

DOCUMENT, MICROFILMING IDENTIFICATION

GEOCRES No. 30M14-7

DIST. 6 REGION

W.P. No. 218-90-00

CONT. No. 92-48

W. O. No.

STR. SITE No. 22-120

HWY. No. 401

LOCATION Duffin Creek / Church St / 401

No of PAGES -

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OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT.

REMARKS:

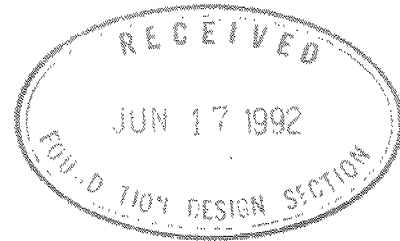
OVERSIZE DRAWING

Minutes of Meeting

June 17/92

Attendance:

Jim Cullen	CReg Construction Office
Shael Gwartz	"
Volker Boehnke	CReg Structural Section
Augustine Liu	"
George Al-Bazi	Structural Office
Murty Devata	Foundation Design Section
Dave Dundas	"



1) Foundation Design requested a meeting to discuss policy for

in general - inspection of complex foundation construction

specifically - construction control of caisson installations at Church Street/Duffin Creek and Hwy. 401 (Contract 92-48)

2) It was agreed that

- expert inspection is required for complex foundation construction activities
- flexibility in Foundation recommendations through field observations is desirable if it can lead to cost savings and construction efficiencies
- FD Section will flag requirement for expert inspection in the Foundation Investigation and Design Report
- arrangements for the inspection person will be completed before advertising of contract
- FD Sect will determine if this inspection person will be
 - a) provided from FD Section staff
 - b) retained on an individual contract
 - c) retained through a consultant
- FD Section will recommend specific person for the assignment
- contract person (b or c above) will be retained by the Construction Office, report through the Project Supervisor, with technical consultation with the FD Section
- this process will be restricted to complex projects such as caissons (but not High Mast Lights), soil or rock anchors, and tunnel installations. On a related topic, inspection of cut slopes before finalizing recommendations for slope treatments is possible.
- at Contract 92-48, the FD Section will provide inspection service (Ken Ahmad 235-3731)

prepared by D. Dundas (235-3731)

If there are any omissions or errors please advise.

MEMORANDUM

(416) 235-3731

To: Volker Boehnke
Head, Structural Section
4th Floor, Atrium Tower
1201 Wilson Avenue
1992 01 29
Attn: A. Liu

From: Foundation Design Section
Room 315, Central Building, Downsview, Ontario

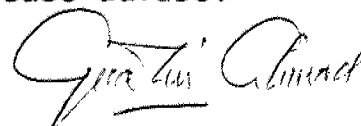
Re: General Arrangement Drawing, and
Documents for Contract Package
Duffin Creek - Church Street Overpass
W.P. 218-90-00, Site: 22-120
Highway 401, District 6, Toronto

This is in response to your memo dated January 20, 1992. We have reviewed the general arrangement drawing 22-120-DWG1 dated September 1991 produced by Cole Sherman. We understand that the jacking frame to install the new bearings will be supported on caissons. The caissons will be constructed on bedrock as per our recommendation dated March 14, 1991. The design therefore, is in conformance with our foundation recommendations.

As you know it was agreed to provide foundation recommendations in the form of memo report using existing soil information. Therefore, no formal drawings and borehole logs were prepared.

Since now you need borehole logs of corresponding boreholes which were used to interpolate soil data and a plan showing the borehole locations, we are providing you this information from Geocres No 30M14-7. The soil information was obtained from Borehole 8,9,10,14,15 and 16 (enclosed). The locations are marked on the enclosed plan. Please note that the logs and plan are in imperial unit.

Should you have any further questions, please advise.

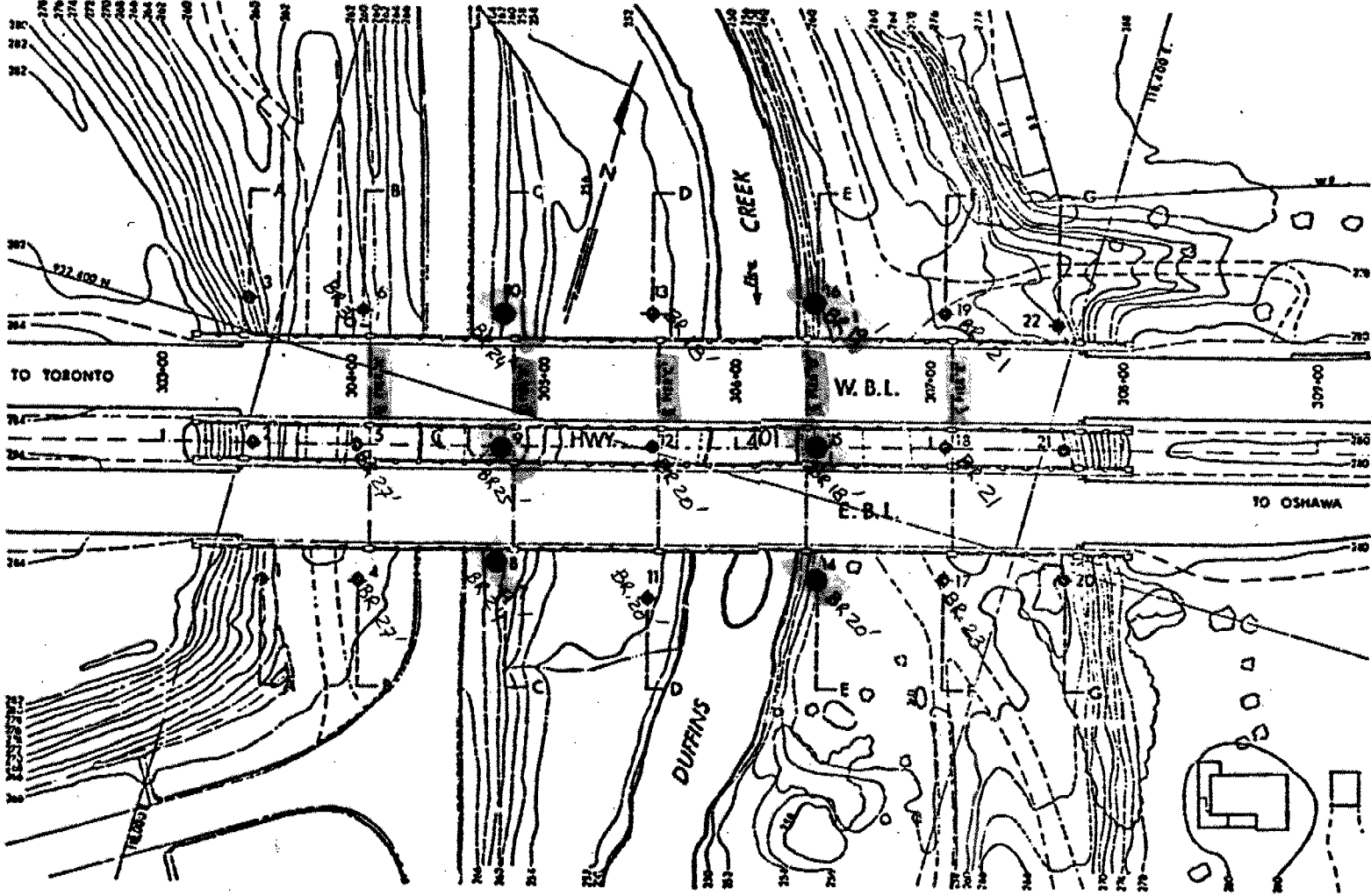


K. Ahmad, P. Eng.
Foundation Engineer

For

D. Dundas, P. Eng.
Senior Foundation Engineer

W.P.: 218-90-00



DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 8

FOUNDATIONS OFFICE

W.P. 218-90-00

JOB 72-11119

LOCATION Co-ords. 932,322 N; 118,145 E.

W.P. 114-71-C2A

BORING DATE November 1, 1972

ORIGINATED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring & Cone Test

COMPILED BY EW

CHECKED BY AR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT w_L PLASTIC LIMIT w_P WATER CONTENT w w_p — w — w_L WATER CONTENT % 20 40 60	BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT					
260.8	Ground Level									
0.0	Silty sand, some gravel, trace clay.		1	SS	16					1h 61 (25)
	Very Loose to Compact		2	SS	2					21 47 (32)
			3	SS	1					
			4	SS	5					
241.8	Silt and sand, some gravel, trace clay.		5	WS	-					1h 45 (41)
19.0	Very Dense		6	SS	90					
236.8	Shale		7	RC	102					
24.0			8	RC	02					
233.8										
27.0	End of Borehole									

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE NO 9

FOUNDATIONS OFFICE

JOB 72-11119

LOCATION Co-ords. 932,381 N; 118,132 E.

W.P. 218-90-00

W.P. 111-71-028

BORING DATE November 13, 1972

ORIGINATED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

COMPILED BY EW

CHECKED BY LR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT w_L		BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT		PLASTIC LIMIT w_p	WATER CONTENT w		
260.8	Ground Level											
0.0	Silty sand, traces of clay and gravel. Loose		1	SS	9	260						5 58 31 6
			2	SS	11							1 55 37 7
			3	SS	2	250						6 37 46 11
			4	SS	4							
			5	SS	13							
			6	SS	6	240						7 26 62 5
238.3	Silt with sand, trace gravel & clay. V. Dense		7	SS	72							
235.8			8	SS	100							
25.0	Shale		9	RC	90%							
232.3			10	RC	90%							
28.5	End of Borehole					230						

OFFICE REPORT ON SOIL EXPLORATION

FOUNDATIONS OFFICE

W. P. 218-90-00

ORIGINATED BY EN

COMPILED BY EW

CHECKED BY SK.

[illegible]

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No 14

FOUNDATIONS OFFICE

W.P. 218-90-00

JOB 72-11119

LOCATION Co-ords. 932,358 N; 118,307 E.

W.P. 14-71-02M

BORING DATE November 21, 1972

DATUM Geodetic

BOREHOLE TYPE Washboring

ORIGINATED BY EW

COMPILED BY EW

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — w_L			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT				PLASTIC LIMIT — w_p				
							SHEAR STRENGTH P.S.F.				WATER CONTENT — w				
258.9	Ground Level														
0.0	Silty sand, trace clay.		1	SS	6									1 55 (44)	
	Loose		2	SS	8										
249.9			3	SS	2	250								0 25 73 2	
9.0	Silt, with sand, trace clay.		4	SS	8										
	Very loose to very dense.		5	SS	100	9"								0 38 (62)	
239.1			6	SS	110	3"									
19.8	End of Borehole					230									

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No 15

FOUNDATIONS OFFICE

W.P. 218-90-00

JOB 72-11119

LOCATION Co-ords. 932,425 N; 118,288 E.

 ORIGINATED BY EW

W.P. 44-71-02A



BORING DATE November 20, 1972

 COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY _____

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L				BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 20 40 60					
257.4	Ground Level														GR. SA. SI. CL.	
0.0	Sand, with silt, traces of clay and gravel.		1	SS	8	250									16 48 (36)	
	Loose		2	SS	5											0 73 (27)
245.9	Gravel with sand, trace silt. Compact		3	SS	2											67 30 (3)
243.4	Silt with sand, some clay, trace gravel.		4	SS	19	240									2 38 50 10	
239.4	Very Dense		5	SS	100/ft											
238.7	Shale		6	SS	100/ft											
19.3	End of Borehole					230										

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

RECORD OF BOREHOLE No 16

FOUNDATIONS OFFICE

W.P. 218-90-09

JOB 72-11119

LOCATION Co-ords. 932,497 N; 118,268 E.

ORIGINATED BY DW

W.P. 44-71-024

BORING DATE November 17, 1972

COMPILED BY EN

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — w_L			BULK DENSITY	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT				PLASTIC LIMIT — w_p				
							SHEAR STRENGTH P.S.F.				WATER CONTENT %				
							○ UNCONFINED + FIELD VANE				w_p — w — w_L				
							● QUICK TRIAXIAL x LAB VANE				20 40 60				
258.1	Ground Level														
0.0	Sandy silt, traces of clay and gravel.		1	SS	4										0 37 46 9
	Loose		2	SS	2	250									
			3	SS	7										
244.1			4	SS	6"										8 45 40 7
24.0	Sand with silt, some gravel, trace clay.		5	SS	100	9"									12 48 35 5
238.9	Very Dense		6	SS	100	2"	240								9 73 12 6
237.4	Shale		7	RC	75%										
20.7	End of Borehole					230									

OFFICE REPORT ON SOIL EXPLORATION

M E M O R A N D U M

To: Mr. M. Devata
Chief Foundation Engineer
Foundation Design Section

From: Structural Section
Central Region

Date: 20th January, 1992

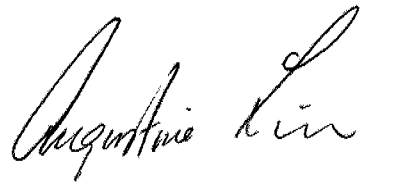
Attention: D. Dundas

Re: W.P. 218-90-00
Duffins Creek-Church Street Overpass
Highway 401, Site 22-120
District 6, Toronto

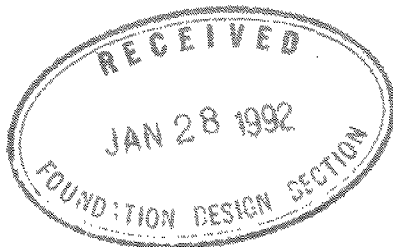
Enclosed please find a set of structural Drawings for the above captioned project for your review and comment. Please note that the scheme of rehabilitation has been changed from that shown on the General Arrangement Drawing submitted to you in November, 1990. Your response by 27th January, 1992 is appreciated.

Though the foundation recommendation is based on existing subsurface data from previous investigation when the existing structures were constructed, I feel that the contract should include necessary foundation information and the "Bore hole locations and soil strata" drawing since caissons are to be constructed. Would you please have these information and drawing available as soon as possible.

Thank you for your prompt attention.



Augustine Liu
Senior Structural Engineer
for
V. Boehnke
Head, Structural Section.



MEMORANDUM

(416) 235-3731

To: Volker Boehnke
Head, Structural Section
4th Floor, Atrium Tower
1201 Wilson Avenue

1991 03 14

Attn: Augustine Liu

From: Foundation Design Section
Room 315, Central Region, Downsview, Ontario
Central Region

Re: Expansion Joint Replacement
Duffins Creek - Church Street Overpass
W.P. 218-90-00, Site 22-120
Highway 401, District 6, Toronto

Further to our foundation recommendation dated 1990 12 14, we understand that the anticipated load on the proposed foundation to support the bridge during expansion joint replacement will be larger than recommended.

It is also understood that the repair of the bridge joint will take place in sections and as a result shifting of load will take place from one portion of the jacking frame to the another. The variation in vertical load from one group of jacking frame to another will cause differential settlement. We understand that the concrete deck will develop cracks if the differential settlement takes place and therefore, no differential settlement can be tolerated.

We recommend that to avoid any differential settlement the jacking frame should be supported on piles or caissons founded on shale bedrock. The bedrock is 5.5 to 7.6 m below existing ground surface.

Due to the restriction of vertical clearance under the bridge structure which is about 5m, pile driving with standard equipments may be difficult. The piles will have to be driven in short lengths and will have to be frequently spliced. In addition pile driving will cause vibration which may not be acceptable near existing structure.

Caissons can be constructed using a special utility rig which can be operated in a minimum clearance of 4m with caissons up to 0.76m in diameter.

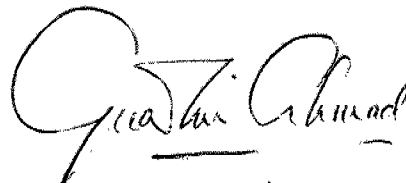
For the design purposes, the following values according to O.H.B.D.C. are recommended for piles and caissons founded on shale bedrock.

Factored Axial Capacity at U.L.S. for HP 310X79 piles	= 1150 kN
Factored Axial Capacity at U.L.S. for HP 310X110 piles	= 1600 kN
Factored Axial Capacity at U.L.S. for 0.76 ϕ caisson	= 2340 kN
Factored Axial Capacity at U.L.S. for 0.90 ϕ caisson	= 3290 kN
Factored Axial Capacity at U.L.S. for 1.20 ϕ caisson	= 5810 kN

} 54 Ton / #2

Bearing capacity at S.L.S. Type II will not govern.

Should you have any further questions, please advise.



Ken Ahmad, P. Eng.
Foundation Engineer

For

Murty Devata, P. Eng.
Chief Foundation Engineer

MINUTES OF MEETING

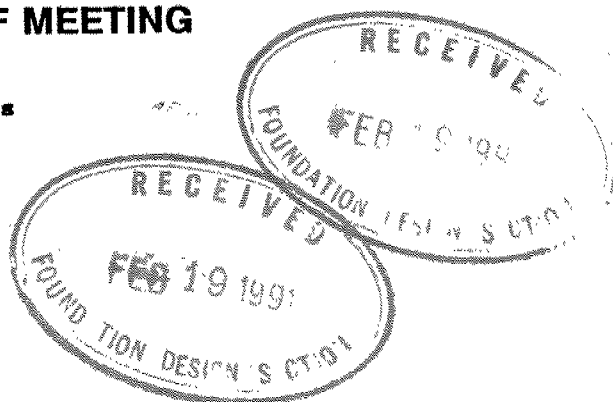
Subject: W.P. 218-90-00
Duffins Creek/Church Street Overpass
Hwy. 401, Site 22-120
District 6, Toronto

Date: 11th February, 1991

Time: 10:30 a.m.

Place: 4th Floor, Atrium Tower

Present: Stan Lepper
Ken Ahmed
Augustine Liu



Stan showed that 165 kpa SLS bearing capacity is required for the temporary support system with a 2 meter wide footing.

Ken said based on the existing soil data, 165 kpa was too high.

Further discussion showed that foundation settlement due to live load alone is in the range of 30 mm. As live load is only on half of the structure while the other half is under rehabilitation, cracking in the concrete deck due to differential settlement is a concern.

Ken is to investigate the feasibility and give recommendations of the following two options given that the vertical clearance under the structure is about 5 meters. The two options are :

1. Scaffolding sitting on footing which is supported on Caissons
2. Steel pile band extended to the structure soffit. Superstructure is jacked from a platform sitting on top of the pile band.

Meeting adjourned at 11:30 a.m.

Handwritten signature of Augustine Liu.

prepared by: Augustine Liu

P.S. Ajax Hydro confirmed that the underground cable east of Duffins Creek and in the vicinity of the east expansion joint has been abandoned.

MEMORANDUM

(416) 235-3731

To: Volker Boehnke
Head, Structural Section
4th Floor, Atrium Tower
1201 Wilson Avenue

1990 12 14

Attn: Augustine Liu

From: Foundation Design Section
Room 315, Central Region, Downsview, Ontario
Central Region

Re: Expansion Joint Replacement
Duffins Creek - Church Street Overpass
W.P. 218-90-00, Site 22-120
Highway 401, District 6, Toronto

This is in response to your memo dated November 26, 1990. We understand that it is required to replace the expansion bearings from the expansion joints of the existing bridges. In order to replace the bearings the bridges will have to be supported temporarily on Jacking Frames at the expansion joints. We have been asked to either provide foundation recommendations for the jacking frames or to advise if any foundation investigation is required for our recommendations.

We have reviewed the information available from an old investigation at this site and we feel that new subsurface investigation is not necessary. Details of the existing structures, subsurface conditions and our recommendations are as follows:

General

The site is located in Ajax, Ontario. The twin six span bridge which is carrying Highway 401 eastbound and westbound over Church Street and Duffins Creek, was originally constructed in 1940. The original bridges were about 13.5m wide and 131m long. In 1976 the bridges were expanded by adding 6.8m widening to both structures.

The bridges are founded on five piers and two abutments. The piers are designated as Pier A to Pier E (from west to east side). The end spans (on the east and west sides) are 19.4m long and the

middle spans are 23.0m long. Based on the information provided by the Structural Section and the information obtained from the Geocres 30M14-7, it is understood that the old bridge structures were founded on spread footings supported by shale bedrock. The new bridge widenings are founded on piles.

The bridges are divided in three segments (east, centre and west segments) by two expansion joints in each bridge. The west joint is provided between Pier A and Pier B and the east joint is provided between Pier D and E. The configuration of the joints is such that the east and west segments of the bridges can be pushed upwards at the joints, while the centre segment stays in place, in order to carry out maintenance work at the expansion joints.

The east jacking frame (proposed location between Pier D and Pier E) will be used to lift the east segment of the bridge at the joint and will be located east of Duffins Creek. The west jacking frame (proposed location between Pier A and Pier B) will be located on the east side of Church Street and will be used to support the west segment of the bridge. We understand that a very small displacement is required in order to perform the required work.

Subsurface Condition

The subsurface information was obtained from a foundation investigation report produced for the widening of Duffins Creek and Highway 401 Structure (Geocres 30M14-7). The proposed west jacking frame will be located near the old boreholes BH 8, 9 and 10, and the east jacking frame will be constructed close to old boreholes BH 14, 15 and 16. The ground surface elevations shown on those boreholes matches with the existing ground surface elevations. The subsoil consists of silty sand to sandy silt with some gravel and trace of clay, underlain by shale bedrock. The 'N' value in the upper portion of this non cohesive material ranges from 1 to 28 blows/0.3m which suggests that the upper 3.5 to 6.8m of this layer is very loose to compact. However, low 'N' value such as 1 and 2 blows could be due to unbalanced hydrostatic pressure. The average 'N' value is estimated to be 5 blows/0.3m. The lower portion of the overburden provided higher 'N' value which ranged from 34 blows to more than 100 blows/0.3m. This suggests that the lower portion of the overburden is in dense to very dense state. Shale bedrock was encountered in all boreholes at depths ranging from 5.5m to 7.6m below the ground surface.

Recommendations

The jacking frame should be constructed on reinforced concrete spread footing founded on a granular pad. The granular pad should be at least 1m thick and consist of compacted Granular 'A' material. The granular pad will extend at least 1m beyond the plan limit of the concrete footing. Once the existing material is removed to construct the granular pad, the subgrade should be

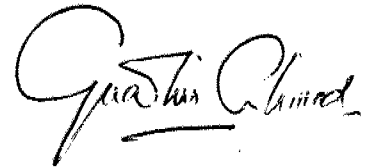
properly compacted (minimum 5 passes with a 8 tonne vibratory drum roller) before placing granular material. The granular material will be compacted according to MTO standard. The following bearing capacities as per OHBDC, may be achieved, provided the footing width does not exceed 2 m.

Factored Bearing Capacity at U.L.S. = 250 kPa
Bearing Capacity at S.L.S. Type II = 100 kPa

Total settlement is expected to be 38 mm, however, this will be of the elastic nature and instantaneous.

It is assumed that there is no underground utilities close to the proposed jacking frame locations. If there are any utilities please advise us and provide details about the type of utility, location and depth below the ground surface for our comments.

Should you have any further questions, please advise.

A handwritten signature in black ink, appearing to read 'Ken Ahmad', with a horizontal line underneath the name.

Ken Ahmad, P. Eng.
Foundation Engineer

For

D.H. Dundas, P. Eng.
Sr. Foundation Engineer

DOCUMENT MICROFILMING IDENTIFICATION

G.I.-30 SEPT. 1976

GEOCRES No. 30M14-7

DIST. 6 REGION Central

W.P. No. 44-71-02

CONT. No. 75-07

W. O. No. _____

STR. SITE No. _____

HWY. No. 401

LOCATION Widening of Duffins
Creek

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 34

REMARKS: 2 photographs are attached
2 documents to be unfolded
before microfilming

Mr. H. Greenland,
District Engineer,
District 6, Downsview.

Construction Office,
Third Floor,
Central Building.

Mr. D.A. MacDonald,
Construction Engineer.

April 29, 1976.

Re: Contract 75-07, W.P. 44-71-02,
Duffin's Creek Bridge Widening,
Site #22-120,
Highway 401, District 6.

This will confirm telephone recommendations of April 28th, 1976, given to Mr. R. Dixon of your field office regarding the preaugered piling on the above bridge.

Earlier, Mr. G. Buck of your field office, advised this office that no problem was encountered in preaugering the east pile of N. Pier "A" down to bedrock. However, during preaugering of the hole for the west pile, the auger stopped 10' above bedrock and could not be advanced further.

The construction site was visited by Mr. K. Selby, Soil Mechanics Section, Mr. H. Jagasia, Structural Design Office, and the writer on April 28th, 1976. Preliminary investigation suggested that the auger was being stopped by the existing bridge footing and that reaugering at a 4:1 batter instead of 6:1 may solve the problem. At 4:1 batter, the auger was able to advance past the existing footing.

Summary of recommendations:

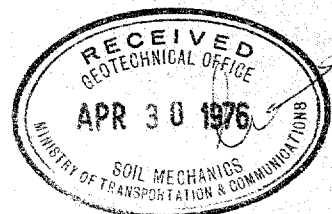
- a) All preaugered holes of each footing to be augered at 4:1 batter;
- b) If auger does not advance at 4:1 batter past existing footing, move the ^H piles closest to existing bridge, outwards by 6"; 4
- c) The non-preaugered H piles to be driven after success of "A" or "B" above.

W. T. Hashizume
W. T. Hashizume

Sr. Structural Construction Engineer.

WTH/db

c.c. R. Dorton
C. Mirza ✓





Memorandum

To: Mr. C. S. Grebski,
Structural Design Engineer.

From: Structural Office,
West Building, Downsview.

Attention:

Date: April 29, 1976.

Our File Ref.

In Reply to

Subject: Widening of Existing Duffins Creek &
Highway 401 Structure.
Contract 75-07,
W.P. 44-71-02 & -03, Site 22-120,
District #6.


I visited the above site with Messrs. K. Selby and P. Stuart of Soil Mechanics Section and W. Hashizume of Construction Branch on April 28th, 1976. The purpose of the visit was to assess causes for the refusal of auger to reach the desired depth as shown on the contract drawings for North Pier "A", and to recommend alternate arrangement.

Our investigation indicated that the auger was hitting the edge of the existing pier footing which is approximately at EL. 238.0. The batter was revised to 1:4 instead of 1:6. This cleared the existing footing and the further operation was carried out without any difficulty or extensive delay.

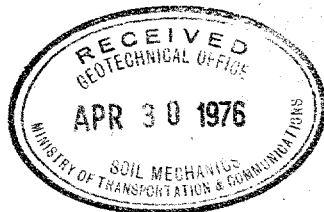
I have further discussed the matter with S. Ma who is design checker for the project. He agrees that the change in the batter is acceptable and this will not alter appreciably any design values.

In order to avoid the occurrence of the same again, I would recommend to change the batter to 1:4 for all piles which are to be pre-augered and are adjacent to the existing structure. It would be desirable to complete the augering for each footing prior to the driving of any H-piles. This will enable us to adjust the spacing between the piles, if the need arises.

HKJ/cf


H. K. Jagasia,
Structural Project Engineer.

c.c. Dr. R. Dorton
A. E. McKim
K. Selby
W. McFarlane



To: Mr. R.S. Pillar,
Regional Manager,
Systems Design,
3501 Pufferin Street.

From: Structural Office,
West Building,
Downsview, Ontario.

Attention:

Date: January 14, 1975.

Our File Ref.

In Reply to

Subject:

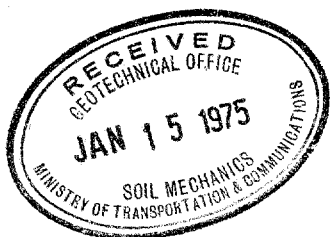
Widening of Existing Duffins Creek Bridge
W.P. 44-71-02 & 03, Site 22-120
Hwy. #401, District #6

Please revise the special provision "Driving Steel "H" Piles" to read as follows:

The contract unit price for the above tender item shall include all labour, material and equipment for predrilling holes for the piles as shown on the contract drawings and as described herein.

At the pile locations as shown on the drawings, a hole sufficiently large to permit insertion of the pile and casing if required, shall be drilled to bedrock. Suitable temporary casing shall be installed, if required, to stabilize the walls of the hole. As soon as a hole is drilled, the pile shall be placed in the hole and temporary casing, if installed, shall then be removed. The cavity around the pile shall then be filled with granular 'B' material. After piles are installed, they shall be advanced by means of a conventional piling hammer to ensure contact with the bedrock, as determined by the Engineer. As the piles are being hammered additional granular 'B' materials shall be added to fill new cavities if they form.

The Contractor shall notify the Engineer in writing of his proposed scheme of his work at least two weeks prior to commencement of this work.



WMCF/ac
Attch.

c.c. J. Wear
H. Greenland
K.C. Howe
N. Zoltay

B. Giroux
A.E. McKim
G. Burkhardt
K. Selby ✓

W. McFarlane
W. McFarlane,
Reg. Structural Design Engineer.

NORTH STRUCTURE

SOUTH STRUCTURE

LOCATION	NO. REQ	LENGTH	LOCATION	NO REQ	LENGTH
W. ABUT.	9	42	W. ABUT	9	31
PIER A	8	32	PIER A	8	28
B	8	22	B	8	23
C	8	23	C	8	21
D	?	10	D	?	10
E	8	21	E	8	23
E ABUT	11	23	E. ABUT	9	23

Calculated by P. Stuart.

Approved to W. McFarlane
Feb. 14th 1975

K. L. Sullivan

44-71-02

- SEQUENCE OF CONSTRUCTION**
2. REMOVE EXISTING CONCRETE AS REQU'D. ADJACENT TO NEW EXTENSION.
 3. CONSTRUCT NEW EXTENSION AND PLACE EXPANSION JOINT AND ASPHALT WITHIN LIMITS OF ~~STAGE I~~. CONSTRUCTION IN STAGE I
 3. RE-ROUTE TRAFFIC OVER COMPLETED PORTION AND REMOVE EXISTING CONCRETE AND ASPHALT AS SHOWN IN STAGE II. CONSTRUCT BARRIER WALL AND REPAIR EXISTING DECK. PLACE NEW JOINTS, WATERPROOF AND PLACE ASPHALT.
 4. RE ROUTE TRAFFIC REMOVE EXISTING ASPHALT, REPAIR EXISTING DECK, PLACE WATERPROOFING AND ASPHALT IN STAGE III (AT THE LOCATION OF ~~STAGE I~~ ~~STAGE II~~ ~~STAGE III~~ ~~STAGE IV~~) No
 5. RE ROUTE TRAFFIC ~~STAGE IV~~ AS SHOWN ON GRADING DRAWINGS

WHERE? AS SHOWN

WHAT IS ST

CONSTR. JOINT
ROUGH SURFACE

AS SHOWN IN

SEQUENCE OF CONSTRUCTION NOTES SHOULD BE READ IN CONJUNCTION WITH SHEET 14- AND THE DRAWING SHOWING THE TRAFFIC STAGING IN THE GRADING DWGS.

AG030

A1125 S PIER 'D'
A1132 N PIER 'D'

A1124 S PIER 'D'
A1131 N PIER 'D'

HP 12x74 PILES					
NORTH STRUCTURE			SOUTH STRUCTURE		
LOCATION	NO. REQ'D	LENGTH	LOCATION	NO. REQ'D	LENGTH
W. ABUT.	9 35 36	34'-0"	W. ABUT.	9	30'-0"
PIER 'A'	8 31 27	25'-0"	PIER 'A'	8	22'-0"
" 'B'	8 21 20	18'-0"	" 'B'	8	18'-0"
" 'C'	8 22 15	13'-0"	" 'C'	8	15'-0"
" 'D'	NIL 9		" 'D'	NIL	
" 'E'	8 20 18	16'-0"	" 'E'	8	19'-0"
E. ABUT.	11 20 22	15'-0"	E. ABUT.	9	19'-0"

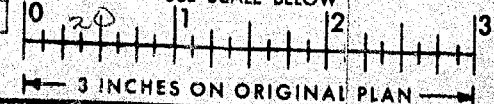
5



31' 28
25' 27
20' 22
16' 20
21' 22
10' 20

FOR REDUCED PLAN

USE SCALE BELOW



4339

FOUNDATION INVESTIGATION REPORT
For
Widening of Duffins Creek
Bridge on Hwy. 401
District 6 (Toronto)
W.O. 72-11119 -- W.P. 44-71-02

1. INTRODUCTION:

A request for a foundation investigation for the proposed widening of the existing structure at the crossing of Highway 401 and Duffins Creek was received from Mr. G. C. E. Burkhardt, Regional Structural Planning Engineer, Central Region, in a memo dated October 16, 1972.

A field investigation has been carried out by the Foundations Office to determine the subsoil conditions at this site. This report contains the results of the field investigation and our recommendations pertaining to the design and construction of the foundations of the proposed widening.

2. SITE CONDITIONS:

This site is located near Pickering in the Iroquois Plain physiographic region of Southern Ontario. The surrounding terrain is generally flat. This site is found in the valley formed by Duffins Creek. In the vicinity of Pickering, this region is characterized by bluffs and gravel bars which mark the old shoreline of Lake Iroquois. Below the old shoreline there is a strip of boulder pavement and sandy off-shore deposits which varies from one half to three miles in width. This coarse sandy soil is fairly level but often poorly drained.

The existing dual structure consists of two, seven span, reinforced concrete bridges which are in good condition. Besides crossing Duffins Creek, the structure also crosses Church Street and a number of underground utilities. Near the west end of the structure there are underground natural gas and water pipelines and a buried telephone cable. Near the east end there is a buried hydro line which is exposed at one point.

Bridge piers adjacent to the creek have been protected against erosion. On the east side of the creek the adjacent bridge piers are protected by concrete slabs which cover the creek bank over a length of 250 feet. On the west side of the creek the adjacent piers are located 5 feet from the bank on the south end and 15 feet from the bank on the north end. The bank is not protected and some erosion has occurred. However, grouted rip-rap has been placed around the piers to protect against erosion of the soil covering the pier footings.

3. FIELD AND LABORATORY WORK:

The field work consisted of 22 sampled boreholes and two dynamic cone penetration tests which were placed at the proposed footing locations. Another twelve unsampled boreholes and one cone test were placed the existing foundations to determine the depth of the existing footings.

The boreholes were advanced either by continuous flight, hollow stem auger equipment mounted on a Bombardier or by diamond drilling equipment modified for soil sampling purposes. Disturbed samples were obtained using a 2-inch O.D. split-spoon sampler driven according to the specifications for the Standard Penetration Test. BX or BXL rock cores were obtained at the bottom of some boreholes.

The two dynamic cone penetration tests placed adjacent to sampled boreholes, were advanced with a driving energy of 350 ft.-lbs. per blow. A third cone test at an existing footing location was advanced manually.

The locations and elevations of the sampled boreholes and adjacent cone tests are marked on Drawing #72-11119A accompanying

this report. The elevations of existing footings determined by unsampled boreholes are given in Section 7.2) of this report.

Samples were examined visually in the field and again in the laboratory. Tests were performed on selected samples to determine the natural moisture content and grain-size distribution.

The results of the field and laboratory tests are given in the Record of Borehole sheets which are contained in the Appendix of this report.

4. SUBSOIL CONDITIONS:

The subsoil at this site is a granular material which varies from silt with some sand to sand with some silt. Pockets of sand with gravel to gravel with sand are also present. The overburden is underlain by shale bedrock.

The subsoil layers differ in width and composition across the site. There is no general pattern of subsoil stratigraphy. The subsoil layers are shown on the Record of Borehole sheets and on Drawing 72-11119A which gives profiles at each pier and abutment location and along the centre-line of the structure.

The results of the laboratory tests indicate that the natural moisture content of the subsoil varies from 5% to 25% with pockets of soil at moisture contents as high as 60%. Standard Penetration 'N' values indicate that the subsoil is very loose to compact nearest the ground surface and becomes very dense at depths greater than 6 to 23 feet below ground level.

5. BEDROCK CONDITIONS:

The bedrock is a shale. Rock core samples from Boreholes No. 6 and 13 were examined by Mr. K. Ingham, Geologist, and his report is as follows:

A brief description is given for two boreholes drilled to bedrock at this site, together with the appropriate bedrock elevations.

The rock is shale typical of the Collingwood formation; generally thin to medium bedded but platy bedded and highly

fragmented where weathered near the surface. Due to poor recovery of this weathered material a precise interpretation of the upper layers of bedrock is impossible. However, a weathered zone of approximately 3.5 ft. in hole 6 and 9.0 ft. in hole 13 apparently overlies the fresh bedrock for which the elevations are given below.

Hole No. 6

Bedrock at 228.2

33.4 - 43.4 Dark brownish grey shale; firm, generally medium bedded with occasional thin bedded sections.

Hole No. 13

Bedrock at 229.6

25.5 - 27.7 Dark brownish grey shale; thin to platy bedded, moderately fractured and weathered throughout with occasional highly weathered layers.

27.7 - 34.0 Dark brownish grey shale; thin to medium bedded,
evidence of minor weathering along bedding planes.

6. GROUNDWATER CONDITIONS:

Groundwater levels are given on the Record of Borehole sheets. In general, the groundwater level is from 1 to 5 feet below ground level at the abutments and follows the slope of the natural ground surface at depths of 5 to 9 feet, down to the creek water level. The water level in the creek on December 6, 1972, was at an elevation of 250.2 feet.

7. DISCUSSION AND RECOMMENDATIONS:

7.1) General:

It is proposed to widen the existing structure as part of the planned widening of Hwy. 401 in this area. This construction will require that the existing piers be extended by 20 feet on each side of the dual structure. It may also be necessary to close the gap between the existing twin bridges.

The existing foundations consist of spread footings on bedrock or in very dense overburden. The bottoms of these footings are from 18 to 23 feet below ground level.

The subsoil is of a granular nature consisting mainly

of silt with some sand to sand with some silt. Pockets of sand with gravel to gravel with sand are also present. The overburden is underlain by shale bedrock. The ground water level ranges from 1 to 9 feet below the ground surface.

7.2) Pile Foundations:

Because of the deep excavations required for spread footings and because of the expense of dewatering these excavations, spread footings are not advisable at this location. Great care would be required in dewatering deep excavations because even slight 'boiling' of the bottom of an excavation adjacent to an existing footing could undermine that footing. Also, dewatering of the subsoil, from below the level of the existing footings is not advisable because of the possibility of inducing settlement of the existing structure. For these reasons it is recommended that the proposed structure widening be founded on end bearing piles driven to bedrock.

If 12 BP 74 piles are used then a maximum allowable load of 95 tons per pile can be incorporated into the design of the structure extension. Table 7-1 gives the estimated elevations of the bottoms of the existing footings. Table 7-2 gives elevations of pile tips driven to bedrock.

TABLE 7-1: *Estimated Elevations of Bottoms of Existing Footings*

<u>Location</u>	<u>Estimated Elevation (feet)</u>
West Abutment, Sta. 303 + 39	242.6 ₊
Pier 'A', Sta. 304 + 04.75	242.6 ₊
Pier 'B', Sta. 304 + 80.25	237.7 ₊
Pier 'C', Sta. 305 + 55.75	236.6 ₊
Pier 'D', Sta. 306 + 31.25	239.2 ₊
Pier 'E', Sta. 307 + 06.75	Between 239 and 243
East Abutment, Sta. 307 + 72.50	Between 241 and 245

TABLE 7-2: Elevations of Piles Driven to Bedrock

Location	Left Side of Structure	Centreline of Structure	Right Side of Structure
West Abutment, Sta. 303 + 39	231 ₊	235 ₊	234 ₊
Pier 'A', Sta. 304 + 04.75	232 ₊	235 ₊	237 ₊
Pier 'B', Sta. 304 + 80.25	237 ₊	236 ₊	237 ₊
Pier 'C', Sta. 305 + 55.75	237 ₊	236 ₊	235 ₊
Pier 'D', Sta. 306 + 31.25	239 ₊	239 ₊	239 ₊
Pier 'E', Sta. 307 + 06.75	239 ₊	239 ₊	236 ₊
East Abutment, Sta. 307 + 72.50	241 ₊	241 ₊	241 ₊

7.3) Construction Considerations:

In order to protect the pile caps against frost action, all pile caps should be placed at a depth below final ground level of at least 4 feet. All pile caps should be placed in the dry. This will necessitate dewatering schemes for excavations for pile caps at the east and west abutments, ~~at the east and west abutments,~~ at Pier 'A', and Pier 'D' and at the north end of Pier 'E'. Water should not be pumped from the subsoil from below the level of the existing footings as this may cause settlement of the existing structure.

There should be no interaction between the existing structure and the proposed extensions. Interaction would be unadvisable because of the possibility of differential settlement which could cause a shift in the stresses in the existing and proposed structures. It is, therefore, recommended that the proposed extensions be built completely independent of the existing structure utilizing a vertical expansion joint.

Since the ends of existing footings are not known exactly, it is recommended that piles immediately adjacent to existing footings be preaugered to ensure that they do not interact with the existing footings.

Erosion protection has been placed along the banks of the existing stream. The Hydrology Office should be consulted

to determine if this protection is adequate for the widened structure and to determine the effects of the disturbance of this protection during construction.

Because of the granular nature of the subsoil, there should be no embankment stability problems. All settlements of the subsoil below the widened embankments should occur immediately during construction.

8. MISCELLANEOUS:

The field work for this project was carried out during the period of October 31 to November 23, 1972, under the supervision of Mr. E. A. Wood, Project Foundations Engineer. The equipment was owned and operated by Canadian Longyear Ltd. and Dominion Soils Ltd.

This report was written by Mr. E. A. Wood and reviewed by Mr. K. G. Selby, Supervising Foundations Engineer.

E A Wood

E. A. Wood

K. G. Selby

K. G. Selby, P. Eng.

EAW/ao

Jan. 22/73

APPENDIX I

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO. 1

JOB 72-11119

LOCATION Co-ords. 932,279 N; 118,029 E.

ORIGINATED BY EW

W.P. 44-71-024

BORING DATE November 15, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			w_p — w — w_L				
							<input type="radio"/> UNCONFINED <input checked="" type="radio"/> QUICK TRIAXIAL	<input type="radio"/> + FIELD VANE <input checked="" type="radio"/> x LAB VANE		WATER CONTENT % 20 40 60				
264.7	Ground Level													
0.0	Silty sand, traces of clay & gravel.													2 52 42 1
260.7	Compact		1	SS	20	260								27 34 38 1
4.0	Sandy silt, some gravel trace of clay.		2	SS	31									7 40 49 4
256.2	Dense		3	SS	100									43 41 15 1
8.5	Gravelly sand, traces of silt & clay.		4	SS	100									60 33 (7)
	Very Dense		5	SS	100	250								
			6	SS	100									16 74 (10)
243.5			7	SS	100									
21.2	Sandy silt, traces of gravel & clay.		8	SS	100	240								5 34 52 9
	Very Dense		9	SS	100									8 43 45 4
234.5			10	SS	100									
233.0	Shale		11	BA	85									
31.7	End of Borehole					230								

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 2

JOB 72-11119

LOCATION Co-ords. 932,346 N; 118,005 E.

ORIGINATED BY EW

W.P. 44-71-028

BORING DATE November 15, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY *EW*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.				w_p	w	w_L		
262.3	Ground Level						O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 20 40 60				
0.0	Silty sand, some gravel, trace clay.					260									
	Very Loose to		1	SS	2										3 49 (48)
	Compact.		2	SS	12										21 44 (35)
251.1			3	SS	21										
11.2	Sand with gravel, trace silt.		4	SS	80	250									39 52 (9)
	Very Dense		5	SS	100/4"										26 66 (8)
			6	SS	100/4"										
			7	SS	100/1"	240									
237.3			8	SS	100/0"										12 77 (11)
235.3	Sand, some silt, trace clay & gravel.		9	SS	100/4"										9 62 (29)
27.0			10	SS	100/4"										
233.1	Shale			RC	100%										
29.2	End of Borehole					230									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 3

JOB 72-11119

LOCATION Co-ords. 932,417 N; 117,983 E.

ORIGINATED BY EW

W.P. 44-71-02A


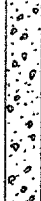

BORING DATE November 14, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY JR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			w_p w w_L WATER CONTENT % 20 40 60					
263.8	Ground Level														
0.0	Sandy silt, some clay		1	SS	5	260								8 38 45 9	
	trace of gravel.		2	SS	13										2 37 53 10
			3	SS	8										4 52 (42)
	Loose		4	SS	5										1 36 52 11
247.8			5	SS	12										
16.0	Sand, some gravel and silt.		6	SS	100/4"	240									
			7	SS	100/4"										17 65 (18)
			8	SS	100										
	Very Dense		9	SS	100/1"										30 61 (9)
231.3			10	SS	100/9"										
32.5	Shale		11	SS	100/9"	230									
224.5			12	SS	100/4"										
39.2	End of Borehole		13	SS	100/4"										
						220									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 4

JOB 72-11119

LOCATION Co-ords. 932,293 N; 118,077 E.

W.P. 44-71-024

BORING DATE November 16, 1972

ORIGINATED BY EW

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Hollow Stem Auger

CHECKED BY CR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.				w_p	w	w_L		
263.6	Ground Level						O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL X LAB VANE				WATER CONTENT % 20 40 60				
0.0	Sand, some silt and gravel, trace clay.		1	SS	22	260									2 63 (35)
			2	SS	100/7	"									45 37 (18)
	Compact to Very Dense		3	SS	100/7	0"									
250.6			4	SS	100/7	"	250								3 29 (68)
13.0	Gravelly sand, trace silt & clay.		5	SS	100/7	"									46 45 (9)
			6	SS	100/7	"									
	Very Dense		7	SS	100		240								9 81 (10)
236.6			8	SS	80										
235.3	Shale		9	SS	100/7	"									
28.3	End of Borehole		10	SS	100/7	"	230								

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 5

JOB 72-11119

LOCATION Co-ords. 932,360 N; 118,057 E.

ORIGINATED BY EN

W.P. 44-71-02

BORING DATE November 10, 1972

COMPILED BY EJ

DATUM Geodetic

BOREHOLE TYPE Hollow stem Auger

CHECKED BY CR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		w_p w w_L	WATER CONTENT % 20 40 60		
262.6	Ground Level											
0.0	Silt, some sand and clay, trace of gravel.		1	SS	3	260						3 26 61 10
	Loose		2	SS	6							
251.6			3	SS	8							
11.0	Sand, some silt, trace gravel & clay.		4	SS	11	250						6 72 (10)
	Loose to Very Dense		5	SS	7							
			6	SS	43							
			7	SS	100 7/8"	240						9 71 (20)
			8	SS	100 7/8"							
235.3			9	SS	100 7/8"							
234.1	Shale		10	SS	100 7/8"							
28.5	End of Borehole					230						

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 6

JOB 72-11119

LOCATION Co-ords. 932,427 N; 118,042 E.

ORIGINATED BY EW

W.P. 44-71-020

BORING DATE November 9, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Hollow stem auger

CHECKED BY *[Signature]*

SOIL PROFILE		SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w				BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % w_p w w_L 20 40 60						
261.6	Ground Level														GR. SA. SI. CL.	
0.0	Sandy silt, some clay, trace gravel.		1	SS	7	260									8 36 42 11	
	Loose		2	SS	5	250									0 39 57 42	
			3	SS	5										43 48 (9)	
246.6			4	SS	6										2 71 (27)	
15.0	Sand, with gravel, some silt, trace clay.		5	SS	22	240									30 50 14 6	
	Very Dense		6	SS	100 7"											27 62 (11)
			7	SS	100 3"											
			8	SS	100 8"											
231.9			9	SS	100 5"	230										
29.7	Shale		10	SS	100 4"											
		11	SS	100 5"												
		12	RC	100%												
218.2		13	RC	95%	220											
43.4	End of Borehole															
					210											

OFFICE REPORT ON SOIL EXPLORATION

ORIGINATED BY 191

COMPILED BY EW

CHECKED BY

20
15 ϕ 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 8

JOB 72-11119

LOCATION Co-ords. 932,322 N; 118,145 E.

ORIGINATED BY EW

W.P. 44-71-028

BORING DATE November 1, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring & Cone Test

CHECKED BY AR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT 20 40 60 80 100	LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W Wp — W — WL	BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT					
260.8	Ground Level									
0.0	Silty sand, some gravel, trace clay.		1	SS	16					14 61 (25)
			2	SS	2					
	Very Loose to Compact		3	SS	1					21 47 (32)
			4	SS	5					
241.8			5	WS	-					
19.0	Silt and sand, some gravel, trace clay.		6	SS	90					14 45 (41)
236.8	Very Dense		7	RC	70%					
24.0	Shale		8	RC	0%					
233.8										
27.0	End of Borehole									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 9

JOB 72-11119

LOCATION Co-ords. 932,381 N; 118,132 E.

ORIGINATED BY EW

W.P. 44-71-020

BORING DATE November 13, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY JR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.				w_p	w	w_L		
260.8	Ground Level						O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 20 40 60				
0.0	Silty sand, traces of clay and gravel. Loose		1	SS	9	260									5 58 31 6
			2	SS	11										1 55 37 7
			3	SS	2	250									6 37 46 1
			4	SS	4										7 26 62 5
			5	SS	13										
			6	SS	6	240									
238.3			7	SS	72										
235.8	Silt with sand, trace of gravel & clay. V. Dense		8	SS	100										
235.0	Shale		9	RC	100	1"									
232.3			10	RC	90%										
28.5	End of Borehole					230									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 10

JOB 72-11119

LOCATION Co-ords. 932,448 N; 118,111 E.

ORIGINATED BY EW

W.P. 44-71-025

BORING DATE November 10, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY *12*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			w_p — w — w_L WATER CONTENT % 20 40 60					
							O UNCONFINED + FIELD VANE • QUICK TRIAXIAL x LAB VANE								
260.9	Ground Level					260								GR SA SI CL	
0.0	Silt with sand, some clay, trace gravel.		1	SS	28	250								5 25 51 15	
			2	SS	9										
			3	SS	18										
	Very Loose to Compact		4	SS	3										4 27 64 5
245.9			5	SS	34	240									
15.0	Sand, some silt, trace gravel.		6	SS	100										9 62 (26)
	Dense to Very Dense		7	SS	100										9 68 21 1
236.8	Shale		8	SS	100										
24.1	End of Borehole					230									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE N^o11

JOB 72-11119

LOCATION Co-ords. 932,326 N; 118,225 E.

ORIGINATED BY EW

W.P. 44-71-026

BORING DATE November 3, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY *HR*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			WATER CONTENT %					
							ϕ UNCONFINED ● QUICK TRIAXIAL	+ FIELD VANE x LAB VANE		w_p — w — w_L					
255.0	Ground Level														
0.0	Sand, some gravel and silt.		1	SS	7	250								19 63 (18)	
246.0	Loose to Compact		2	SS	23										13 41 (46)
9.0	Gravelly sand, some silt.		3	SS	36										37 48 (15)
			4	SS	100		6"								
			5	SS	100		4"								
235.5	Dense to Very Dense		6	SS	100	4"								34 54 (12)	
19.5	Shale		7	SS	100	3"									
228.5				8	RC	60%	230								
26.5				10	RC	60%									
26.5	End of Borehole														
						220									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 12

JOB 72-11119

LOCATION Co-ords. 932,403 N; 118,206 E.

ORIGINATED BY EW

W.P. 14-71-020

BORING DATE November 7, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY SR

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.				W_P	W	W_L		
256.4	Ground Level														
0.0	Sand with silt, trace clay and gravel.		1	SS	6										8 54 (38)
	Loose		2	SS	3	250									
245.4			3	SS	7										
11.0	Gravelly sand, some silt.		4	SS	58										37 40 (2)
240.4	Very Dense		5	SS	67	240									
16.0	Silty sand, traces of gravel & clay. V. Dense		6	SS	101	3"									6 48 41
236.4	Chute		7	SS	103	1"									
20.1	End of Borehole					230									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 13

JOB 72-11119

LOCATION Co-ords. 932,468 N; 118,187 E.

ORIGINATED BY EW

W.P. 44-71-024

BORING DATE November 8, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY *EW*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			BULK DENSITY γ P.C.F.	REMARKS		
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % 20 40 60						
255.1	Ground Level															
0.0	Sand, some silt, trace gravel.		1	SS	3	250								4 79 (17)		
250.6	Very Loose		2	SS	100		6"									
4.5	Sand with gravel, some silt, trace clay.		3	SS	19											
			4	SS	100		2"									
			5	SS	100		5"	24								
236.7	Very Dense	6	SS	100	6"									28 47 (25)		
18.4	Shale		7	RC	0%	230										
			8	SS	100		3"									
			9	RC	40%											
			10	RC	75%											
221.1			11	RC	100%											
34.0	End of Borehole					220										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 14

JOB 72-11119

LOCATION Co-ords. 932,358 N; 118,307 E.

ORIGINATED BY EW

W.P. 44-71-02X

BORING DATE November 21, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.				w_p	w	w_L		
258.9	Ground Level						O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % 20 40 60			P.C.F.	GR. SA. SI. CL.
0.0	Silty sand, trace clay.		1	SS	6										1 55 (44)
	Loose		2	SS	8										
249.9			3	SS	2	250									0 25 73 2
9.0	Silt, with sand, trace clay.		4	SS	8										
	Very loose to very dense.		5	SS	100	9"									0 38 (62)
239.4	Shale		6	SS	100	3" 240									
239.1			7	SS	100	3"									
19.8	End of Borehole														
						230									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 15

JOB 72-11119

LOCATION Co-ords. 932,425 N; 118,288 E.

ORIGINATED BY EW

W.P. 44-71-02X

BORING DATE November 20, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				W_P	W	W_L		
257.4	Ground Level														
0.0	Sand, with silt, traces of clay and gravel.		1	SS	8										16 48 (36)
			2	SS	5	250									0 73 (27)
245.9	Loose		3	SS	2										
243.4	Gravel with sand, trace silt. Compact		4	SS	19										67 30 (3)
243.4	Silt with sand, some clay, trace gravel.		5	SS	100 7"										2 38 50 10
239.4	Very Dense		6	SS	100 7"	240									
238.7	Shale		7	SS	100 7"										
19.3	End of Borehole					230									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 16

JOB 72-11119

LOCATION Co-ords. 932,497 N; 118,268 E.

ORIGINATED BY EW

W.P. 44-71-02A

BORING DATE November 17, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L			BULK DENSITY γ	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % 20 40 60				
258.1	Ground Level													
0.0	Sandy silt, traces of clay and gravel.		1	SS	4	250								0 37 46 9
	Loose		2	SS	2									
			3	SS	7									
244.1			4	SS	100	6"								8 45 40 7
14.0	Sand with silt, some gravel, trace clay.		5	SS	100	9"								12 48 35 5
238.9	Very Dense		6	SS	100	2"	240							9 73 12 6
237.4	Shale		7	RC	75%									
20.7	End of Borehole													
						230								

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE N^o17

JOB 72-11119

LOCATION Co-ords. 932,377 N; 118,369 E.

ORIGINATED BY EW

W.P. 44-71-02A

BORING DATE November 21, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY *CR*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			w_p — w — w_L WATER CONTENT % 20 40 60				
259.1	Ground Level													
0.0	Sandy silt, traces of gravel and clay.		1	SS	8	250								5 42 48 5
	Loose		2	SS	7									
247.6			3	SS	7									
11.5	Sand, some silt, trace gravel and cobbles.		4	SS	7	240								1 78 20 1
	Loose to Very Dense		5	WS	-									
			6	SS	18									
236.1			7	SS	100									
236.1	State		8	RC	10%									
23.5	End of Borehole					230								

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 18

JOB 72-11119

LOCATION Co-ords. 932,443 N; 118,351 E.

ORIGINATED BY EW

W.P. 44-71-028

BORING DATE November 22, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Washboring

CHECKED BY *EW*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT _____		LIQUID LIMIT _____ w_L PLASTIC LIMIT _____ w_p WATER CONTENT _____ w		BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		w_p — w — w_L WATER CONTENT % 20 40 60				
259.6	Ground Level												
0.0	Sandy silt, traces of clay & gravel.		1	SS	5								6 45 (19)
	Very Loose to Loose		2	SS	2								
			3	SS	3								
			4	SS	4								
244.6												4 38 (58)	
15.0	Sand, some gravel and silt, trace clay.		5	SS	7							25 45 23 7	
238.6	Very Dense Shale		6	SS	93							21 67 (12)	
			7	SS	122								
21.5	End of Borehole												
						230							

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

 RECORD OF BOREHOLE N^o19

JOB 72-11119

LOCATION Co-ords. 932,509 N; 118,332 E.

 ORIGINATED BY EW

 W.P. 44-71-026

BORING DATE November 20, 1972

 COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Hollow stem auger

CHECKED BY _____

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			WATER CONTENT % 20 40 60				
259.9	Ground Level													
0.0	Silty sand, some gravel, trace clay. Dense		1	SS	33									
254.4			2	SS	6									
5.5	Silt with sand, trace clay.		3	SS	4	250								2 11 80 7
247.2	Loose		4	SS	5									0 40 56 4 0 64 (36)
12.7	Sand with silt, some gravel, trace clay.		5	SS	31									25 46 (29)
239.4	Loose to Very Dense		6	SS	100	11" 240								2 61 (37)
230.7	Shale		7	SS	200	3"								
21.2	End of Borehole													
						230								

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE N^o20

JOB 72-11119

LOCATION Co-ords. 932,394 N; 118,429 E.

ORIGINATED BY EW

W.P. 114-71-027A

BORING DATE November 21, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Hollow stem auger

CHECKED BY *EW*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F.			w_p — w — w_L WATER CONTENT % 20 40 60				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE							
261.3	Ground Level													
0.0	Silt with sand, some clay, trace gravel.		1	SS	3	260								8 29 49 11
254.8	Very Loose		2	SS	17									
6.5	Sand with silt, traces of gravel & clay.		3	SS	79	250								0 63 33 1
246.3	Compact to Very Dense		4	SS	100	5"								
15.0	Sandy gravel, traces of silt & clay.		5	SS	100	5"								
241.0	Very Dense		6	SS	100									58 35 (7)
240.1	Shale		7	SS	100	2"								
21.2	End of Borehole													
						230								

RECORD OF BOREHOLE NO 21

JOB 72-11119

LOCATION Co-ords. 932,459 N; 118,410 E.

ORIGINATED BY EW

W.P. 44-71-028

BORING DATE November 21, 1972

COMPILED BY EW

DATUM Geodetic

BOREHOLE TYPE Hollow stem auger

CHECKED BY *SK*

SOIL PROFILE		STRAT. PILOT	SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT		LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION		NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE		w_p — w — w_L WATER CONTENT % 20 40 60			
262.5	Ground Level											
0.0	Silt with sand, some gravel, trace clay.		1	SS	3	260						9 25 59 7
253.5	Very Loose		2	SS	3							
9.0	Sand with silt, some gravel, trace clay.		3	SS	2	250						26 39 25 10
	Very Loose		4	SS	2							
244.0			5	SS	3							17 46 28 9
18.5	Sand, some silt, trace grav.		6	SS	32							9 79 (12)
241.2	Dense to V. Dense											
240.0	Shale		7	SS	100	5"						
22.5	End of Borehole					230						

OFFICE REPORT ON SOIL EXPLORATION

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 22

JOB 72-11119

LOCATION Co-ords. 932,520 N; 118,390 E.

ORIGINATED BY EW

W.P. 44-71-029

BORING DATE November 20, 1972

COMPILED BY EW

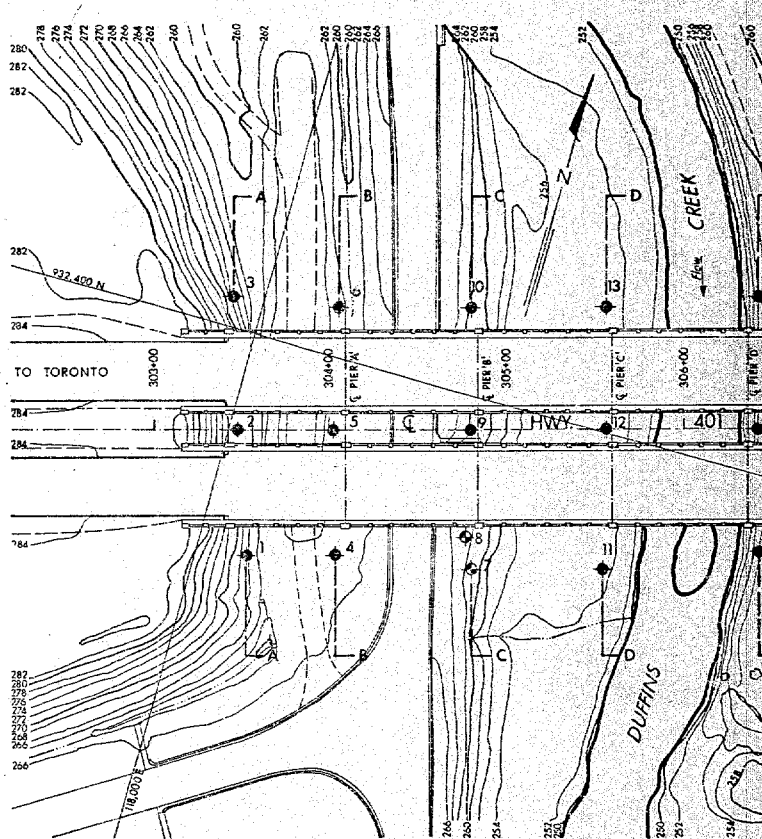
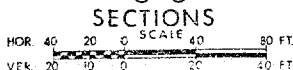
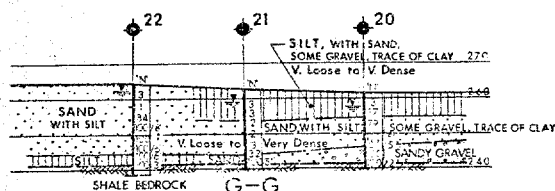
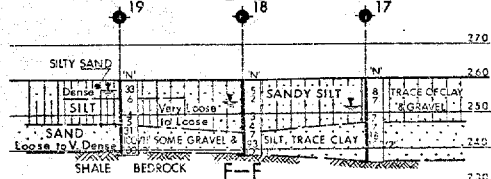
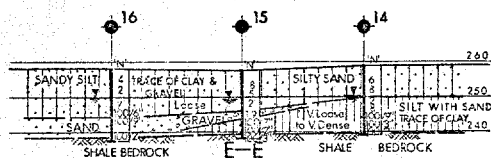
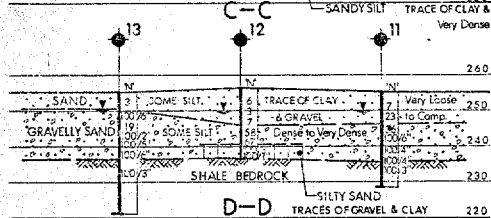
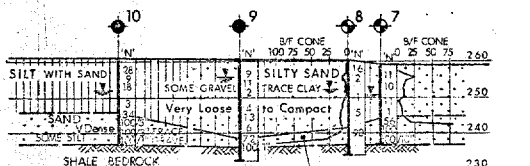
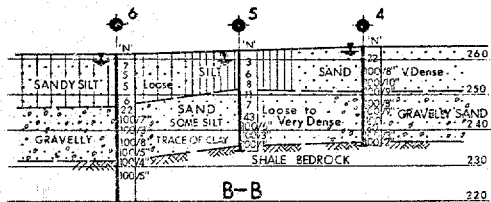
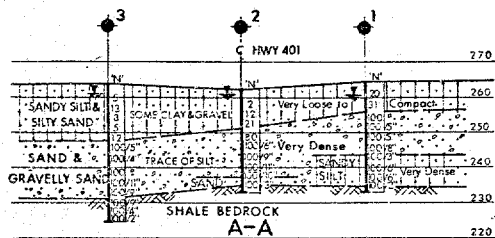
DATUM Geodetic

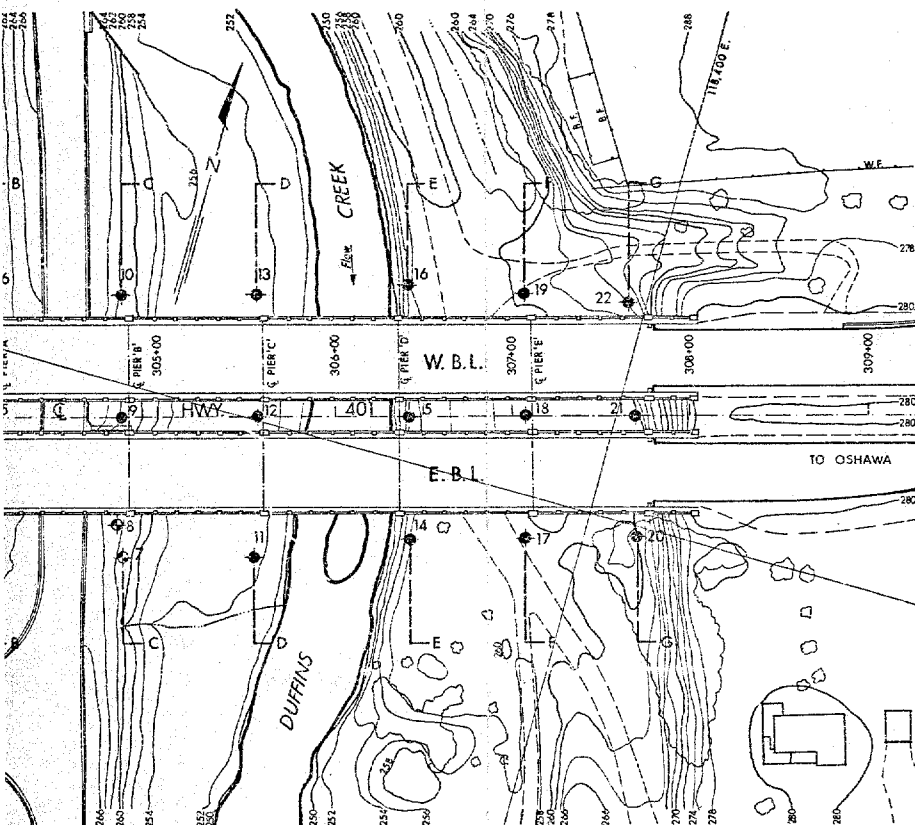
BOREHOLE TYPE Hollow stem auger

CHECKED BY *EW*

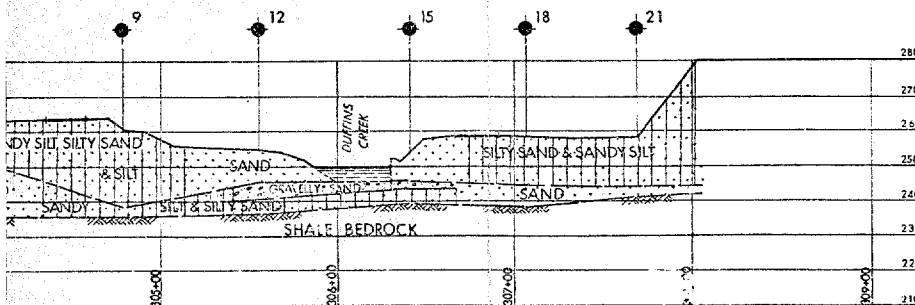
SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT			LIQUID LIMIT W_L PLASTIC LIMIT W_P WATER CONTENT W			BULK DENSITY 7 P.C.F.	REMARKS GR. SA. SI. C.
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE			W_P W W_L WATER CONTENT % 20 40 60				
264.6	Ground Level													
0.0	Sand with silt, some gravel, trace clay.		1	SS	3	260							○	3 50 (47)
	V. Loose to very dense.		2	SS	1								○	32 53 (15)
			3	SS	84								○	9 46 (45)
249.6				4	SS		100	8"						○
15.0	Sand, some gravel and silt, trace clay.		5	SS	100	250							○	5 74 (11)
244.7	Very Dense		6	SS	100	6"							○	0 31 (69)
20.5	Silt with sand, some clay. Very Dense		7	SS	100	6"							○	
241.1			8	SS	100	6"								
23.9	Shale		9	SS	100	3"	240							
238.8														
25.8	End of Borehole													
						230								

OFFICE REPORT ON SOIL EXPLORATION

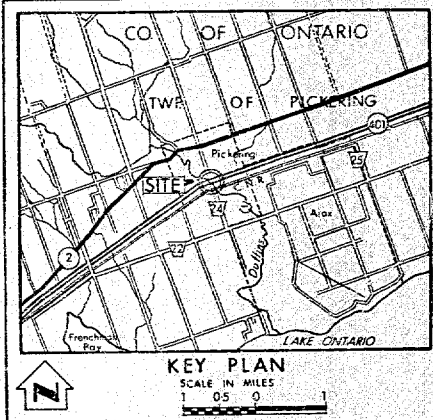




PLAN
0 SCALE 80 FT.



PROFILE
HOR. 40 20 0 SCALE 80 FT.
VER. 20 10 0 20 40 FT.



- Bore Hole & Cone Test
- Bore Hole
- ⊕ Cone Penetration Test
- W Water Levels established at time of field investigation, NOV. 1972

NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	264.7	932,279	118,029
2	262.3	932,346	118,005
3	263.8	932,417	117,983
4	263.6	932,293	118,077
5	262.6	932,360	118,057
6	261.6	932,427	118,042
7	259.4	932,306	118,154
8	260.8	932,322	118,145
9	260.8	932,381	118,132
10	260.9	932,446	118,114
11	255.0	932,326	118,225
12	256.4	932,403	118,206
13	255.1	932,468	118,187
14	258.9	932,358	118,307
15	257.4	932,425	118,288
16	258.1	932,497	118,268
17	259.1	932,377	118,369
18	259.6	932,443	118,351
19	259.9	932,509	118,342
20	261.3	932,594	118,429
21	262.5	932,459	118,410
22	264.6	932,520	118,390

— 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

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS—ONTARIO
DESIGN SERVICES BRANCH—FOUNDATIONS OFFICE

DUFFINS CREEK

HIGHWAY NO. 401 DIST. NO. 6

CO. ONTARIO

TWP. PICKERING LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUSWD. EW	CHECKED <input checked="" type="checkbox"/>	WP NO. 44-71-02	DRAWING NO.
DRAWN FL	CHECKED <input checked="" type="checkbox"/>	WO NO. 72-11119	72-11119A
DATE JAN 10, 1973	SITE NO.	BRIDGE DRAWING NO.	
APPROVED <i>[Signature]</i>	CONE NO.		
PRINCIPAL ENGINEER			

Mr. C.S. Grebski,
Structural Design Engineer,
Structural Design Section,
West Building, Downsview.

Soil Mechanics Section,
Geotechnical Office,
West Building, Downsview.

April 8th, 1974.

RE: Widening of Existing Duffins Creek
and Highway 401 Structure,
District 6 (Toronto),
W.O. 72-11119 W.P. 44-71-02 & 03.

We have reviewed the final drawings for the above job,
and would like to revise the Table of Piles as follows:

HP 12 x 74 Piles					
South Structure			North Structure		
Location	No. Req'd	Length	Location	No. Req'd	Length
W. Abut.	9	36'-0"	W. Abut.	9	32'-0"
Pier 'A'	8	27'-0"	Pier 'A'	8	24'-0"
Pier 'B'	8	20'-0"	Pier 'B'	8	20'-0"
Pier 'C'	8	15'-0"	Pier 'C'	8	17'-0"
Pier 'D'	-	-	Pier 'D'	-	-
Pier 'E'	8	18'-0"	Pier 'E'	8	21'-0"
E. Abut.	11	22'-0"	E. Abut.	9	22'-0"

We have no other comments to make.

Anand Prakash
Anand Prakash,
Senior Engineer,
For: K.G. Selby,
Supervising Engineer.

AP/mj
c.c. Files, ✓
Documents.

Mr. G. Burkhardt
Reg. Struct. Planning Engineer.

Hydrology Office

W.W. Kulmatickas
Struct. Planning Engineer.

April 13, 1973

Duffin Ck. at Hwy. 401
Hydrology Report BW 2438
Site 22-120; WP 44-71-02 & 03, Dist. 6

After reviewing the Hydrology Report for above structure extensions we have the following comments.

The proposed structure extensions, founded on bearing piles down to bedrock, should be safe from scour damage even during an extreme flood.

Protection of the east bank by the bank revetment should be adequate for the design flood. Details of the toe and the revetment end treatment should be shown. Gabion blankets could be considered as an alternative for the concrete revetment.

Scouring down to bedrock during an extreme flood is possible, however the structure would be safe and any damage to the revetment after a large flood should be reported and rectified as soon as possible.

Sheetpile protection is not considered necessary for the safety of the structure, provided that the piles will be safe for the condition of scour to bedrock.

Effective spans as quoted in list of existing structures are not correct. (Example:- Hwy. 2 210' instead of 130 to 140 feet off.)

On page 4, paragraph 3 the first sentence does not clearly express what should be said.

- 2 -

On page 6, recommendation 2b, if used as an alternative, it should state that bearing piles are needed.

Spelling errors have not been corrected by us.

Fig. 1 Title is wrong and very misleading. The figure does not represent true existing conditions and hydrology recommendations for the extension.

The design HWL, upper limits of revetment, and existing bridge waterway are missing.

K.B. Jorns
Special Project Engineer.

KBJ/ec

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. M. Devata,
Supervising Foundations Engineer,
West Building.

FROM: K. Ingham

ATTENTION:

DATE: January 11, 1973

OUR FILE REF.

IN REPLY TO

SUBJECT:

Foundation Investigation 72-11119;
Highway 401 at Duffins Creek

A brief description is given for 2 boreholes drilled to bedrock at this site, together with the appropriate bedrock elevations.

The rock is shale typical of the Collingwood formation; generally thin to medium bedded but platy bedded and highly fragmented where weathered near the surface. Due to poor recovery of this weathered material a precise interpretation of the upper layers of bedrock is impossible. However, a weathered zone of approximately 3.5 ft. in hole 6 and 9.0 ft. in hole 13 apparently overlies the fresh bedrock for which the elevations are given below.

Hole No. 6

Bedrock at 228.2

33.4 - 43.4 Dark brownish grey shale; firm, generally medium bedded with occasional thin bedded sections.

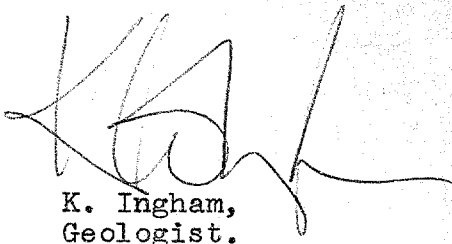
Hole No. 13

Bedrock at 229.6

25.5 - 27.7 Dark brownish grey shale; thin to platy bedded, moderately fractured and weathered throughout with occasional highly weathered layers.

27.7 - 34.0 Dark brownish grey shale; thin to medium bedded, evidence of minor weathering along bedding planes.

KI:nr


K. Ingham,
Geologist.

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DIST 1 REGION Central

W.P. No. 44-71-152

CONT. No. 15-07

W.O. No.

STR. SITE No.

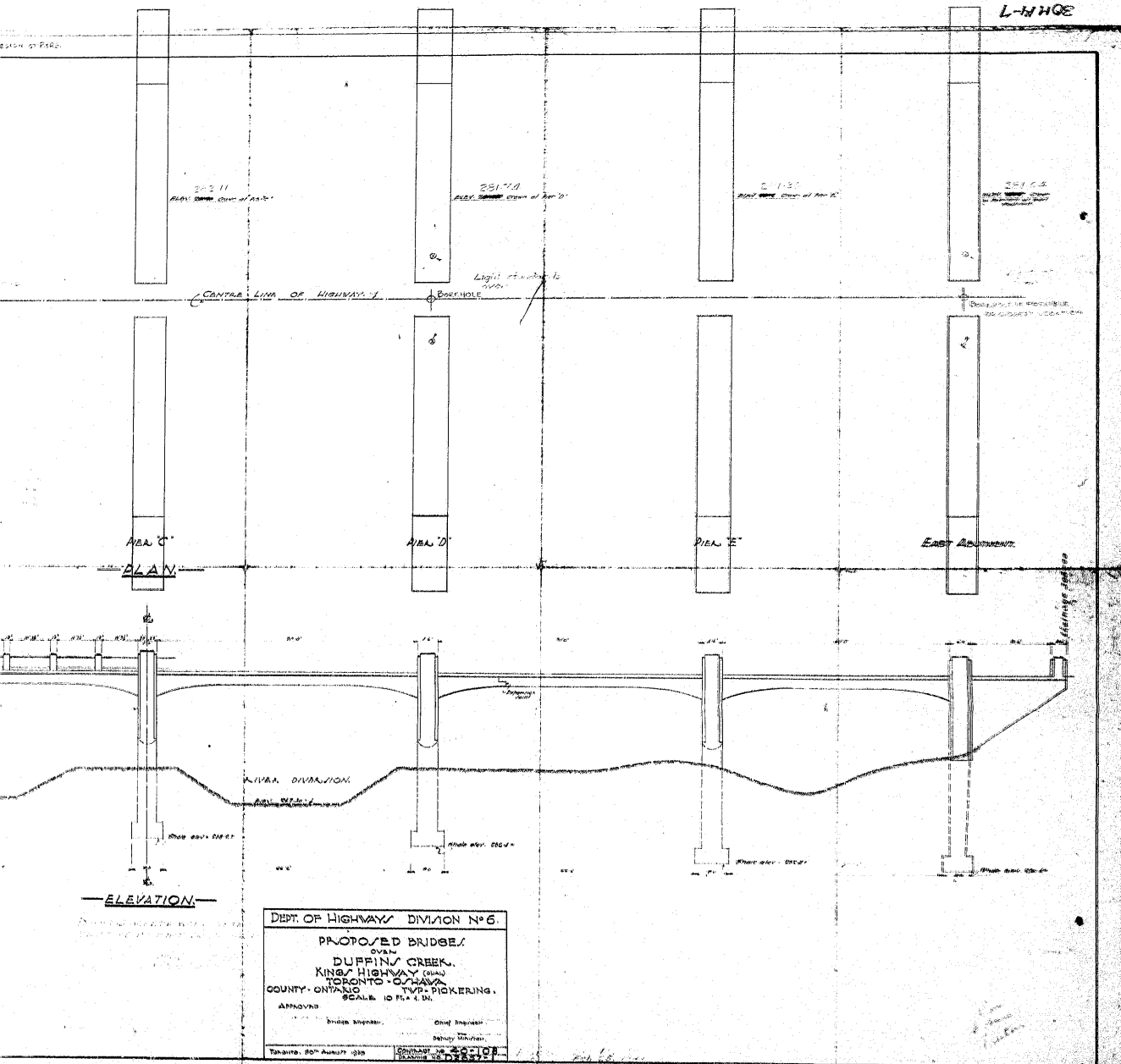
HWY. No. 401

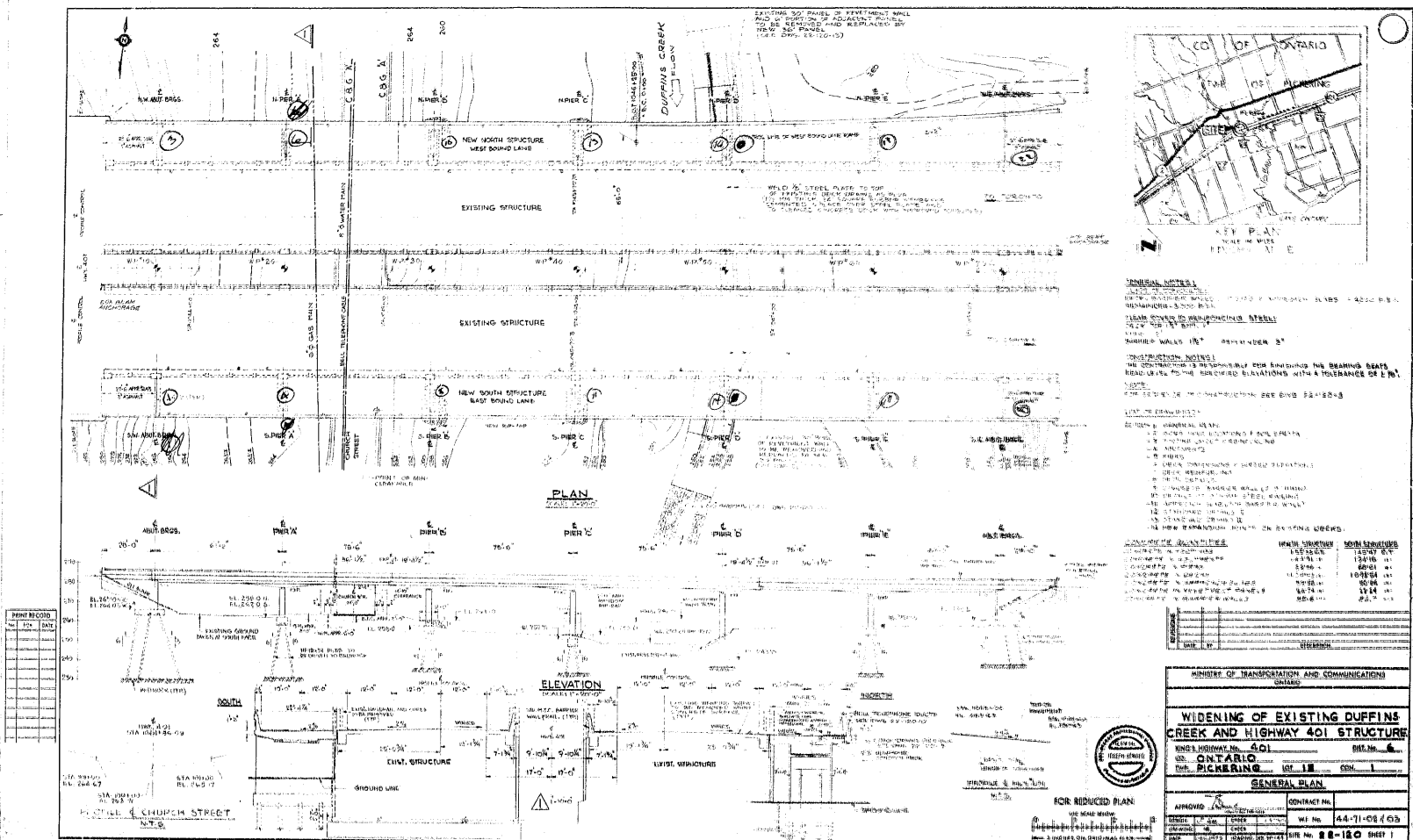
LOCATION WISCONSIN ST

DUFFINS CREEK

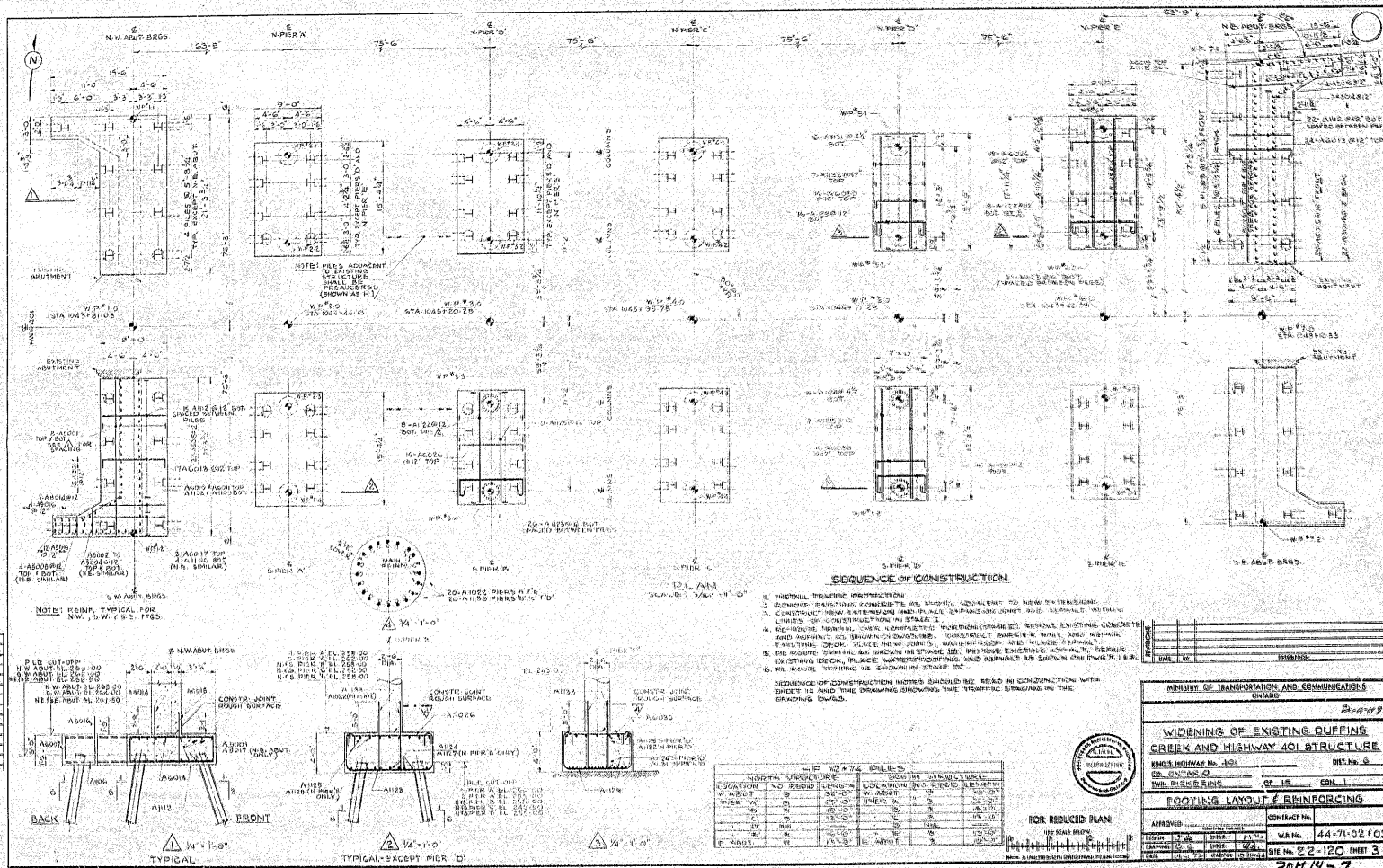
DATE OF COLLECTION 4

REMARKS

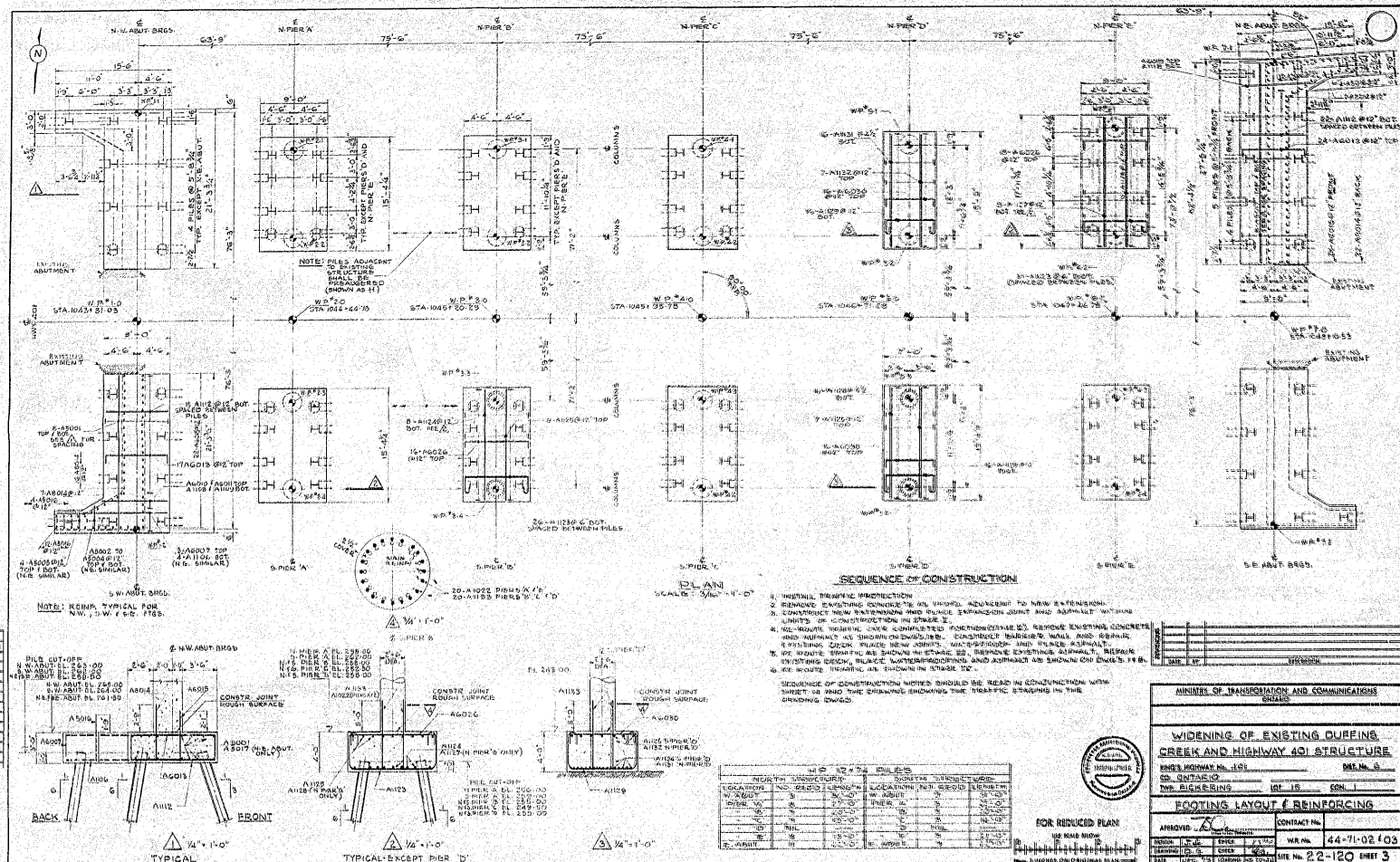




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MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
BRITISH COLUMBIA

WIDENING OF EXISTING DUFFIN CREEK AND HIGHWAY 401 STRUCTURE

ENGINEER: DATE:

CONTRACT NO. CONTRACT VALUE:

PROJECT NO. PROJECT VALUE:

APPROVED: CONTRACT NO.

DATE: SITE NO.

304 14-7