

DOCUMENT MICROFILMING IDENTIFICATION

GEOCREs No. 41K-4

W.P. No. 902-69-04

CONT. No. 71-520

W. O. No. 71-11202(c)

STR. SITE No. 385-145

HWY. No. 17 DIST 18

LOCATION BAR RIVER BRIDGE

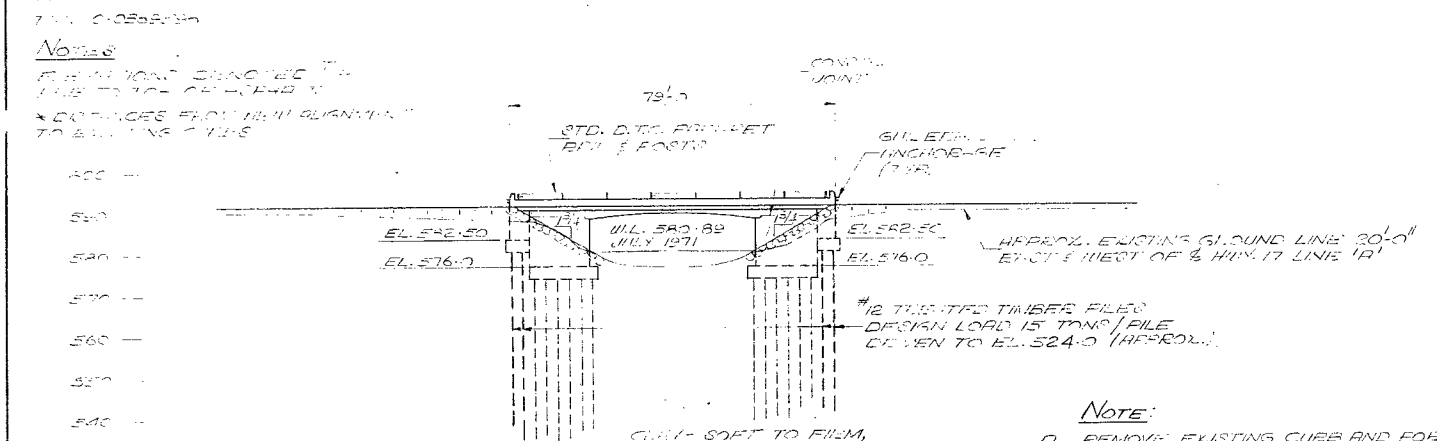
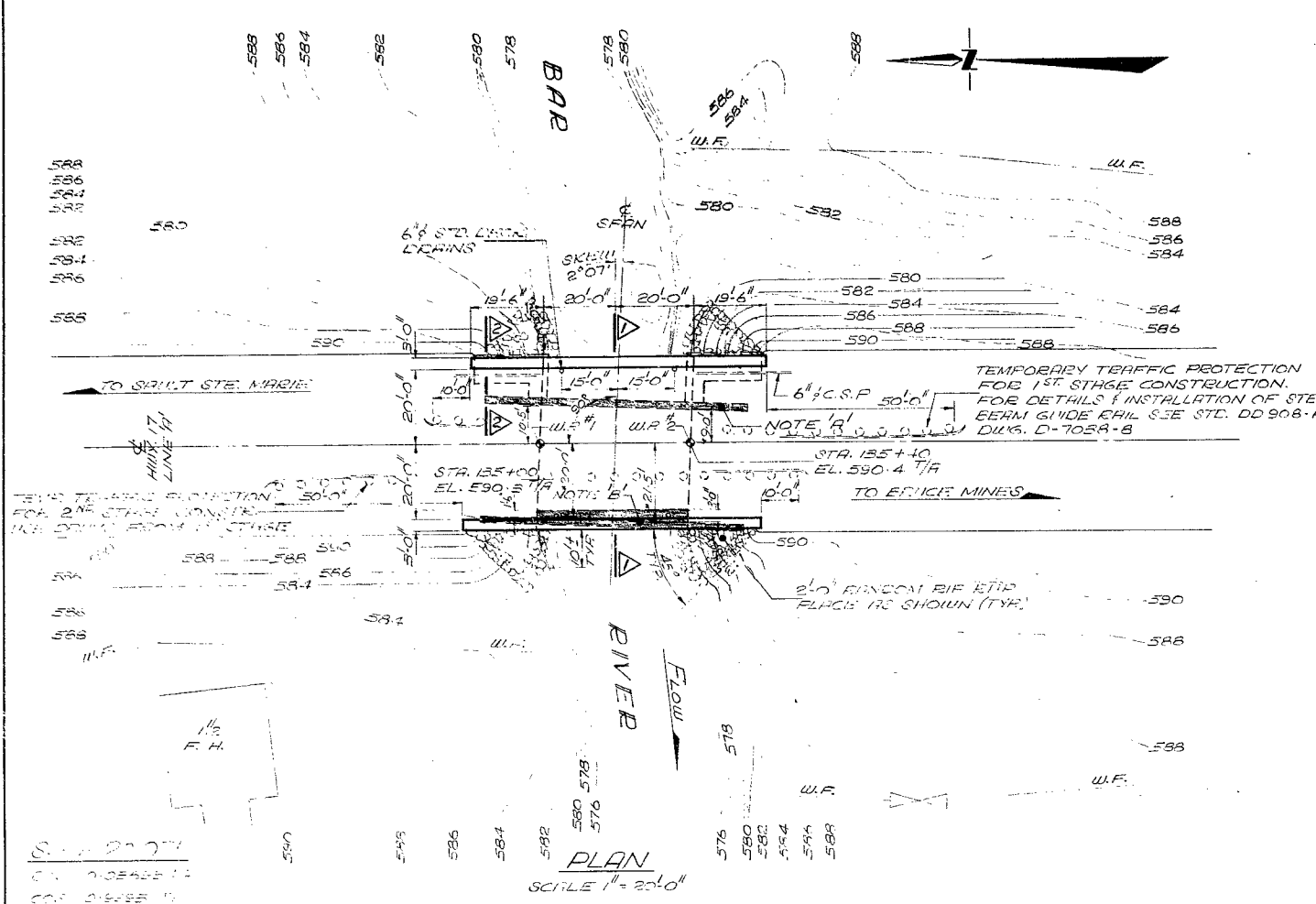
WIDENING, 4.3 mi. S. of

HWY. 638

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 3

REMARKS: _____

G.I.-30 SEPT. 1976



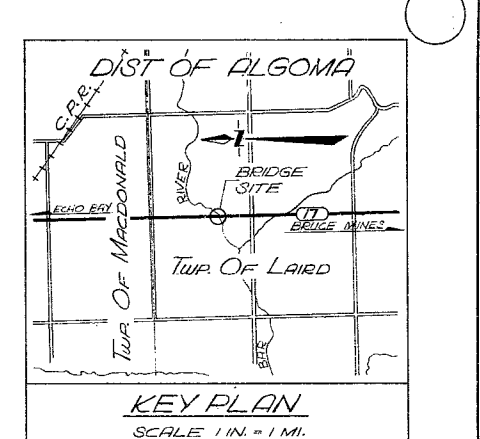
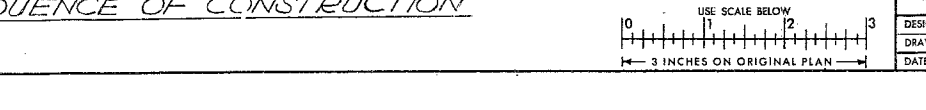
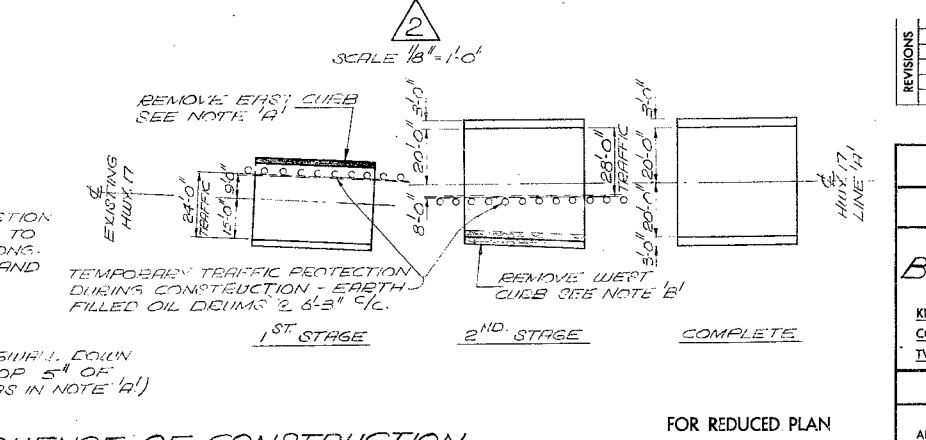
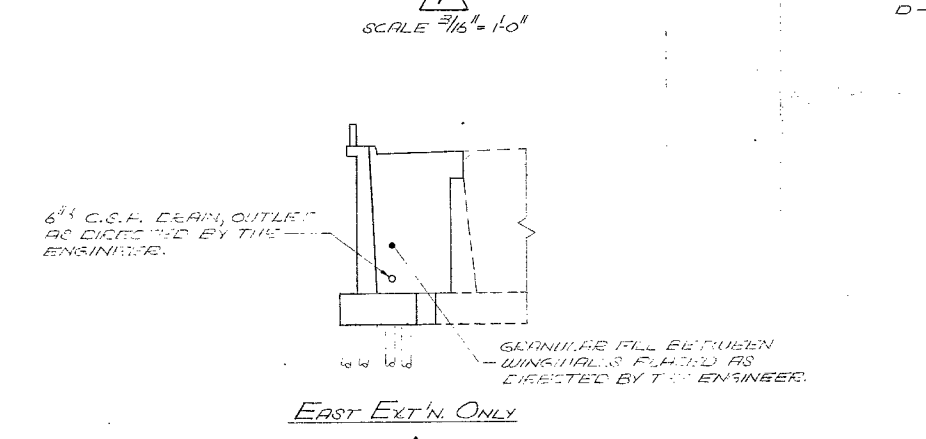
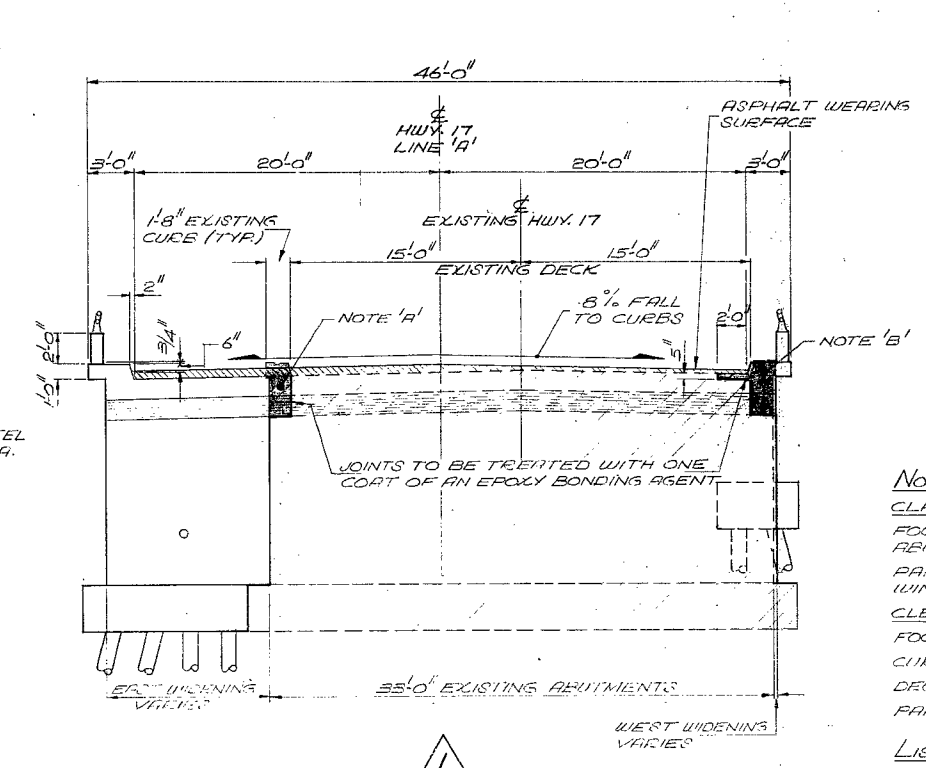
PLAN
SCALE 1" = 20'-0"

ELEVATION
SCALE 1" = 20'-0"

Notes:

A. REMOVE EXISTING CURB AND PORTION OF DECK AND WINGWALLS DOWN TO 3" BELOW GRADE. (EXISTING LONG AND TRANS. STEEL IN INTERDOS AND EXTRADOS TO REMAIN.)

B. REMOVE EXISTING CURB AND WINGWALL DOWN TO 3" BELOW GRADE. REMOVE TOP 5" OF DECK STRIP AS SHOWN. (STEEL AS IN NOTE 'A')



NOTES

CLASS OF CONCRETE
FOOTINGS, WINGWALLS AND ABUTMENTS 3,000 P.S.I.
PARAPET WALLS, CURBS, DECK AND WINGWALLS ABOVE CONSTR. JOINT 4,000 P.S.I.

CLEAR COVER ON REINFORCING STEEL
FOOTINGS, WINGWALLS AND ABUT'S. - 3"
CURBS - 2"
DECK TOP - 2" BOT. - 1 1/2"
PARAPET WALLS - 1 1/2"

LIST OF DRAWINGS
D-7038-1 GENERAL LAYOUT
- 2 ROCK HOLE LOCATIONS & SOIL TESTS
- 3 FOOTING LAYOUT & REINFORCEMENT
- 4 DECK & WINGWALL DETAILS - EAST SIDE
- 5 DECK & WINGWALL DETAILS - WEST SIDE
- 6 PARAPET WALL DETAILS
- 7 STANDARD STEEL PARAPET RAIL
- 8 STANDARD DETAILS

REVISIONS		DATE	BY	DESCRIPTION

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

BAR RIVER BRIDGE WIDENING

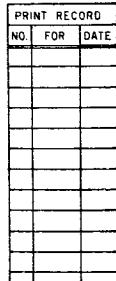
KING'S HIGHWAY No. 17 DIST. No. 18
CO. DIST. OF ALGOMA
TWP. LAIRD LOT CON.

GENERAL LAYOUT

APPROVED: *[Signature]*
DESIGN: V.F.B. CHECK: A.K.
DRAWING: E.O.N. CHECK: V.F.B.
DATE: OCT 77 LOADING: HSE0-48

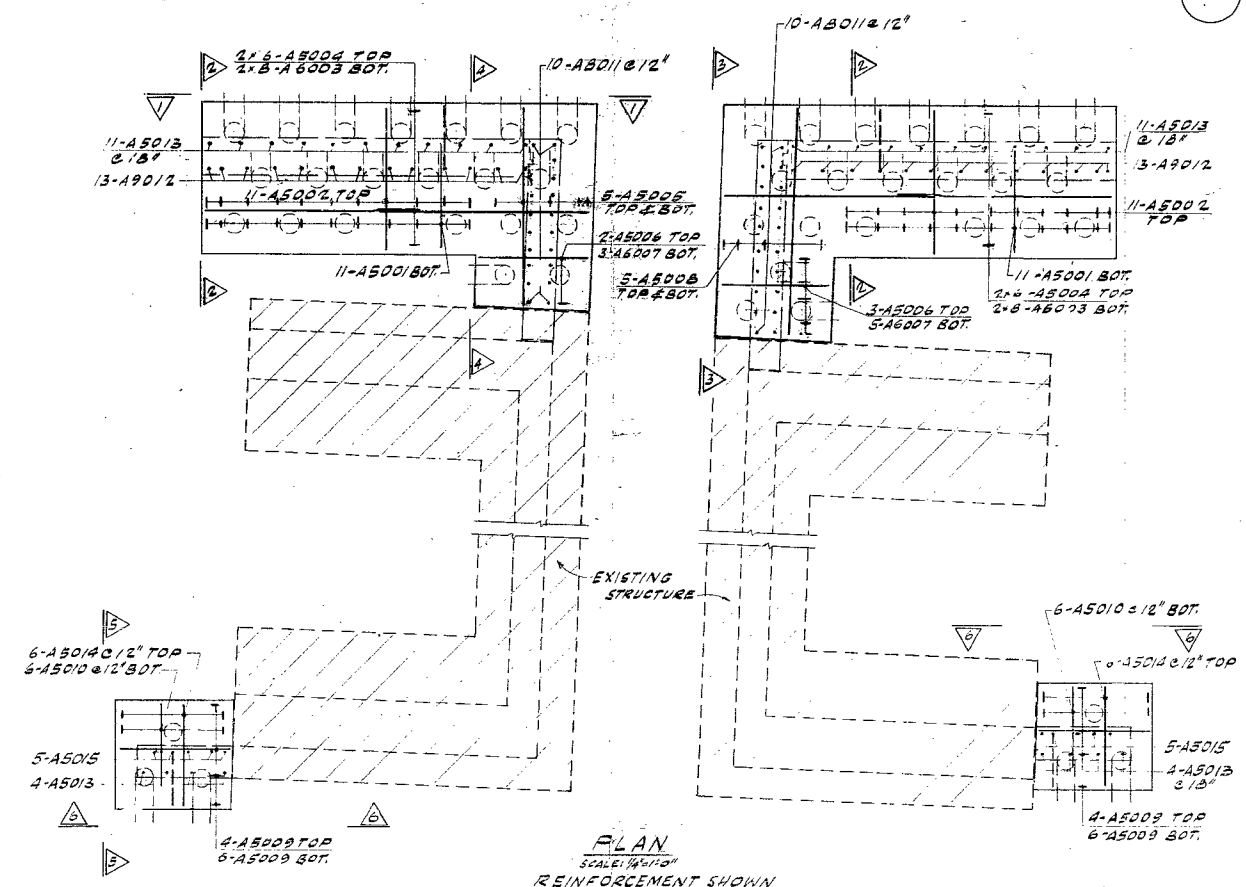
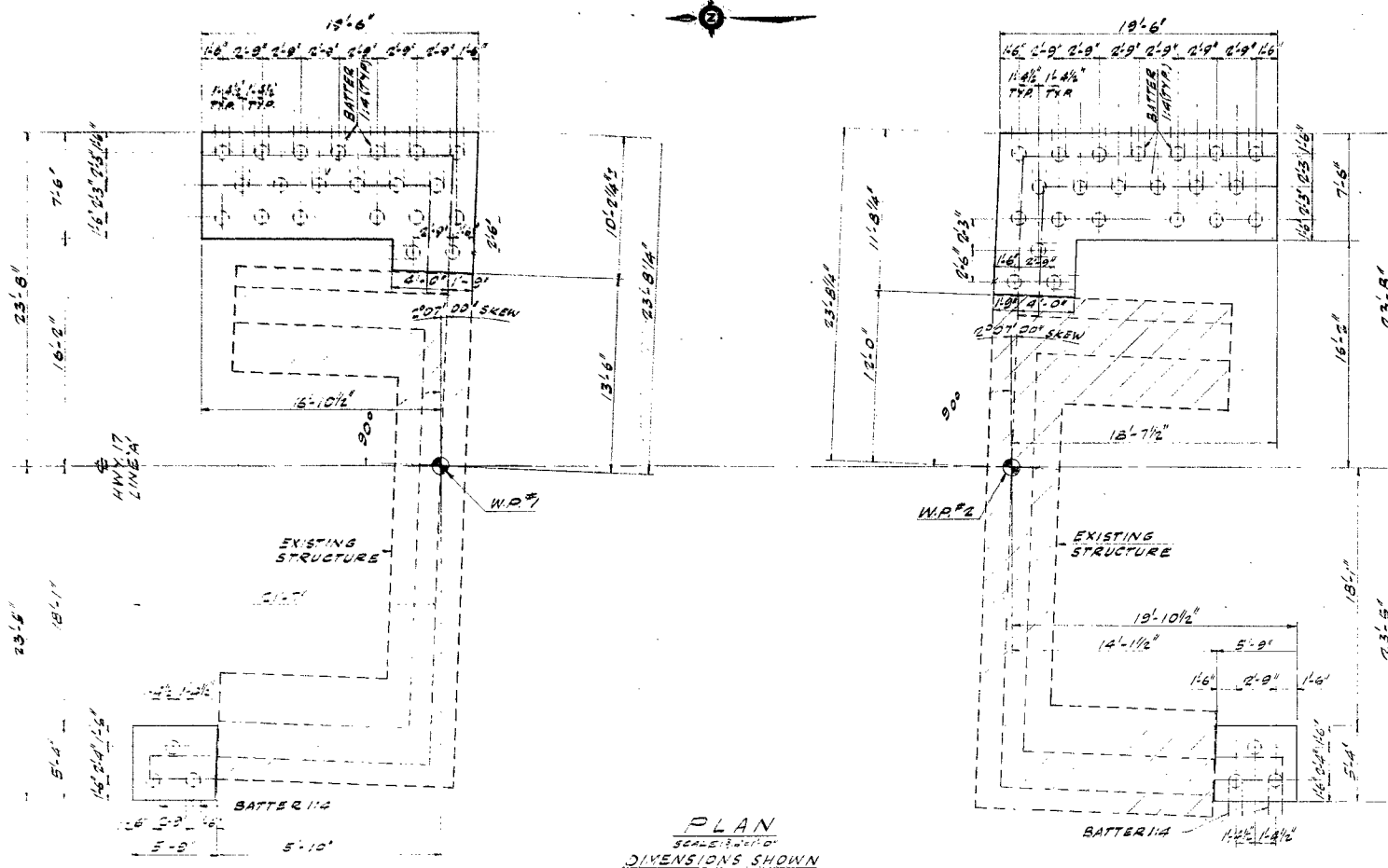
SITE No. 58 S-145 W.P. No. 502-69-04
CONTRACT No.
DRAWING No. D-7038-1

41K-4

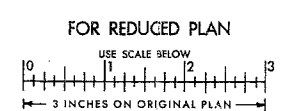
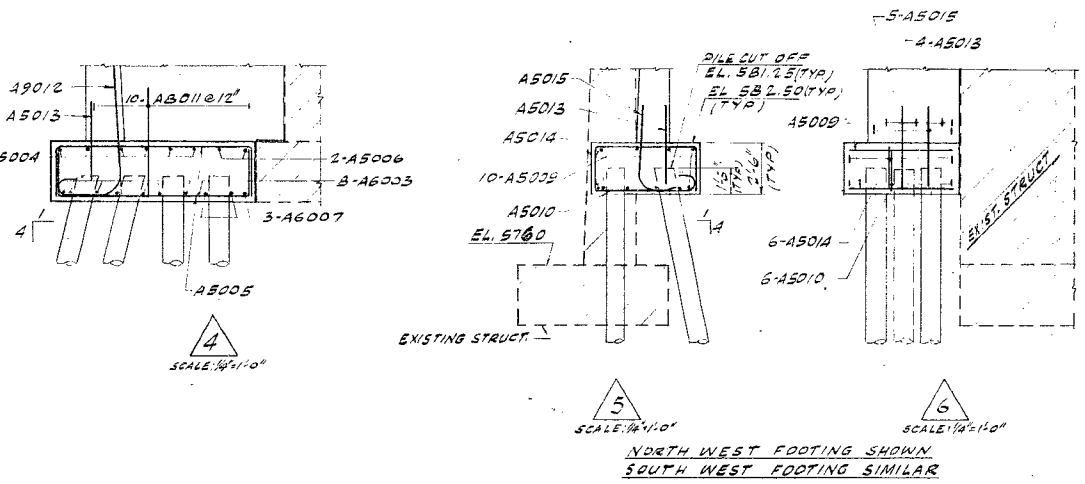
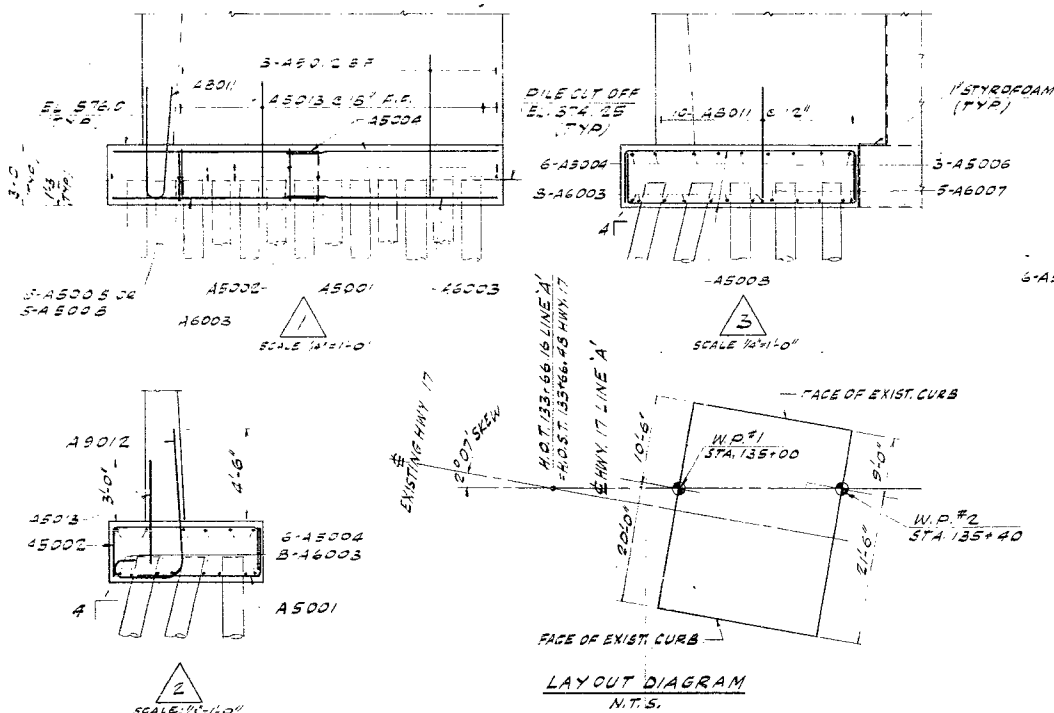


41 K - 4

REVISIONS						GEORES No.
	DATE	BY	DESCRIPTION			
WILLIAM TROW ASSOCIATES LIMITED						
DEPARTMENT OF HIGHWAYS - ONTARIO						
MATERIALS & TESTING DIVISION - FOUNDATION SECTION						
BAR RIVER BRIDGE EXTENSION						
KING'S HIGHWAY NO.		17		DIST. NO. 18		
DIST. ALGOMA						
TWP. LAIRD		LOT		CON.		
BORE HOLE LOCATIONS & SOIL STRATA						
SUBWD H.K.	CHECKED	W.P. NO. 902-69-04		DRAWING NO.		
DRAWN E.F.K.	CHECKED	JOB NO.		S - 1019		
DATE MAY 1971		SITE NO.		BRIDGE DRAWING NO.		
APPROVED		CONT. NO.		D-7038-2		



LIST OF TIMBER PILES				
LOCATION	TYPE	NO. OF PILES	LENGTH	DESIGN LOAD
SOUTH ABUT. E. SIDE	2 TREATED	22	52'-0"	15 T/PILE
SOUTH ABUT. W. SIDE	-	3	60'-0"	15 T/PILE
NORTH ABUT. E. SIDE	-	21	52'-0"	15 T/PILE
NORTH ABUT. W. SIDE	-	3	60'-0"	15 T/PILE



REVISIONS	
DATE	DESCRIPTION
DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS ONTARIO	
T-200/171	
BAR RIVER BRIDGE WIDENING	
KING'S HIGHWAY No. 17	DIST. No. 13
DIST. OF ALBAMA	
TWP. - A10	LOT - CON.
FOOTING LAYOUT & REINFORCEMENT	
APPROVED	SITE No. 385-125 W.P. No. 902-69-04
DESIGN V.F.B. CHECK A.K.	CONTRACT No.
DRAWING A.V. CHECK V.F.B.	DRAWING No. D-703B-3
DATE OCT/71	LOADING 102000

Department of Transportation and Communications

~~XXXXXXXXXXXXXXXXXXXX~~

MEMORANDUM

41K-4

GEOCRES No.

TO: Mr. B. R. Davis,
Bridge Engineer,
Bridge Office,
Admin. Bldg.

FROM: Foundation Section,
Materials & Testing Office,
Room 107, Lab. Bldg.

ATTENTION: Mr. S. McCombie,
Bridge Planning Engr.

DATE: June 2, 1971

OUR FILE REF.

IN REPLY TO

JUN 2 1971

SUBJECT: FOUNDATION INVESTIGATION REPORT -- S-1019
Prepared by William Trow Associates Limited,
Proposed Widening - Bar River Bridge
Echo Bay, Ont. - Dist. #18 (Sault Ste. Marie)
W.P. 902-69-04

Attached, please find copy of the above mentioned report prepared for the Department by the Consultant, William Trow Associates Ltd. (Sudbury).

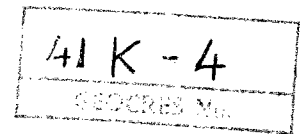
We have reviewed the report and have found that it contains all the necessary information for your staff to proceed with their design work.

Should you have any queries regarding this report, please feel free to contact this Office.

AGS/MdeF
Attach.

A. G. Stermac
A. G. Stermac
PRINCIPAL FOUNDATION ENGINEER

cc: Messrs. B. R. Davis
F. G. Allen
D. W. Farren
H. W. Hurrell
R. G. Gascoyne
P. Lester (2)
R. Morgenroth
B. J. Giroux
B. A. Singh
Foundations Files
General Files



CONT. 71-520

FOUNDATION INVESTIGATION
PROPOSED WIDENING
BAR RIVER BRIDGE
ECHO BAY, ONTARIO.

W.P. 902-69-04

CONT. 71-520

Prepared for:

MR. A. RUTKA
MATERIALS AND TESTING ENGINEER
DEPARTMENT OF HIGHWAYS OF ONTARIO
MATERIALS AND TESTING DIVISION
HWY. 401 & KEELE STREET
DOWNSVIEW 464, ONTARIO.

WILLIAM TROW ASSOCIATES LIMITED
Toronto, Sudbury, Hamilton
London, Sarnia.

Project: S-1019
May 28th, 1971.

562 Notre Dame Avenue,
Sudbury, Ontario.
(705) 674-9681

TABLE OF CONTENTSTEXT

	<u>Page No.</u>
Summary	1
Field Work and Subsoil	3
Site and Project Description	3
Foundations	4
Settlement	5
Earth Pressure	5
Scour Protection	6
Sulphate and pH Tests	6

DRAWINGS

Site Plan and Stratigraphy
Borehole Logs

Dwgs. 1 to 4

FOUNDATION INVESTIGATION
PROPOSED WIDENING
BAR RIVER BRIDGE
ECHOE BAY, ONTARIO

SUMMARY

The subsoil at the bridge site consists of 8 to 10 feet of dense granular fill overlying firm to soft clay to a depth of at least 100 feet.

The river level was measured to be at elevation 582.2, and the water level in the boreholes was at elevation 584 on May 19th, 1971.

Wood pile foundations are recommended for the bridge widening. It is expected that 45 to 50-foot piles will have a safe capacity of 15 tons.

Differential settlement is not expected to be a problem, as the embankment fill has been in place for many years.

The earth pressure acting on the abutment walls can be estimated using an earth pressure coefficient $K_a = 0.35$.

The widened abutment should be protected from erosion by applying coarse rock rip-rap or sheet pile protection.



The sulphate and pH tests performed on the soil and water at the site do not indicate a condition for sulphate or acid attack on concrete.

The above points are discussed in detail in the following report.



FIELD WORK AND SUBSOIL

The field work, which consisted of 2 wash borings and 2 cone penetrometer tests carried out with Bombardier mounted equipment, was performed during the period of May 12th to 19th, 1971.

The subsoil was found to consist of 8 to 10 feet of dense granular fill overlying the natural soft to firm clay. The clay was sampled to a depth of about 100 feet before the boreholes were terminated. A local well driller (Amedeo Pozzebon) has indicated that bedrock could be as deep as 300 feet in the bridge area. The subsoil is described in detail on the borehole logs, Dwgs. 1 and 2. The cone penetrometer test results are given on Dwgs. 3 and 4. The test locations and a stratigraphy are shown on the site plan.

The water level in the boreholes was recorded to be at approximate elevation 584 on May 19th, 1971.

SITE AND PROJECT DESCRIPTION

The existing bridge is located on Highway 17, at the Bar River near Echo Bay. With the exception of the railings, the existing bridge



structure was observed to be in good condition. Some old wood piling was observed in the river bed adjacent to the abutments, and it is expected that wood piles were used as foundations for the structure.

At the bridge site, the river is about 33 feet wide and at the time of the field work was flowing at about 17 feet per minute. The river level was measured to be at elevation 582.2, and the depth of water at the centre line of the bridge was measure to be about 5 feet. The river bed consisted of cobbles and boulders, which likely were placed during construction. The height of the banks above the river level was observed to be 6 to 7 feet.

It is understood that the existing bridge will be widened 6 feet on each side to accommodate wider traffic lanes.

FOUNDATIONS

It is recommended that the proposed bridge widening be founded on timber friction piles. The soft to firm clay at the site is not considered to be sufficiently competent to support the widening on simple spread footings.



Based on the field and laboratory shear strength measurements of the clay, it is expected that a safe load of 15 tons could be carried on a 45 to 40 foot long, 12 inch diameter wood pile with an 8 inch diameter tip. In the estimate, it has been assumed that the average circumference is 2.6 feet and the skin friction is 750 psf. A safety factor of 3 and the undisturbed shear strength have been used in this calculation. With the recommended wooden pile the regain in strength with time will be rapid hence the use of a factor of 3 on the undisturbed strength appears to be realistic.

SETTLEMENT

It is not expected that differential settlement between the existing and new widening will be a problem. The embankment fill for the existing structure has been in place for many years and additional fill is not contemplated. Any minor differential settlement between the existing and new widening could be eliminated by joining the existing and the widening structurally.

EARTH PRESSURE

The earth pressure acting on the abutment walls can be estimated from the expression:

$$p = K_a (\gamma h + q) \text{ psf.}$$

where: p = the earth pressure in psf.



K_a = the earth pressure coefficient is estimated to be 0.35 for drained granular backfill material.

γ = the unit weight of the backfill material, estimated to be 130 pcf.

q = the value in psf of any surcharge loading acting on the ground surface adjacent to the abutment walls.

No hydrostatic pressure has been considered in the above expression, as it has been assumed that the backfill material will be free-draining and fully drained.

SCOUR PROTECTION

The piles should be protected from erosion by providing coarse rock rip-rap protection around the pile cap. An alternative would be to protect the foundations with steel sheeting driven well into the natural clay.

SULPHATE AND pH TESTS

Laboratory tests on the soil and river water indicate negligible sulphate contents. The pH of the soil was measured to be 8.1 and the pH



of the water was 7.6

WILLIAM TROW ASSOCIATES (SUDBURY) LTD.

H.R. Krzywicki, P. Eng.

HRK/mmg.

Encls.

Dist: Mr. A. Rutka,
Materials and Testing Engineer,
Department of Highways of Ontario,
Materials and Testing Division,
Hwy. 401 & Keele Street,
DOWNSVIEW 464, Ontario.

(12)

BOREHOLE LOG

JOB No. S-1019

BOREHOLE No. 1

DRAWING No. 1

PROJECT Bar River Bridge Widening

LOCATION Echo Bay, Ontario.

2" O.D. SPLIT TUBE

2" I.D. SHELBY TUBE

2" DIA. CONE

PUSHED

VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE

PLASTIC AND LIQUID LIMIT

UNDRAINED TRIAXIAL AT

OVERBURDEN PRESSURE

% STRAIN AT FAILURE

HOLE LOCATION AND DATUM SEE DRAWING No. 1

G L	SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FT.	PENETRATION RESISTANCE 350 FT. LB. BLOWS/FT.				NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT				NATURAL UNIT WEIGHT P.C.F.
					SHEAR STRENGTH		K.S.F.		25		50		
					1	2	3	4	75	100			
		FILL - Sand and Gravel - dense, brown, occasional concrete pieces & rock fragments, moist	589.4							X			A
			583.1							X			
		CLAY - soft to firm, red/brown, stratified, wet.	581.9	10							X		
					2.9								
					5.3								P 99.4
				20	5.3								
					10.7								P 93.0
		- alternate 1/8" grey and red/brown layers below 60 feet depth.		30	5.3						X		P 91.3
					8.0								P 93.4
				40	5.2								P 95.4
					4.8								P 92.4
		NOTES		50	3.1								P 94.0
		1. Borehole advanced with Bom- bardier Penn drill. Hole cased to 87 feet depth with BX. Washed ahead to 97 feet depth.			1.8								P103.0
				60	10.3								
					3.1								P102.2
				70	3.3								P105.8
					1.7								P107.8
				80									P107.0
													P107.0
				90									P101.2
													P 99.8
													P 99.8
													P103.5
													P103.5
		END OF BOREHOLE	492.4	100									P100.2



William Trow Associates Ltd.

BOREHOLE LOG

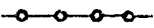
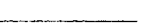


JOB No. S-1019

BOREHOLE No. 2

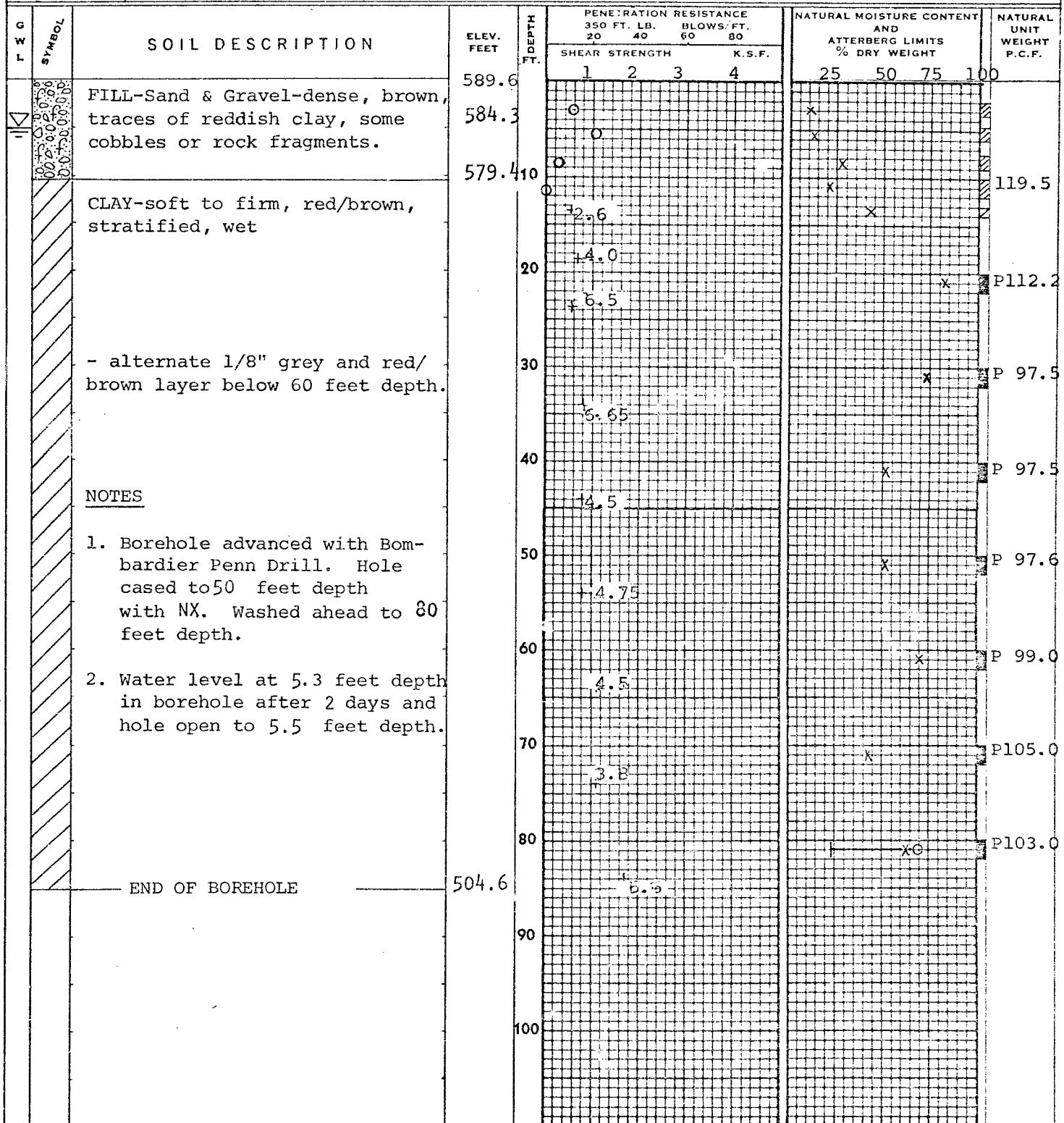
DRAWING No. 2

PROJECT Bar River Bridge Widening

LOCATION Echo Bay, Ontario.

2" O.D. SPLIT TUBE 2" I.D. SHELBY TUBE 2" DIA. CONE PUSHED  PVANE TEST AND SENSITIVITY (S)  SNATURAL MOISTURE  XPLASTIC AND LIQUID LIMIT  UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE % STRAIN AT FAILURE 

HOLE LOCATION AND DATUM SEE DRAWING No. 1



BOREHOLE LOG

JOB No. S-1019






BOREHOLE No. Cone 3





DRAWING No. 3

PROJECT Bar River Bridge Widening

LOCATION Echo Bay, Ontario.

HOLE LOCATION AND DATUM SEE DRAWING No. 1

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

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

LEG	SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FT.	PENETRATION RESISTANCE				NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT	NATURAL UNIT WEIGHT P.C.F.
					350 FT. LB.	40	BLOWS/FT.	80		
		CONE PENETROMETER TEST ONLY	589.6		SHEAR STRENGTH K.S.F.					
				10						
				20						
				30						
				40						
				50						
				60						
				70						
				80						
				90						
		END OF CONE	499.6							
				100						



BOREHOLE LOG

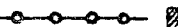
JOB No. Sc1019

BOREHOLE No. Cone 4

DRAWING No. 4

PROJECT Bar River Bridge Widening

LOCATION Echo Bay, Ontario.

2" O.D. SPLIT TUBE 

2" I.D. SHELBY TUBE 

2" DIA. CONE 

PUSHED 

VANE TEST AND SENSITIVITY (S) 

NATURAL MOISTURE 

PLASTIC AND LIQUID LIMIT 

UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE 

% STRAIN AT FAILURE 

HOLE LOCATION AND DATUM SEE DRAWING No. 1

G W L	SYMBOL	SOIL DESCRIPTION	ELEV. FEET	DEPTH FT.	PENETRATION RESISTANCE				NATURAL MOISTURE CONTENT AND ATTERBERG LIMITS % DRY WEIGHT	NATURAL UNIT WEIGHT P.C.F.
					350 FT. LB. 20	BLOWS/FT. 40	60	80		
					SHEAR STRENGTH K.S.F.					
		CONE PENETROMETER TEST ONLY	590.3							
				10						
				20						
				30						
				40						
				50						
				60						
				70						
				80						
				90						
		END OF CONE	500.3							
				100						



Department of Highways Ontario

Copy for the information of

Mr. A. Stermac

~~Mr. P. D. Hester,~~
Regional Bridge Planning
Engineer,
Northwestern Region,
Thunder Bay.

Structural Office,
West Building,
Downsview.

October 7, 1971.

41 K - 4
GEOCRES No.

Bar River Bridge Widening,
W.P. 902-69-04, Site #38S-145,
Highway #17, District #18.

Draw 171

Attached herewith are prints of the Preliminary
Bridge Plan Drawing D-7038-P1 for the above-mentioned
structure.

The estimated cost of the proposed structure is
\$35,000 which includes tender, materials, engineering and
sundry construction.

Any comments or revisions you may have should be
submitted within three weeks.

C. S. Grebski,
Structural Design Engineer.

CSG/mh

ENCL*

cc: A. McKim,
B. Davis,
A. Stermac (2),
J. Anderson.

17 OCT 71

NO COMMENTS.

A.K.B.

1 K-2

DEPARTMENT OF TRANSPORTATION AND COMMUNICATIONS

MEMORANDUM

TO: Mr. A. Stermac,
Principal Foundation Engineer,
Foundation Office.

FROM: Structural Office,
West Building.

ATTENTION:

DATE: November 3, 1971.

OUR FILE REF.

IN REPLY TO

SUBJECT: Bar River Bridge Widening,
W.P. #902-69-04, Site #38S-145,
Highway #17, District #18.

Trow/n

Attached herewith we are submitting the final bridge drawings which show the foundation design for this structure.

Kindly give us your comments at your earliest convenience.

C. S. Grebski
C. S. Grebski,
Structural Design Engineer.

CSG/mh
ENCL*
cc: Foundation Office.

2. Dec 1971

*On drawing # D-7038-3 section #1 the elevation of pile cut off
is marked as el. 374.25. It should be 574.25.*

OK

*A.K.B.
K.L. [unclear]*

*Jan 72
[signature]*