immediately to the north of the bridge, while the flood plain is approximately 50 to 70 feet wide. The river banks are approximately 6 inches to 1 foot above the water level in the creek, although the river is situated in an approximately 25 to 50 feet deep valley. Probing of the creek bed from the deck of the existing bridge indicated that the depth of water is approximately 10 inches to 4 feet and the depth of scour is 3 inches to 2 feet.

Observations at the site indicate that the existing bridge is in a poor condition. It is supported on footings. Visual observations indicate that the creek is undermining the northwest footing of the bridge, although some gravel and large boulders have been used as fill material around the footings as scour protection.

Two boreholes undertaken at the site indicate that the area in the northwest side of the bridge contains fill to a depth of 3½ feet approximately (Elevation 572 feet). The fill consists of silty sand with gravel sizes, ceramic tile pieces, organic pockets, etc. It is loose and has a standard penetration resistance of 7 blows per foot. The fill is underlain by approximately 1½ feet thick layer of organic silt which extends to 5 feet depth (Elevation 570 feet).

The surficial soil in the southeast part of the site is silty sand which extends to a depth of 4 feet (Elevation 570 feet). It contains some roots, shells, etc. It is very loose and has a standard penetration resistance of 2 blows per foot. It has a natural moisture content of 41 per cent.

Beneath the organic silt in Borehole 1 and the silty sand in Borehole 2, the predominant soil at the site is dense to very dense silt which extends to the entire depth in both the boreholes (Elevation 548 to 551 feet). The silt is slightly cohesive and slightly sandy. It contains some cobbles or boulders in the vicinity of Borehole 1. It has a standard penetration resistance of 34 to 73 blows per foot. Its natural moisture content and unit weight are 18 to 24 per cent and 122 to 125 pcf respectively.

Water level observations undertaken during the fieldwork indicate that the groundwater table at the site is 5 inches to

1 foot below the existing groundsurface, i.e. Elevation 574 feet.

FOUNDATION CONSIDERATIONS

The geotechnical conditions at the site are well suited to the construction of the proposed bridge on spread footings. The footings may be founded in the dense to very dense silt at a minimum depth of 4 feet below the depth of scour. Field observations and the geotechnical information obtained during the investigation have indicated that the maximum depth of scour is approximately 2 to 3 feet below the river bed (Elevation 570 to 571 feet). This approximately coincides with the surface of the silt stratum encountered at the site. The proposed bridge may therefore be founded in the dense to very dense silt at or below Elevation 566 feet. The allowable bearing capacity of the soil for footings placed between Elevation 547 feet and 566 feet is 5 tsf. Settlements of the footings under this pressure are expected to be well within the normally tolerated limits of 1 inch total and 3/4 inch differential movements.

There is evidence at the site that the northwest abutment footing of the existing bridge is being undermined due to scour. It is therefore recommended that scour protection should be provided near the abutments of the reconstructed bridge. This protection may consist of rip-rap etc.

EARTH PRESSURE AND DRAINAGE CONSIDERATIONS ADJACENT TO BRIDGE ABUTMENTS

The bridge abutments will be subject to lateral earth pressures which develop due to the backfill and surcharge behind them. The lateral earth pressures may be computed by means of Equations (1) and (2). It has been assumed that the backfill behind the abutments will be a free-draining granular material, preferably conforming to the Ontario Ministry of Transportation and Communications specifications for granular sub-basecourse, Granular 'C' and adequate drainage facilities will be provided to equalize the water level behind the abutments with that of the water level in the river. The drainage facilities are schematically illustrated in Drawing 4. They should consist of 4 inch diameter weep holes through the abutments located at 5 feet centres and surrounded with 1 foot of 2 inch clear crushed stone which extends between weep holes. The crushed stone should be surrounded by 12 inches of pea gravel.

The earth pressure, p, in psf, acting on the abutment walls above the water level at any depth, h, in feet, below the finished groundsurface, may be calculated by Equation (1). Below the water level, Equation (2) should be used to calculate the earth pressures.

$$p = k\ (\gamma h + q) \quad \text{.......................(1)}$$

(continued---)

$$p = k\{\gamma h_1 + \gamma'(h-h_1) + q\} \quad (2)$$

where: k = the earth pressure coefficient considered applicable

= k_a, the active earth pressure coefficient, if small lateral movements can be tolerated,
= 0.35

= k_o, the 'at rest' earth pressure coefficient applicable if no lateral movements can be tolerated,
= 0.50

γ = the unit weight of free-draining granular backfill estimated to be 130 pcf

γ' = the buoyant unit weight of the granular backfill estimated to be 65 pcf

q = the equivalent surcharge, in psf, of any load acting on the groundsurface next to the bridge abutments

h_1 = the depth, in feet, of the water level below the finished groundsurface

CONSTRUCTION OF APPROACH EMBANKMENTS

It is understood that the reconstructed bridge would be designed to accommodate a thirty feet wide pavement. As such, the existing embankments which carry single lane traffic and are up to 25 feet high would have to be widened. This would most likely be undertaken on the upstream (north) side of the existing bridge. The embankment fill should be placed in 6 to 8 inch layers and compacted to 95 per cent Standard Proctor Maximum Dry Density, to minimize future settlements. It is desirable that any surficial soft or organic material should be sub-excavated from the area of the embankment, as this material could cause differential settlements as it consolidates under the weight of the overlying fill.

The road bed of the approach routes to the bridge will be effectively drained by gravity to the low lying area on either side of the embankments. The sides of the road embankment should perform satisfactorily at an inclination of 2 horizontal to 1 vertical. A deep rooted vegetation should be provided on the slopes to minimize surface slippage on the face of the slope due to weathering effects, erosion etc.

EXCAVATIONS

Excavations for the construction of the bridge abutments will extend to Elevation 566 feet through the fill, silty sand and silt. They will be a maximum of 7 to 8 feet below the groundwater table. These excavations may be carried out within the confines of a closed sheet pile wall driven deep enough to prevent a 'base heave' type of failure of the excavations. For this purpose, the sheeting should be driven to the same depth below the base of the excavation as the groundwater table will be above it. The groundwater table should be assumed to be at the same level as the highest water level anticipated in the river during the construction period. The lateral earth pressures acting on the sheeting may be computed from the criterion presented in Appendix 'A'.

The alternative of constructing a cofferdam to prevent piping of the soil in the base of the excavations from taking place, has been investigated. However, based on preliminary calculations, it is estimated that the excavations would have to be approximately 200 feet away from the river banks. Thus, the use of this method would require installation of a culvert in the river bed extending 200 feet north and south of the area where excavations for the bridge abutments are to be undertaken. This method of dewatering the excavations is therefore not considered to be practical.

The founding soil at the site is highly susceptible to disturbance from freezing and thawing, precipitation and the movement of construction equipment and personnel over its surface. It is therefore recommended that the final 2 to 3 feet of the excavations should be undertaken with equipment which moves away from the excavations as it works, e.g. a backhoe or gradall. The base of the excavation may be protected from disturbance due to construction personnel working in them by a skim coat of concrete. The footing beds should be adequately protected to prevent frost penetration if construction is undertaken during cold months.

BACKFILLING REQUIREMENTS

The backfill against the abutment walls should be a free-draining granular material preferably conforming to the Ontario Ministry of Transportation and Communications specifications for granular sub-basecourse, Granular 'C'. It should be compacted to 95 per cent Standard Proctor Maximum Dry Density. The embankment or subgrade fill should be compactible, i.e., one free of organics and with a natural moisture content which is within 3 per cent of the optimum moisture content as determined from Standard Proctor Density tests or free-draining granular material. It should also be compacted to 95 per cent Standard Proctor Maximum Dry Density.

SUITABILITY OF ON-SITE SOILS FOR BACKFILLING PURPOSES

The majority of the soils to be excavated from the site are fill, silty sand and silt. The fill is not considered to be suitable for backfilling purposes as it contains organic pockets and is random in nature. The sand is free-draining and may be used as backfill against the abutments. The silt is not free-draining material. As such, it is not suitable for backfilling areas where free-draining granular backfill is required, e.g., against abutment walls. However, it may be used as embankment or subgrade fill provided it is compactible. A review of the natural moisture content of the silt indicates that this soil is on the wet side for adequate compaction. As such, it may be used as fill material if construction is undertaken during the hot summer months and can be spread to dry in the sun.

CULVERT INSTALLATION

It is understood that consideration is being given to the installation of a large diameter corrugated iron culvert instead of rebuilding the bridge. For this purpose, it is recommended that all the loose sand and silt should be dredged from the bottom of the river bed. The culvert should be seated in Ontario Ministry of Transportation and Communications granular sub-basecourse, Granular 'C', or equivalent, compacted to 95 per cent Standard Proctor Maximum Dry Density. The pipe bedding should be carefully shaped to receive the lowest segment of the pipe to a depth equal to 10 per cent of the pipe diameter. The bedding should extend to the spring line of the pipe and for a distance of at least 2 feet beyond the pipe diameter on either side. The Granular 'C' should be placed in 6 inch layers, keeping it level on both sides of the culvert. Each layer should be compacted to 95 per cent Standard Proctor Maximum Dry Density. The upstream end of the culvert should be provided with a cut-off wall to prevent seepage through the fill which should extend to the design scour level, Elevation 566 feet.

CONCRETE IN SUBSURFACE STRUCTURES AND SERVICES

Chemical analyses were undertaken on water samples obtained from both the boreholes during the fieldwork. The results of the analyses are given on Table 1.

TABLE 1

RESULTS OF CHEMICAL ANALYSES ON GROUNDWATER SAMPLES

Borehole No.	pH	SO_4 (ppm)
1	7.7	62
2	6.8	24

A review of Table 1 indicates that the groundwater contains less than 150 ppm of water soluble sulphates in a slightly alkaline environment. The Canadian Standards Association requirements indicate that a concentration of water soluble sulphates less than 150 ppm has negligible affect on concrete in contact with it. Normal Portland cement may therefore be used in concrete in contact with the groundwater and soil at the site. The concrete should, however, be dense, well compacted and cured.

WILLIAM TROW ASSOCIATES (HAMILTON) LTD.

S.K. Aggarwal, P.Eng.

C.D. Thompson, P.Eng.

SKA/yg
Encls.
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Mr. Bob Lewis
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6 Main St. North, Jarvis, Ont. (1)

APPENDIX 'A'
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APPENDIX 'A'

DESIGN OF TEMPORARY FLEXIBLE CLOSED SHEET PILE WALL

The construction of the footings for the bridge will require excavations through sand and silt below the water table. These excavations can be carried out within the confines of closed sheet pile walls.

There are two controlling aspects from a soils engineering point of view, regarding the design of closed sheet pile walls below the water table, namely, the earth and water pressures acting on the sheeting, and the seepage pressure tending to boil up the base of the excavation. To ensure stability of the base of the excavation, it is recommended that the sheet pile wall should be driven to the same depth below the base of the excavation as the groundwater table will be above it. For this purpose, the groundwater table should be assumed to be at the highest water level anticipated in the river during the construction period. The design of the sheeting to resist the earth and water pressures may be undertaken with reference to the following sketch. The more severe criterion should govern the design.

a) Single Strut Support

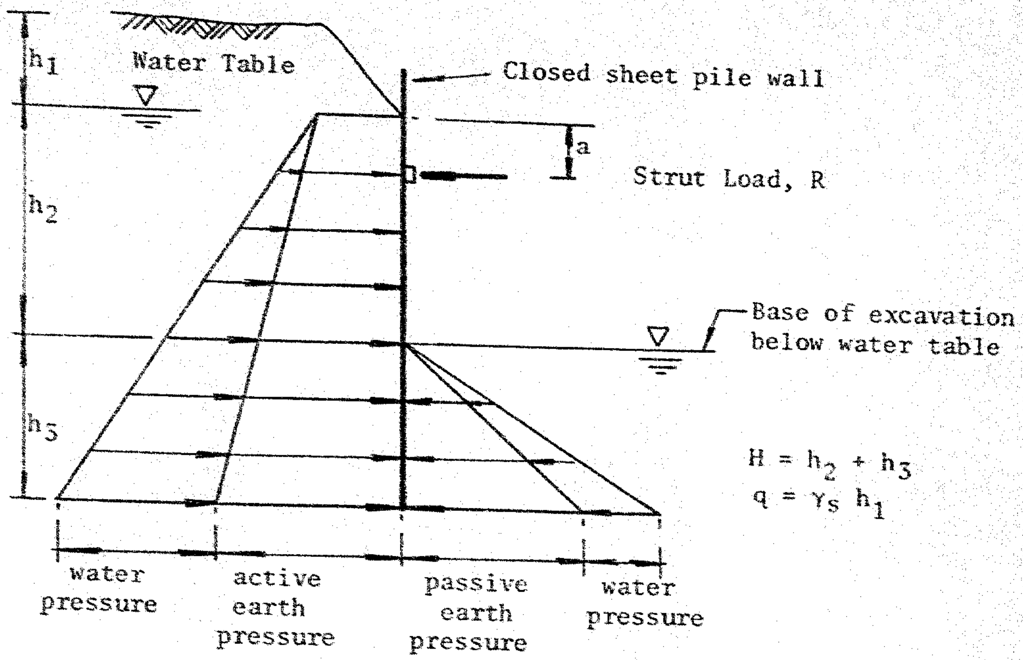


DIAGRAM ILLUSTRATING SINGLE-STRUTTED SHEET PILE WALL

Criterion 1

To prevent the base of the excavation from heaving or 'boiling up', the closed sheeting should be driven to a depth such that:

$$h_3 \geqslant h_2$$

Criterion 2

To provide sufficient toe support for the closed sheeting, it should be driven to a depth such that:

$$\left\{ \begin{array}{l} q\ H\ K_a \left(\frac{H}{2} - a\right) \\ + \frac{1}{2} H^2 \left(K_a\ \gamma' + \gamma_w\right) \left(\frac{2H}{3} - a\right) \\ - \frac{1}{2} h_3^2 \left(K_p\ \gamma' + \gamma_w\right) \left(\frac{2h_3}{3} + h_2 - a\right) \end{array} \right\} \geq 0$$

Criterion 3

To provide sufficient strut capacit it should be designed such that:

$$\frac{R}{F_s} \geq q\ H\ K_a + \frac{1}{2} H^2 \left(K_a\ \gamma' + \gamma_w\right) - \frac{1}{2} h_3^2 \left(K_p\ \gamma' + \gamma_w\right)$$

The bending moments and shear in the sheet pile wall may be computed by assuming that the earth and water pressures are linearly distributed on both sides of the wall, as shown in the foregoing diagram, i.e., the active pressure = $k_a\ (q + \gamma_s'\ h)$

the passive pressure = $K_p\ (\gamma_s'\ h)$

where: q = the value of surcharge which may be applied to the groundsurface near the wall, in psf;

for the case illustrated in the foregoing diagram

$q = \gamma_s\ h_1$

(continued....)

H, h_1, h_2, h_3, a = dimensions as defined in the diagram, in feet

K_a = the active coefficient of earth pressure
= 0.35

K_p = the passive coefficient of earth pressure
= 3.0 (factor of safety included)

γ = estimated unit weight of soil above the water table, in pcf
= 125 pcf for sand and silt

γ' = submerged or buoyant unit weight of soil, in pcf
= 65 pcf for silt and sand encountered at the site

γ_w = unit weight of water
= 62.4 pcf

R = strut load required to support the sheet pile wall, in pounds

F_s = suitable factor of safety, depending on the strut material

b) Multi-Strut Support

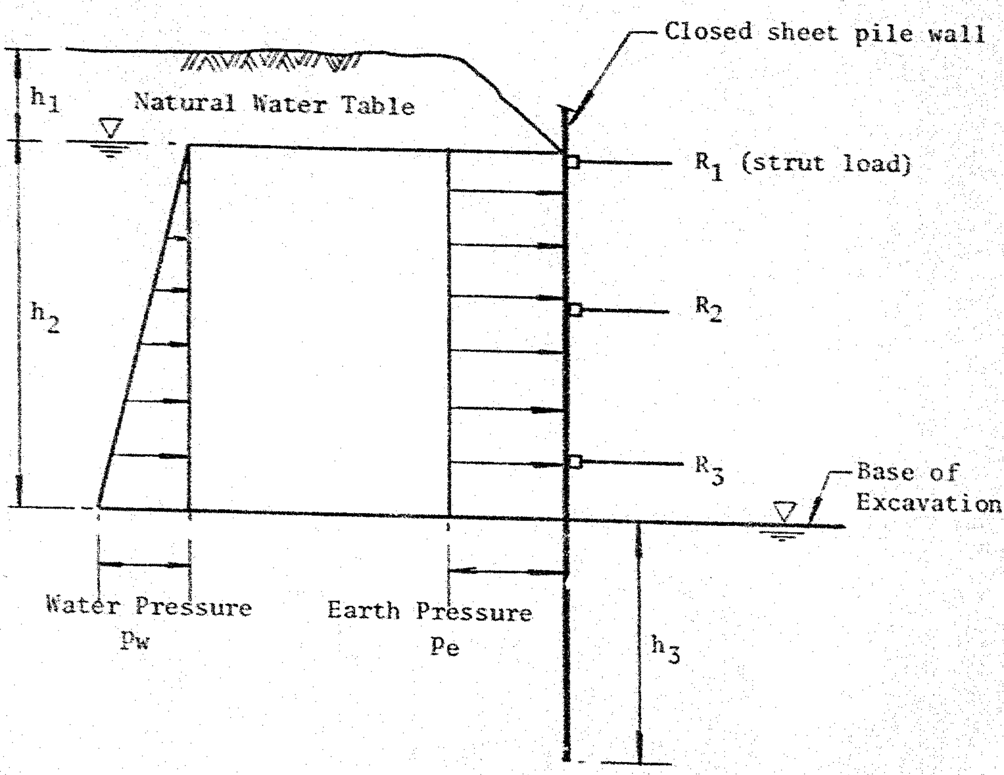


DIAGRAM ILLUSTRATING MULTI-STRUTTED SHEET PILE WALL

The earth pressure acting on a multi-strut support system is equal to p_e, as illustrated in the foregoing diagram.

where: $p_e = K_a\ (0.65\ \gamma'\ h_2 + q)$

q = any surcharge which may be applied to the groundsurface near the wall, in psf

for the case illustrated in the foregoing diagram
$q = \gamma_s\ h_1$

In addition, the closed sheet pile wall must support the water pressure, p_w, where: $p_w = \gamma_w\ h$

where: h = any depth below the natural water table, in feet

A suitable factor of safety should be incorporated in the design of the struts, depending on the strut material.

All other symbols are as defined in the preceding section.

BOREHOLE LOG

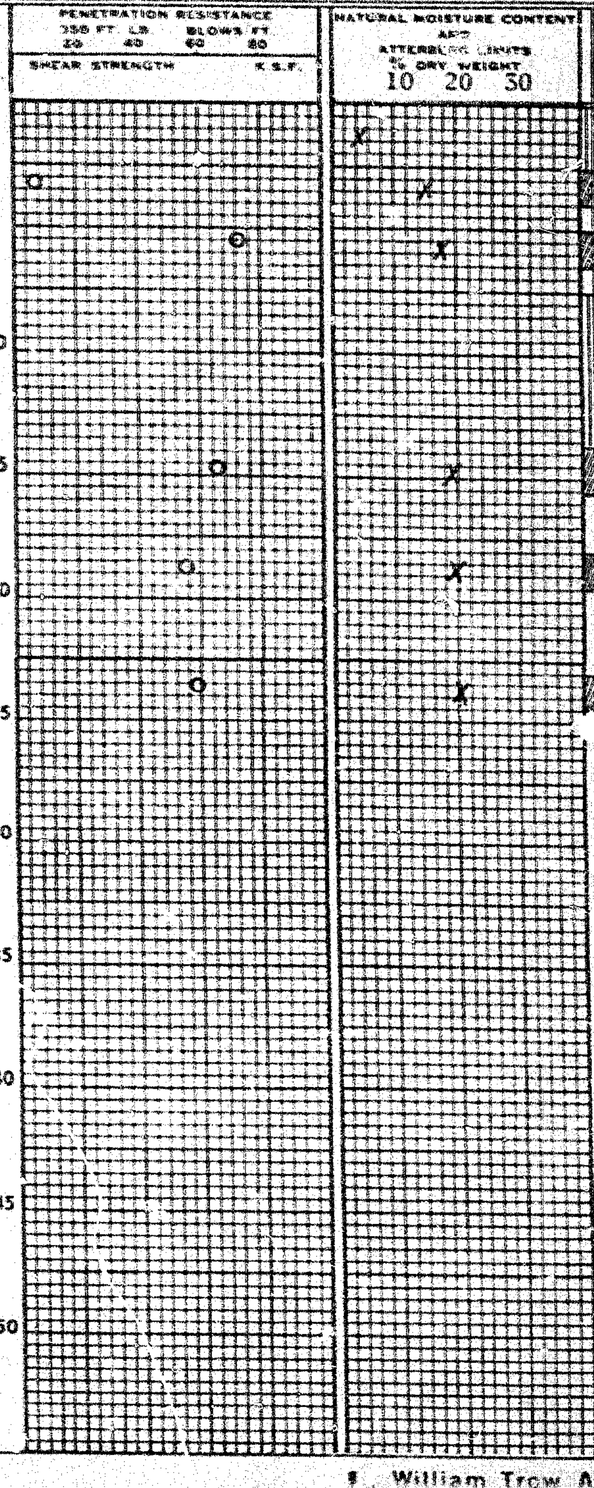
PROJECT No. H2131 BOREHOLE No. 1 DRAWING No. 2

PROJECT Proposed Bridge Reconstruction
LOCATION Young Creek
Port Ryerse, Ontario
HOLE LOCATION AND DATUM SEE DRAWING No. 1

2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
2" DIA. CONE
PUSHED P
VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE X
PLASTIC AND LIQUID LIMIT
UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE
% STRAIN AT FAILURE

SOIL DESCRIPTION	ELEV. FEET	DEPTH FT.	NATURAL UNIT WEIGHT P.C.F.
FILL - silty sand & fine to medium gravel, occ. ceramic tile pieces, organic pockets, grey, wet, (loose)	575.1	0	
ORGANIC SILT - roots, grey to black, wet, (very loose)	571.6		
SILT - slightly sandy & slightly cohesive, occ. silty clay seams or pockets, scattered sand & gravel sizes, some cobbles, reddish grey to grey, wet, (very dense)	570.1	5	124 122 125
TERMINATED	550.6	25	



NOTES:

1. Borehole advanced (cased to 16ft. depth) using washboring & core drilling techniques with a diamond drill to termination at 24½' depth on Dec.31/74 & Jan.2/75 by Cdn. Longyear Ltd.

2. Water level record:

ELAPSED TIME	DEPTH TO W.L. (ft.)	HOLE OPEN TO (ft.)
On completion	1.0	8.0
2 days	1.0	4.6

BOREHOLE LOG

PROJECT No. H2131 BOREHOLE No. 2 DRAWING No. 3

PROJECT: Proposed Bridge Reconstruction

LOCATION: Young Creek

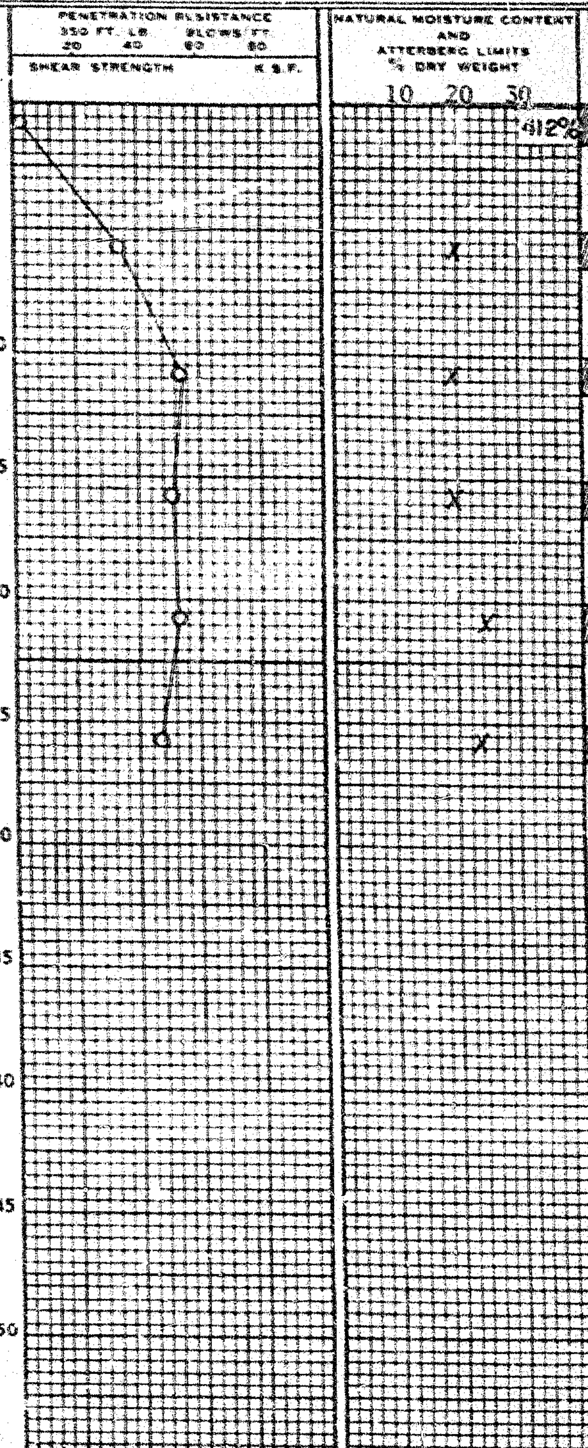
Port Ryerse, Ontario

HOLE LOCATION AND DATUM SEE DRAWING No. 1

2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
2" DIA. CONE
PUSHED P
VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE X
PLASTIC AND LIQUID LIMIT
UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE
% STRAIN AT FAILURE

W.L.	SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FT.	NATURAL UNIT WEIGHT P.C.F.
			574.1	0	
▽		SAND - silty, fine to coarse, occasional roots, some white shells, brown-grey, wet. (very loose)			
			570.1		
		SILT - slightly cohesive and slightly sandy, occ. silty clay seams or pockets, grey, wet, (dense to very dense)			124
					123
		TERMINATED	547.6		



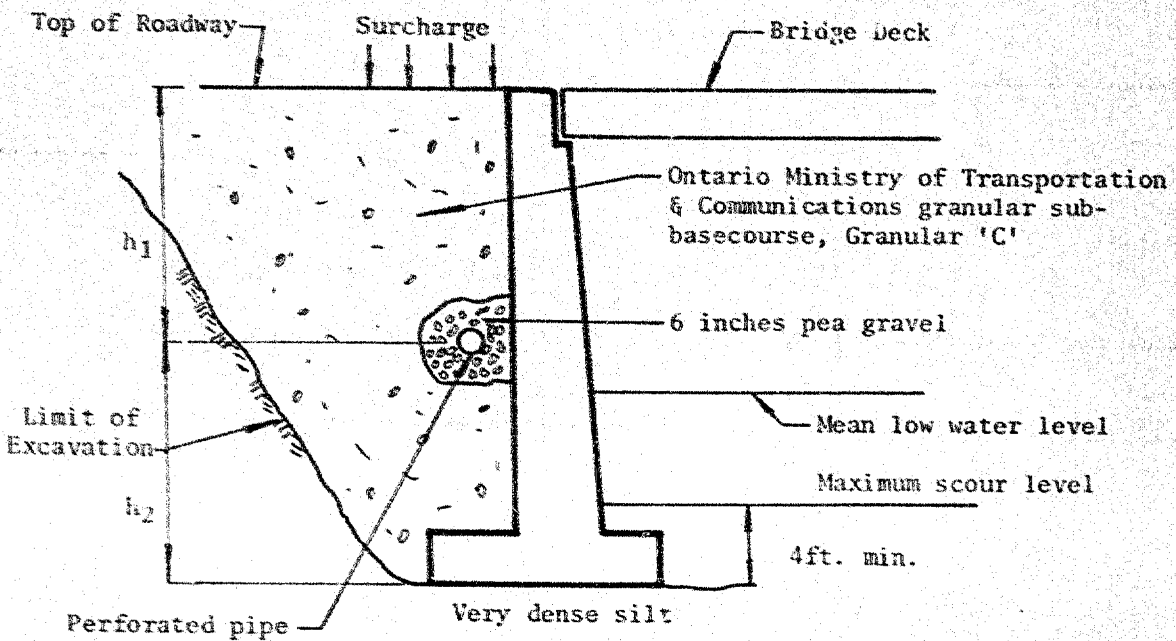
NOTES:

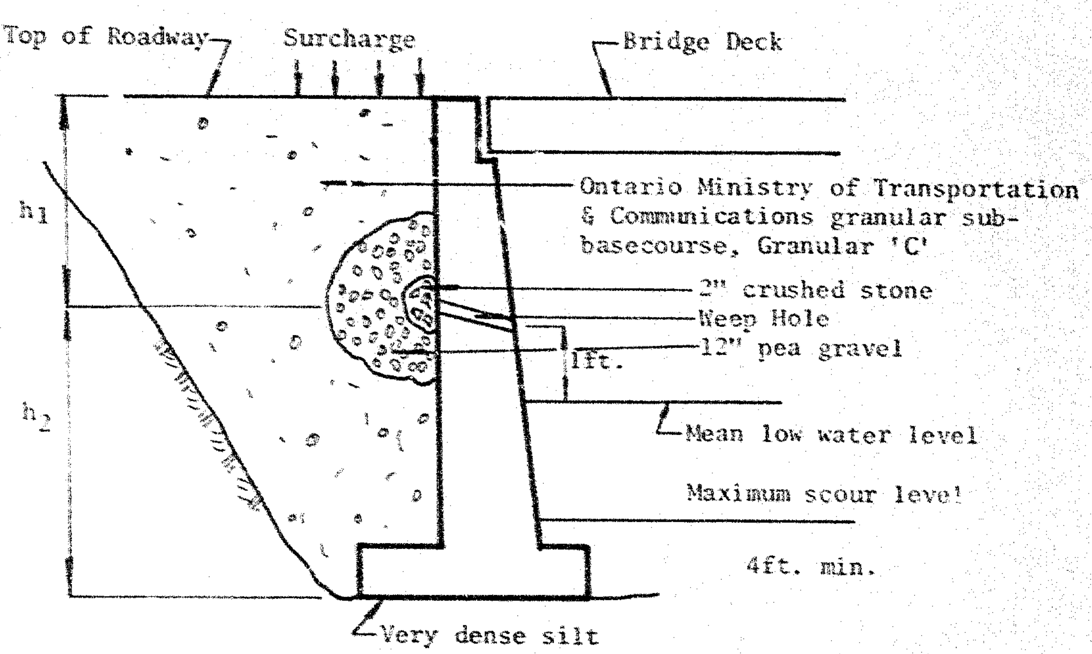
1. Borehole advanced cased to 10ft. depth using washboring techniques with a diamond drill to termination at $26\frac{1}{2}$ft. depth on Jan.2 & 3/75 by Cdn. Longyear Ltd.
2. Water level record:

ELAPSED TIME	DEPTH TO W.L. (ft.)	HOLE OPEN TO (ft.)
On completion	0.4	7.0

William Trow Associates

PROJECT NO. H2131 DRAWING NO. 4

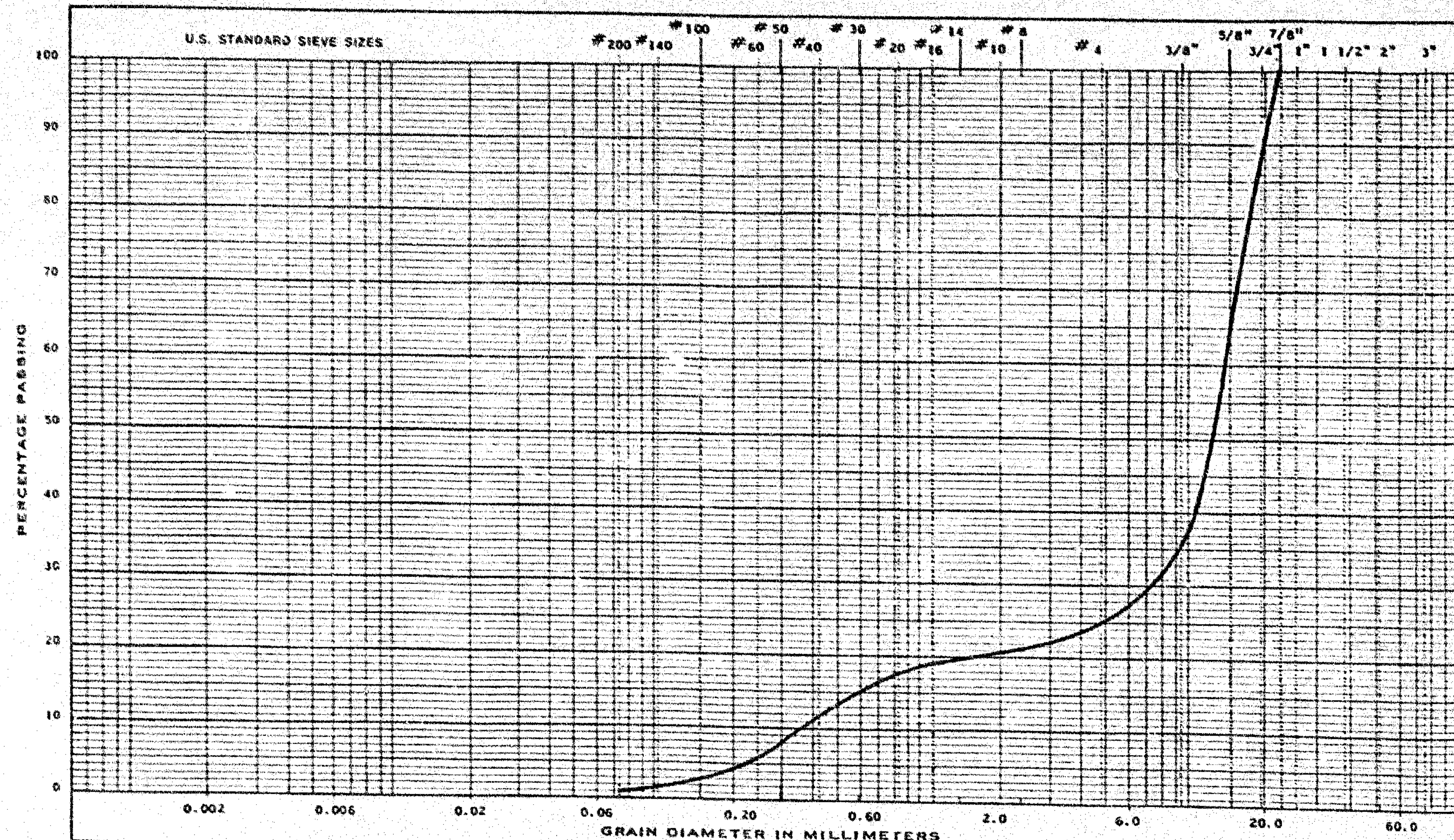




ALTERNATE DRAINAGE METHODS FOR BRIDGE ABUTMENTS

William Trow Associates (Hamilton) Ltd.

MECHANICAL ANALYSIS



← CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

MODIFIED M.I.T. CLASSIFICATION
MEDIUM TO COARSE SAND & FINE TO MEDIUM GRAVEL
Borehole 1, 0 to 2½ feet depth

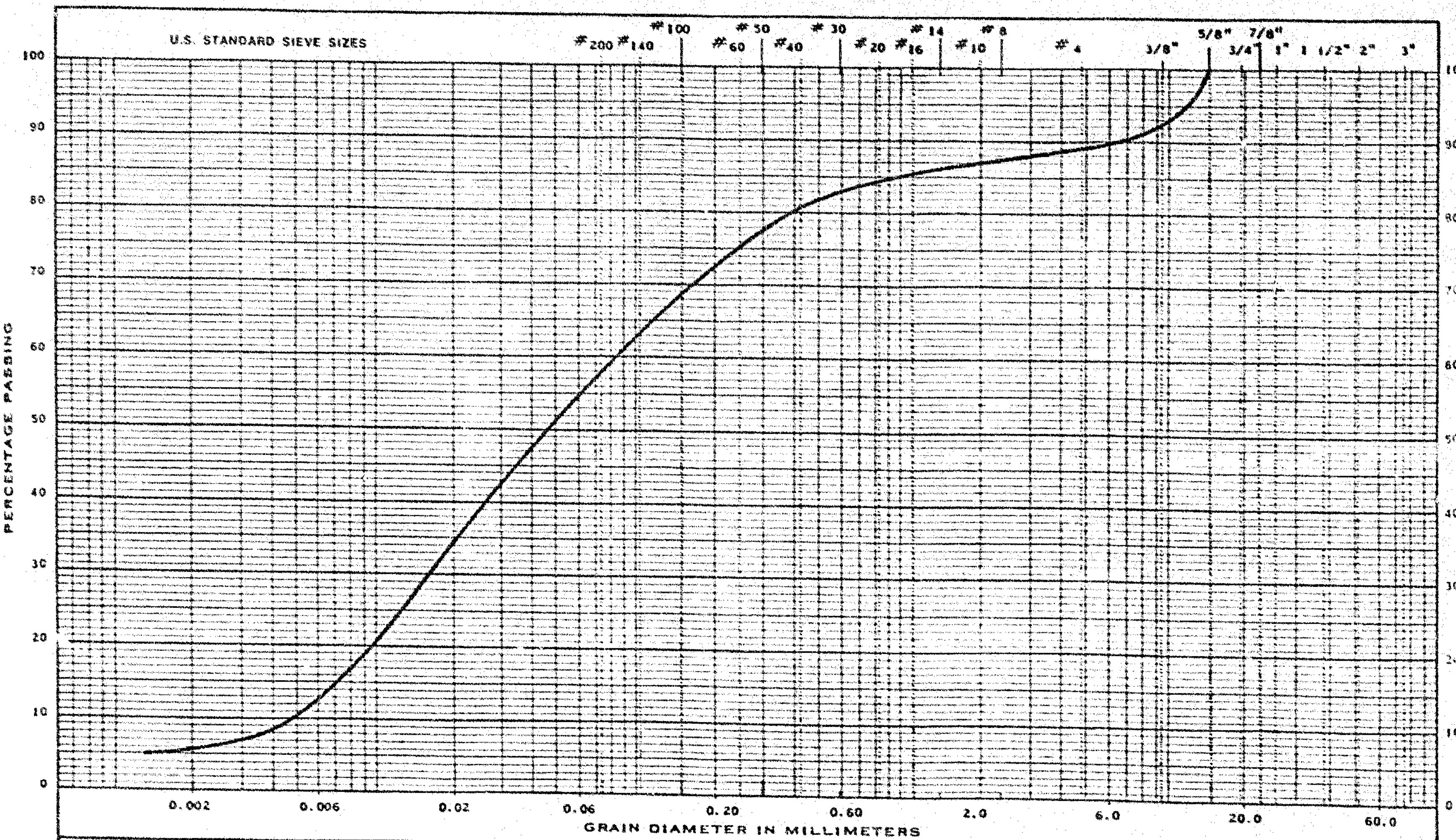
William Trow Associates
(Hamilton) Ltd.

Project: H2131

Drawing 5

Project: H2131

MECHANICAL ANALYSIS



← CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

MODIFIED M.I.T. CLASSIFICATION

SANDY SILT WITH OCCASIONAL GRAVEL SIZES

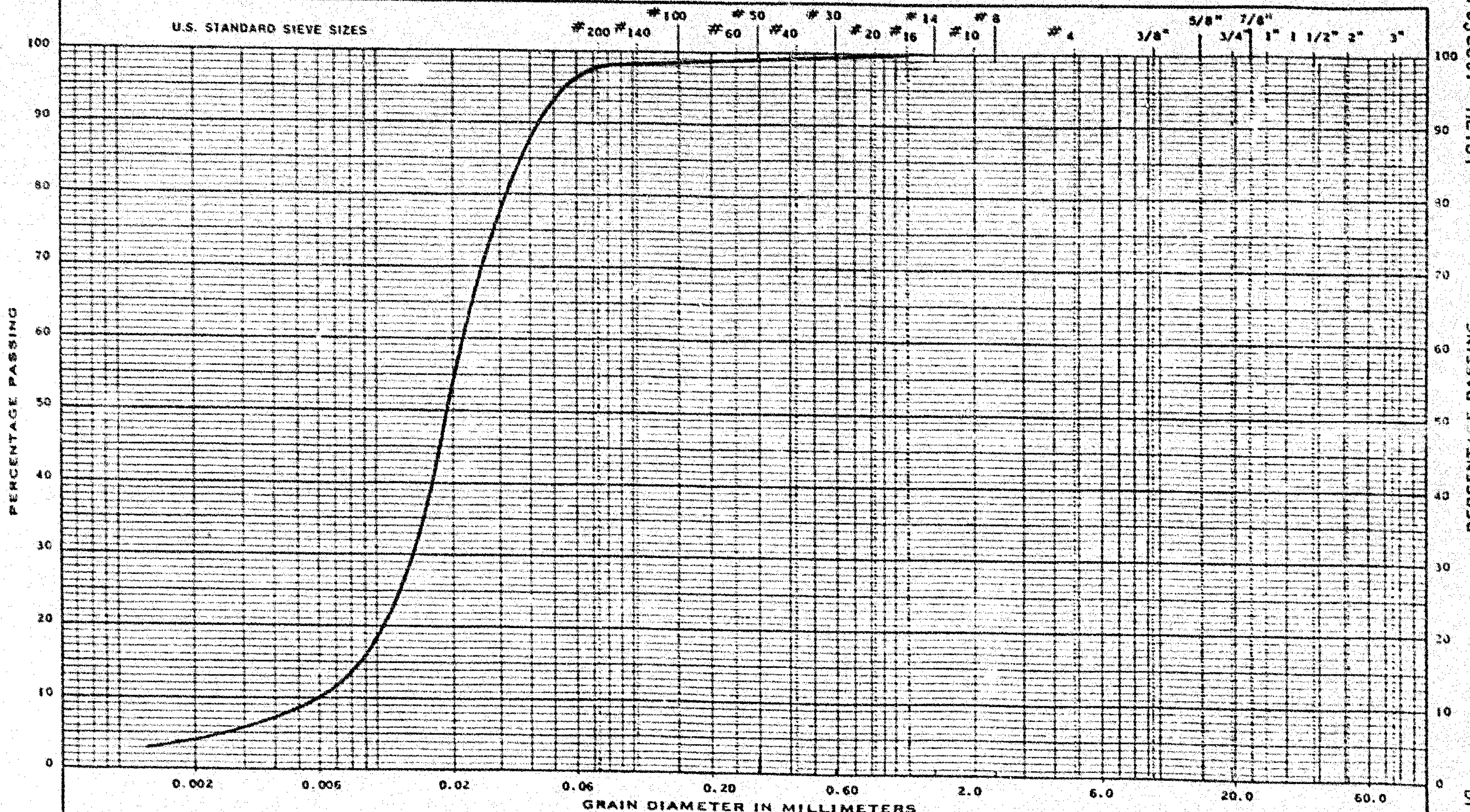
Borehole 1, 5 to 6½ feet depth

William Trow Associates (Hamilton) Ltd.

Drawing 6

Project: H2131

MECHANICAL ANALYSIS



← CLAY	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE	FINE	MEDIUM	COARSE
	SILT			SAND			GRAVEL		

MODIFIED M.I.T. CLASSIFICATION

SILT, MEDIUM TO COARSE
Borehole 2, 10 to 11½ feet depth

William Trow Associates (Hamilton) Ltd.

Drawing 7

G.I.-30 SEPT. 1976

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 40I16-16

DIST. 2 REGION SOUTHWESTERN

W.P. No.

CONT. No.

W. O. No.

STR. SITE No. 20-C.

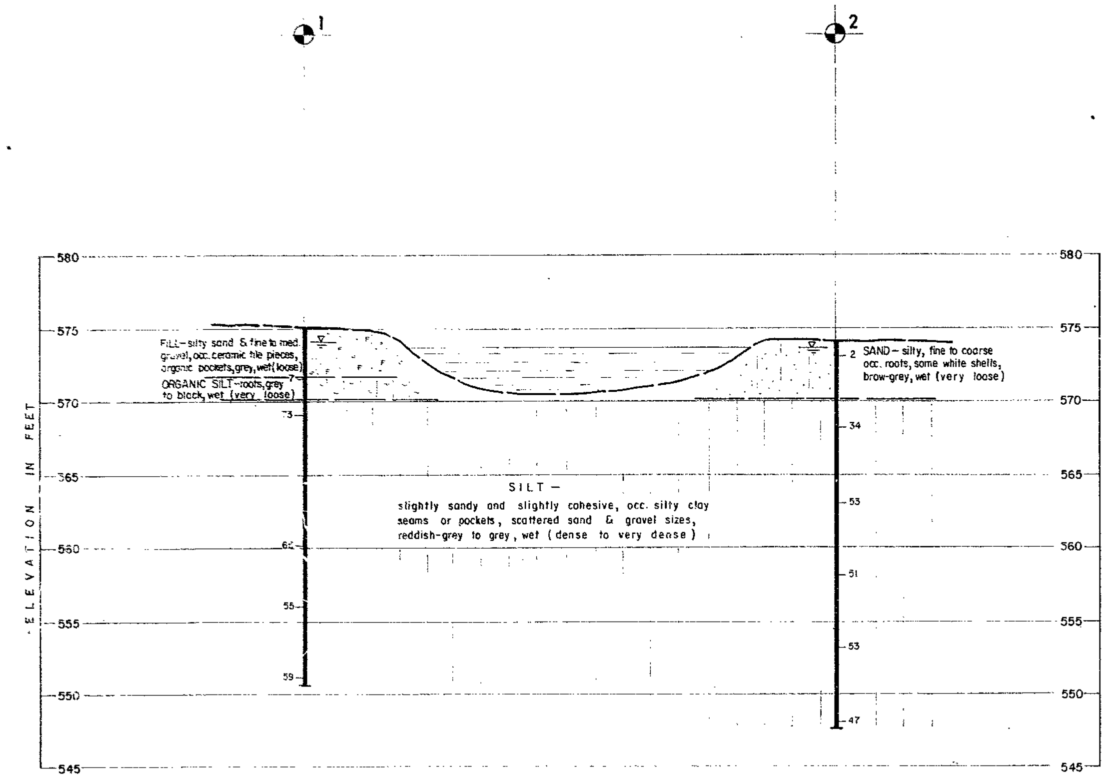
HWY. No.

LOCATION PROP. YOUNG CK. BRIDGE RECONS.

PORT RYERSE, NORFOLK CO.

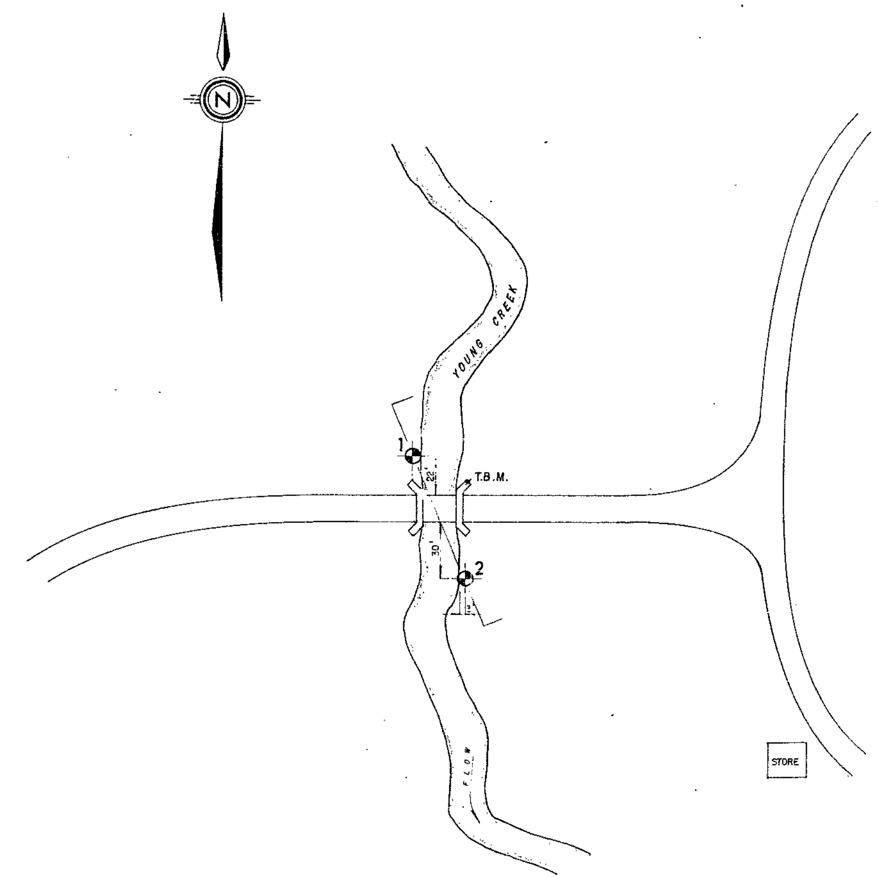
OVERSIZE DR. [illegible]NGS TO BE INCLUDED WITH THIS REPORT. 1

REMARKS:



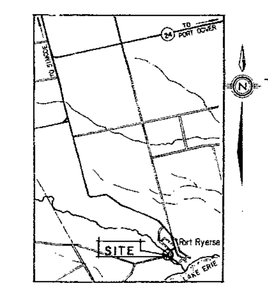
GEOTECHNICAL PROFILE

SCALE VERTICAL: 1" = 5', SCALE HORIZONTAL: NOT TO SCALE



PLAN

NOT TO SCALE



LOCATION PLAN

TEMPORARY BENCH MARK — ELEVATION 592·32 ft. (Geodetic)

TOP OF THE BOLT SET IN THE NORTH WING WALL OF THE EAST ABUTMENT OF THE BRIDGE. ELEVATION PROVIDED BY C. C. PARKER & ASSOCIATES LTD., CONSULTING ENGINEERS. (See Plan)

LEGEND

- BOREHOLE
- GROUND WATER TABLE
- 53 — STANDARD PENETRATION RESISTANCE (blows/ft.)

40 I16-16
GEOCRES No.

PLAN & PROFILE

— NOTE —

The boundaries between soil strata have been established only at Bore Hole locations. Between Bore Holes the boundaries are assumed from geological evidence and may be subject to considerable error.

William Trow Associates Ltd.

FOUNDATION INVESTIGATION

PROPOSED BRIDGE RECONSTRUCTION

YOUNG CREEK

PORT RYERSE, ONTARIO

PROJ. H 2131	DATE: JANUARY 1975	DWG. № 1.

D.T.C. TORONTO RECEIVED APR 16 1975 STRUCTURAL OFFICE

75 140

STRUCTURE SITE No. 20-101