

DOCUMENT MICROFILMING IDENTIFICATION

GEOCRES No. 42B-4

DIST. 14 REGION NORTHERN

W.P. No. 58-67-02

CONT. No. 75-13

W.O. No. 75-F-93

STR. SITE No. 46-275

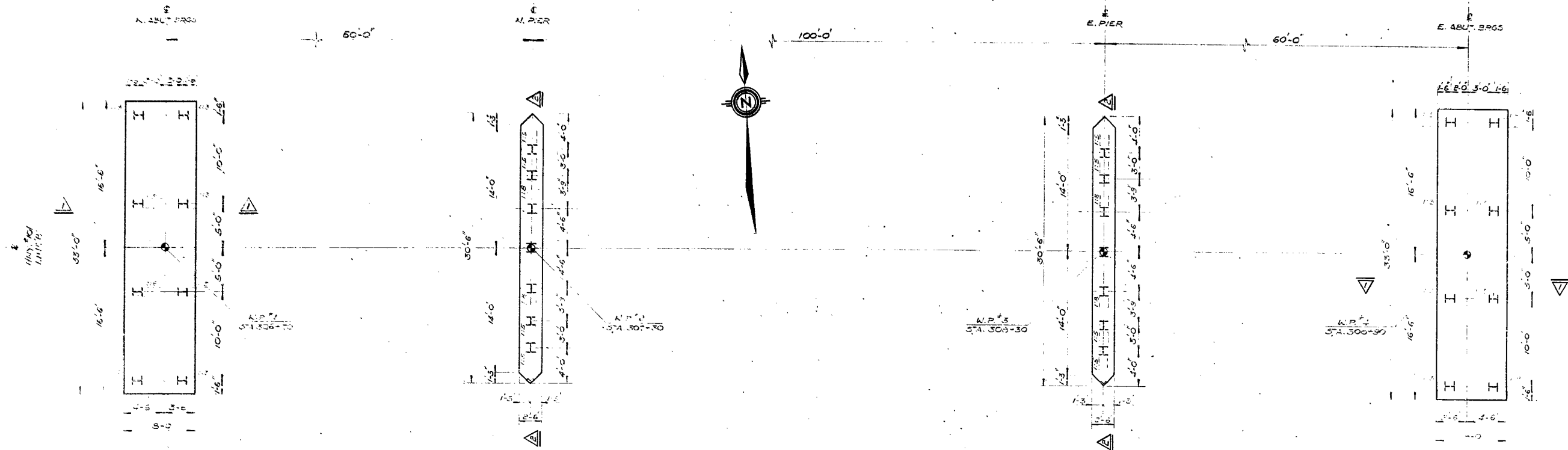
HWY. No. 101

LOCATION HWY. 101 AND

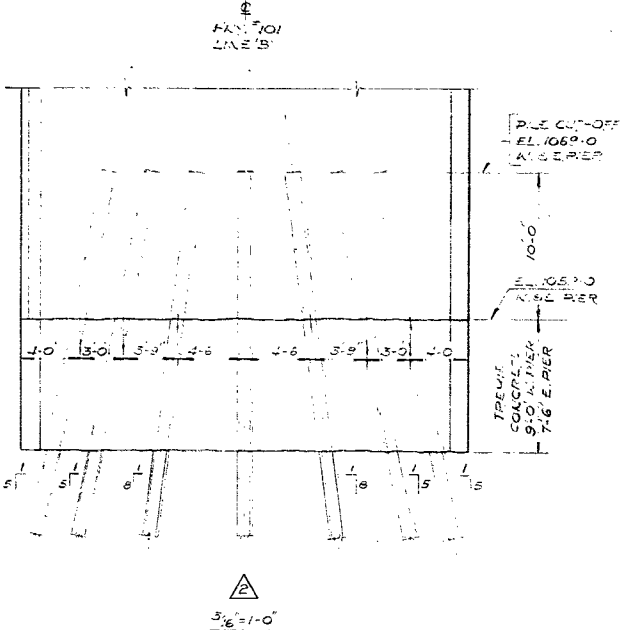
GROUNDWATER RIVER.

OVERSIZE DRAWINGS TO BE INCLUDED WITH THIS REPORT. 2

REMARKS: DOCUMENTS TO BE UNFOLDED
BEFORE MICROFILMED



FOOTING LAYOUT
3/16" = 1'-0"



LIST OF STEEL H-PILES

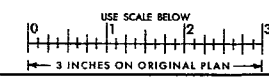
LOCATION	TYPE	No OF PILES REQ'D	ESTIMATED LENGTH	REMARKS
N.ABU	HP 12x53	8	34'	WITH OLD POINT (SEE SHEET 1)
N. PIER	HP 12x53	7	38'	
E. PIER	HP 12x53	7	41'	WITH DRIVING SHOE (SEE SHEET 13)
E. ABUT	HP 12x53	8	41'	

42B-4
GEODESIC No.

REVISIONS	DATE	BY	DESCRIPTION



FOR REDUCED PLAN



MINISTRY OF TRANSPORTATION AND COMMUNICATIONS
ONTARIO

GROUNDHOG RIVER BRIDGE
APPROX. 4.5 MILES EAST - N. 6° E

KING'S HIGHWAY No. 101 DIST. No. 14
DIST. SUDBURY
TWP. REEVES LOT CON.

FOOTING LAYOUT

APPROVED: [Signature] SPECIAL ENGINEER CONTRACT No. [Blank]
DESIGN: P.O.L. CHECK: P.O.L. W.P. No. 58-67-02
DRAWING: H.A. CHECK: P.O.L.
DATE: JAN. 72 LOADING: 4520-22 SITE No. 46-275 SHEET 3

W.O.	W.P.	LOCATION	GEOCRES NO.
------	------	----------	-------------

● DATA ON FILE IN SOIL MECHANICS SECTION

REFER TO: _____

REMARKS _____

GEOCRES INDEXING CARD FOR REPORTS NOT MICROFILMED

G1-20 AUG. 74

BLUPER IMPOSED DOCUMENT MAY
APPEAR AS MULTI-FEED ON FILM.

MEMORANDUM

To: Mr. S. McCombie,
Bridge Planning Engineer,
Bridge Office,
Admin. Bldg.

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

ATTENTION: Mr. J. C. McAllister

DATE: October 2, 1970

OUR FILE REF.

IN REPLY TO

SUBJECT:

Groundhog River and New Hwy. #101 Line 'F'
District No. 14 (New Liskeard)
W.O. 70-11075 -- W.P. 58-67-02

As requested by you, we have prepared a summary of our foundation investigation at the above mentioned site. The summary has been prepared by Mr. G. Allen, and is as follows:

The Foundation Section carried out borings at the above mentioned site and also, on a line 170 ft. upstream of Line 'F' and parallel to it. The former line will be denoted in the text as Line 'F-F'.

The proposed structure will have a total span of 320 ft. and an elevation 20 ft. above the lowest water level. It was estimated that the water level was at its lowest point at the time of the investigation - i.e., elev. 1072.0.

Results of the investigation and recommendations concerning the structure foundations, are as follows:

Line 'F':

The river at this location is 270 ft. wide and slopes down to a maximum depth of 17 ft.

The subsoil consists of 6 to 8 ft. of loose to compact sand with occasional pockets of gravel overlying compact to very dense glacial till (non-cohesive) and this, in turn, overlying schist bedrock.

A deposit of soft organic silt with sand was found in the borehole nearest the west bank only, extending to a depth of 3 feet below river bottom and overlying the sand deposit.

It is recommended that the whole structure be founded on steel H-piles driven down to the surface of the bedrock or into the very dense portion of the glacial till - whichever is the case.

October 2, 1970

Re: Groundhog River and New Hwy. #101 Line 'F' -
Dist. #14 -- W.O. 70-11075 -- W.P. 58-67-02 ...

Line 'F': (cont'd.) ...

The organic silt layer found near the west bank should be excavated and replaced with well compacted granular material.

Line 'F-F':

The river at this site was again some 270 ft. wide and sloped down to a maximum depth of 21 ft. below low water level.

Bedrock outcrops were observed on both banks of the river, and boreholes undertaken in the river indicated that the surface of the bedrock sloped down to a maximum depth of 25 ft. below the water level. Overlying the bedrock is some 0 to 5 ft. of sand and gravel with occasional boulders.

Both the piers and abutments can be founded on spread footings placed directly on the bedrock - in this case, a safe bearing pressure of 20 tons/sq. ft. can be adopted.

An alternative would be to found the piers on steel H-piles driven down to the surface of the bedrock.

Summary:

Whichever scheme is adopted, the following points apply:

1) The design load for the steel H-piles depend on the particular section adopted.

2) The H-piles need to be keyed into the bedrock due to the possibility of scour in Line 'F', and the shallow overburden in alternative Line 'F-F'; this can be achieved by the use of Oslo points affixed to the pile tips. Information regarding Oslo points may be obtained from the Norwegian Technical Institute, Publication No. 23, or Geotechnique, Vol. VII, P. 73, 1957.

3) Further protection against scour should be provided against the pile bents by placing suitably sized rip-rap around the actual bents to a distance of about 10 ft.

Mr. M. McCombie,
Bridge Planning Engr. - Admin. Bldg.
Attn: Mr. J. C. McAllister

3

October 2, 1970

Re: Groundhog River and New Hwy. #101 Line 'F' -
Dist. #14 -- W.O. 70-11075 -- W.P. 58-67-02 ...

If you have any queries relating to this project,
please contact this Office. Our complete report will be
forwarded to you in the near future.

KGS/MdF
Attach.

K. G. Selby
SUPERVISING FOUNDATION ENGR.
For:
A. G. Stermac
PRINCIPAL FOUNDATION ENGR.

cc: Messrs. B. R. Davis
T. A. Sharpe
H. McArthur
T. G. Smith
E. R. Saint

Foundations Files
Gen. Files

Design Services Branch,
1201 Wilson Avenue,
Downsview, Ontario.
M3M 1J8

November 27, 1973.

H. C. Golder & Associates,
3151 Wharton Way,
Mississauga, Ontario.

Dear Sirs:

This letter confirms our request of November 13, 1973, for a qualified field supervisor to supervise soil boring operations on our project at Groundhog River and Hwy. 101.

Charges will be in accordance with your letter of November 27, 1973.

Our Project Number is W.O. 73-11093.

Yours truly,

KCS/ao

A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

C.C. W. W. Fry
(Attn: Mrs. Marion Porter)

Foundations Files
Documents

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. J. C. McAllister,
Regional Structural Planning Supervisor,
Northern Region,
North Bay, Ontario.

FROM: Geotechnical Office,
Engineering Services Br.,
West Bldg., Downsview.

ATTENTION: DATE: January 21, 1974.

OUR FILE REF. IN REPLY TO

SUBJECT: Groundhog River Bridge
Hwy. #101, Line 'B', District #14
Site 46-275
W.O. 73-11093 -- W.P. 58-67-02

Further to the information given by telephone, please have this memo attached to the above-mentioned report. On page 5, section 4.2.2, "elevation 1045 ft." should be changed to "elevation 1035 ft."

PK/ao

c.c. E. J. Orr
B. R. Davis
A. Rutka
H. McArthur
T. A. Sharpe
B. J. Giroux
J. E. Gruspier
G. A. Wrong
B. A. Singh
S. McCombie
Foundations Files
Documents

For:

P. Korgemagi
P. Korgemagi,
Project Foundations Engineer,
K. G. Selby,
Supervising Foundations Engineer.

*Much to be taken
Please handle*

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. Putka Mgr.
Geotechnical Office
West Bldg.

FROM: C.S. Grebski
Structural Design Engineer
Structural Office
West Bldg.

DATE: January 30th, 1974

ATTENTION:

OUR FILE REF.

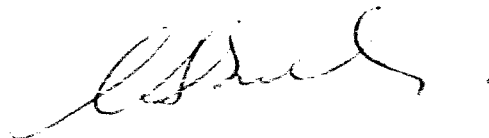
IN REPLY TO

SUBJECT: Groundhog River Bridge
Approx. 4.5 miles east of Hwy. 616
W.P. 58-67-02, Site 46-275
District 14, Hwy. 101

73-11-093

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.

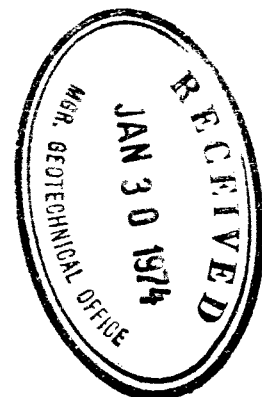


C.S. Grebski
Structural Design Engineer

CSG:AMF

Attached

c.c. Foundation Office



LISTING OF VERIFIED BIDS

NOTICE OF AWARD OF CONTRACT

CONTRACT NO. 75-13 TENDER OPENING NO. 3
DATE April 16th, 19 75

DESCRIPTION

GRADING, DRAINAGE, GRANULAR BASE AND STRUCTURE (INCLUDING STRUCTURAL STEEL)
NECESSARY AVAILABLE RATING IS (6) IN (G) OR (S)

39.1 Miles West of Highway 576 Westerly 7.1 including Groundhog
River Bridge.

HIGHWAY 101

NEW LISKEARD DISTRICT

MILEAGE: 7.1

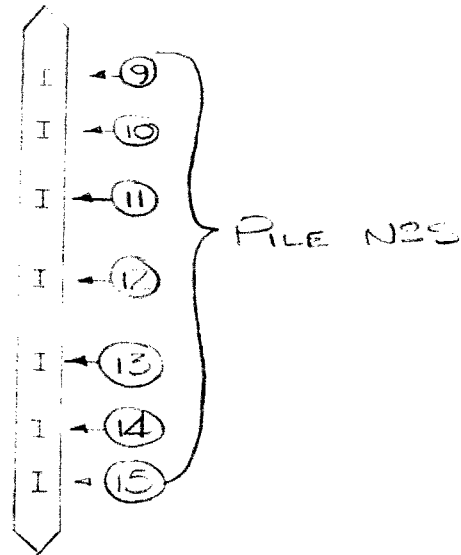
M. J. Labelle Company Limited	\$ 2,240,269.75
D. Lamothe Limited & D. Lamothe Northern Limited	2,742,785.50
Smiths Construction Company Arnprior Limited	2,589,837.94

AWARDED TO: M.J. LABELLE CO. LTD.,
P. O. BOX 610,
COCHRANE, ONTARIO. P0L 1C0

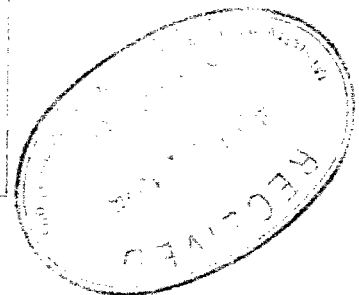
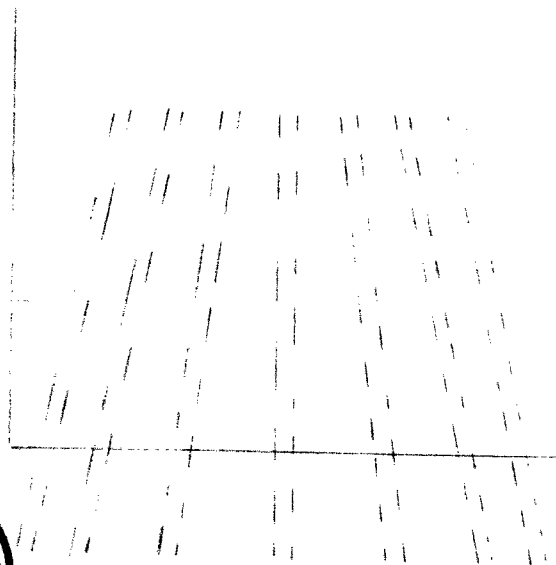
DATE APRIL 24th, 19 75.

CONTRACT 75-13
Ground Hog River Bridge
STRUCTURE 58-
HWY 101 w/ 98-62-02

SKETCH OF PILE NOS
WEST PIER.



West Pier



HWY 101

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 14 CONTRACT NO. 75-13 STRUCTURE W.P. NO. 58-61-02
CONTRACTOR MAGLELLAND CONST DESIGN LOAD OF PILE 95 TON
HAMMER DETAILS: TYPE D200 WEIGHT 4100 HEIGHT OF FALL OR ENERGY 85
TYPE OF ANVIL OR CAP H-12 X 74 WEIGHT OF ANVIL OR CAP 410
PILE DETAILS H-12 X 74 BATTER: 85
PILE NO. 13 LOCATION W. PIER DATE DRIVEN July 27/75

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
35	1	5		26			51			76	
20.4	2	2		27			52			77	
	3	3		28			53			78	
	4	4		29			54			79	
	5	5		30			55			80	
	6	6		31			56			81	
	7	3		32			57			82	
	8	3		33			58			83	
	9	5		34			59			84	
	10	6		35			60			85	
	11	5		36			61			86	
	12	6		37			62			87	
	13	7		38			63			88	
	14	8		39			64			89	
	15	8		40			65			90	
	16	16		41			66			91	
	17			42			67			92	
	18			43			68			93	
	19			44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	2	2	2	2	2
MEASURED REBOUND IN INCHES	1/4	1/4	1/4	1/4	1/4	1/4
FINAL LENGTH OF PILE	31.30					FINAL CUT OFF ELEVATION 1069.0

REPORT TO BE SENT TO: -

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED [Signature]
NAME (PRINT) MATTHEW
DATE July 29/75
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

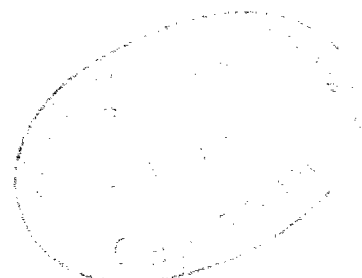
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 14 CONTRACT NO. 7513 STRUCTURE W.P. NO. CIRCUITING BRIDGE
CONTRACTOR Flanagan Construction DESIGN LOAD OF PILE 95 TC
HAMMER DETAILS: TYPE DRP WEIGHT 4100 HEIGHT OF FALL OR ENERGY 85
TYPE OF ANVIL OR CAP Steel WEIGHT OF ANVIL OR CAP 410
PILE DETAILS H P12x74 BATTER: 51'
PILE NO. 14 LOCATION W PIER DATE DRIVEN July 29/75

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
3.00	1	7		26			51			76	
10.00	2	7		27			52			77	
4.00	3	4		28			53			78	
	4	5		29			54			79	
	5	3		30			55			80	
	6	2		31			56			81	
	7	2		32			57			82	
	8	2		33			58			83	
	9	3		34			59			84	
	10	4		35			60			85	
	11	5		36			61			86	
	12	5		37			62			87	
	13	5		38			63			88	
	14	6		39			64			89	
	15	7		40			65			90	
	16	9		41			66			91	
	17	26		42			67			92	
	18			43			68			93	
	19			44			69			94	
	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	3	3	4	4	4
MEASURED REBOUND IN INCHES	8	1/4	1/4	1/8	1/4	1/4
FINAL LENGTH OF PILE	37.63					
FINAL CUT OFF ELEVATION	106.50					

REPORT TO BE SENT TO: -

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED [Signature]
NAME (PRINT) L. MATTHEW
DATE July 29/75
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 14 CONTRACT NO. 75-13 STRUCTURE W.P. NO. 53-67-65
 CONTRACTOR MACHINERY CORP. DESIGN LOAD OF PILE 55 TONS
 HAMMER DETAILS: TYPE DEWING D-12 WEIGHT 1500 HEIGHT OF FALL OR ENERGY 10
 TYPE OF ANVIL OR CAP DEWING "H" PILE ^{NEOPHENE} ^{STEEL} ^{WELDED} ^{COLLISION} WEIGHT OF ANVIL OR CAP 475
 PILE DETAILS 2x33 - 34' LONG BATTER: 1:6
 PILE NO. 2 LOCATION Greenwood River Bridge w/ River DATE DRIVEN Aug 22/75

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
34	1			26			51			76	
1	2	1		27			52			77	
1	3	1		28			53			78	
6	4	6		29			54			79	
4	5	4		30			55			80	
2	6	2		31			56			81	
1	7	1		32			57			82	
3	8	3		33			58			83	
2	9	2		34			59			84	
2	10	2		35			60			85	
2	11	2		36			61			86	
1	12	1		37			62			87	
1	13	1		38			63			88	
1	14	1		39			64			89	
1	15	1		40			65			90	
1	16	2		41			66			91	
1	17	1		42			67			92	
1	18	1		43			68			93	
2	19	2		44			69			94	
2	20	2		45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	5	10	21			
MEASURED REBOUND IN INCHES	1/2"	1/2"	1/2"			
FINAL LENGTH OF PILE	21 FT 5 IN					
FINAL CUT OFF ELEVATION	127' 1073.5					

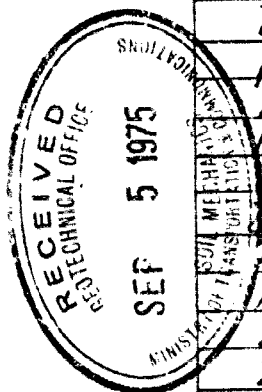
REPORT TO BE SENT TO: -

GEOTECHNICAL OFFICE
 ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
 MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
 DOWNSVIEW, ONTARIO

SIGNED

NAME (PRINT)

DATE Aug 22, 1975
 ATTACH SKETCH OF PILE NUMBERING SYSTEM



Jan

BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 14 CONTRACT NO. 75-13 STRUCTURE W.P. NO. 58-67-02
CONTRACTOR MACHILLAN CONST DESIGN LOAD OF PILE 55 TONS
HAMMER DETAILS: TYPE DELMAG D-12 WEIGHT _____ HEIGHT OF FALL OR ENERGY _____
TYPE OF ANVIL OR CAP _____ WEIGHT OF ANVIL OR CAP _____
PILE DETAILS 12x53 - 34' LONG BATTER: 1:6
PILE NO. 2 LOCATION Georgetown River Bridge - W/ Abut. DATE DRIVEN Aug 22/75

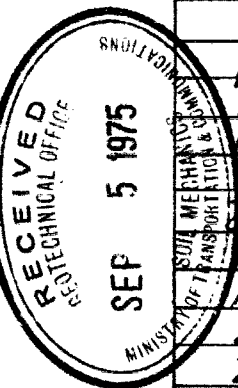
TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
	1			26			51			76	
1	2			27			52			77	
1	3			28			53			78	
6	4			29			54			79	
4	5			30			55			80	
2	6			31			56			81	
1	7			32			57			82	
3	8			33			58			83	
2	9			34			59			84	
2	10			35			60			85	
2	11			36			61			86	
1	12			37			62			87	
1	13			38			63			88	
1	14			39			64			89	
1	15			40			65			90	
1	16			41			66			91	
1	17			42			67			92	
1	18			43			68			93	
2	19			44			69			94	
2	20			45			70			95	
	21			46			71			96	
	22			47			72			97	
	23			48			73			98	
	24			49			74			99	
	25			50			75			100	

DETAILS FOR FINAL <u>THREE</u> INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	5	10	21			
MEASURED REBOUND IN INCHES	1/4"	1/2"	1/2"			
FINAL LENGTH OF PILE	FINAL CUT OFF ELEVATION					

REPORT TO BE SENT TO: -

GEOTECHNICAL OFFICE
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED *[Signature]*
NAME (PRINT) J. BOUCH
DATE Aug 22, 1975
ATTACH SKETCH OF PILE NUMBERING SYSTEM



NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

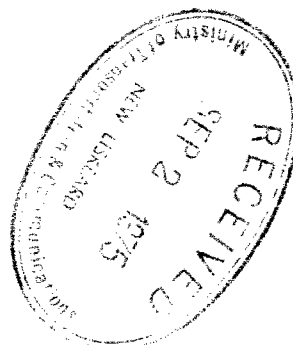
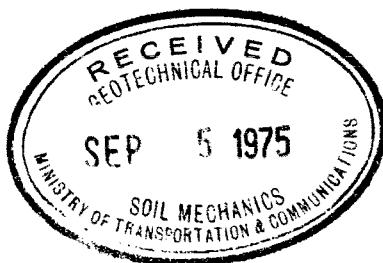
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.

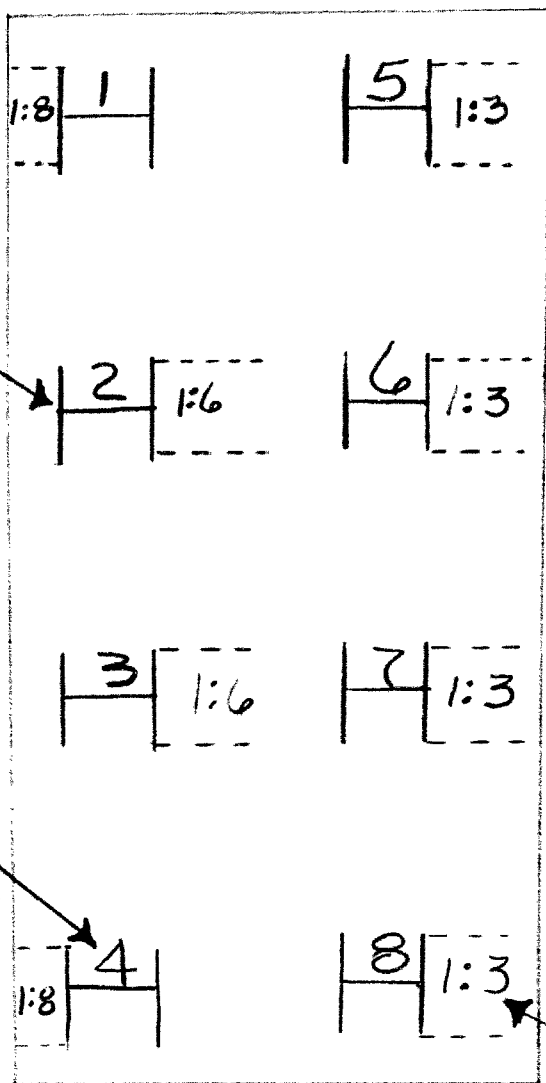


SKETCH OF PILES IN
WEST ABUTMENT GROUND
Hwy River Bridge

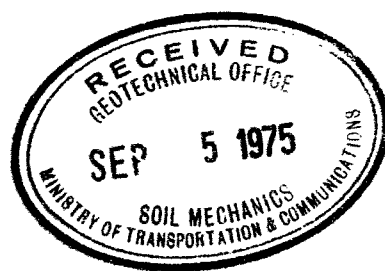
W. ABUTMENT. CONTRACT 75-13
May 101

PILE
RECORDED

PILE NO.



BATTER



BRIDGE CONSTRUCTION - PILE DRIVING RECORD

DISTRICT NO. 14 CONTRACT NO. 75-13 STRUCTURE W.P. NO. 58-67-02
 CONTRACTOR MACLELLAN CONST. DESIGN LOAD OF PILE 95 Ton
 HAMMER DETAILS: TYPE DROP WEIGHT 4100 HEIGHT OF FALL OR ENERGY 8'
 TYPE OF ANVIL OR CAP HOME MADE "H" PILE WEIGHT OF ANVIL OR CAP 370
 PILE DETAILS HP 42X74 BATTER: NIL
 PILE NO. 19 LOCATION E PIER DATE DRIVEN SEPT 25/75

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
41 FT	1	8		26			51			76	
	2	4		27			52			77	
	3	3		28			53			78	
	4	4		29			54			79	
	5	2		30			55			80	
	6	1		31			56			81	
	7			32			57			82	
	8			33			58			83	
	9			34			59			84	
	10			35			60			85	
	11			36			61			86	
	12	1		37			62			87	
	13			38			63			88	
	14			39			64			89	
	15	4		40			65			90	
	16	8		41			66			91	
	17	8		42			67			92	
	18	1		43			68			93	
	19	6		44			69			94	
	20	7		45			70			95	
	21	8		46			71			96	
	22	8		47			72			97	
	23	9		48			73			98	
	24	16		49			74			99	
	25			50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	2	2	2	2	2	2
MEASURED REBOUND IN INCHES	1/4	1/4	1/4	1/4	1/4	1/4
FINAL LENGTH OF PILE	37.5'					FINAL CUT OFF ELEVATION
						106.9

REPORT TO BE SENT TO:-

GEOTECHNICAL OFFICE TIP EL.
 ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
 MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
 DOWNSVIEW, ONTARIO

SIGNED

NAME (PRINT)

DATE

ATTACH SKETCH OF PILE NUMBERING SYSTEM.

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

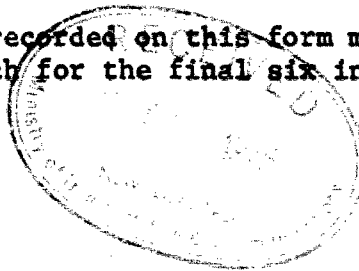
Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

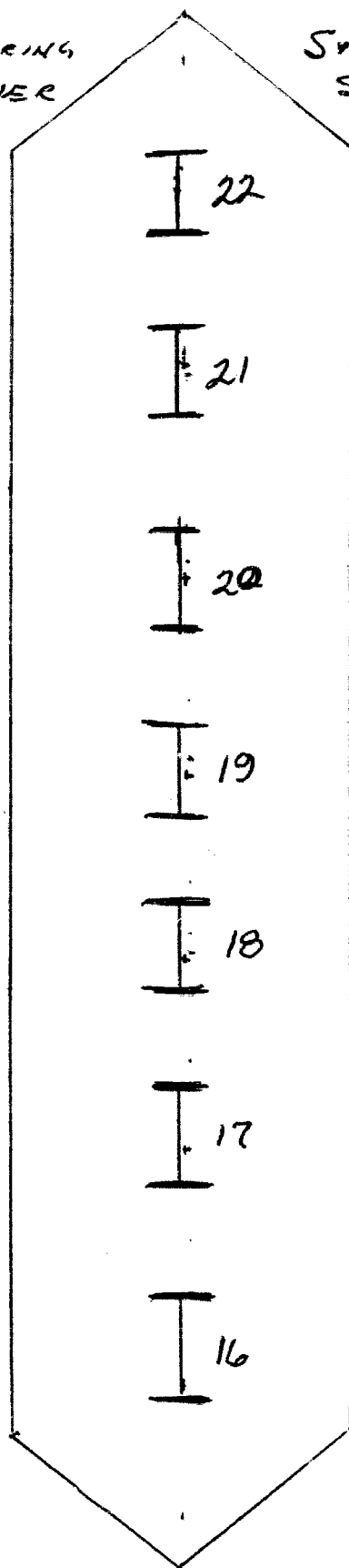
The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



SKETCH OF PILE NUMBERING
PIER OF GROUNDHOG RIVER

SYSTEM ON EAST
STRUCTURE COOT 75-13



211

W.O. 73-11093 W.P. 58-67-02 CONT. 75-13 DIST. 14

SITE GROUNDHOG RIVER

DATE DRIVEN JULY 29 - OCT. 18/75 WEIGHT OF ANVIL A) 475 lb
A) DEVMAG D-12 A) 1.375 T B) 370 lb
HAMMER TYPE B) DROP HAMMER WEIGHT B) 265 T ENERGY A) 22500 FT/LB
B) 32800 FT/LB

HAMMER TYPE B) DROP HAMMER WEIGHT B) 205 T ENERGY B) 32 800 FT/LB

[illegible]

Grp. No. 100

TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.	TOTAL LENGTH BEING DRIVEN	LENGTH IN GROUND	PENETRATION BLOWS / FT.
41	1	2		26	10		51			76	
	2	3		27	16		52			77	
	3	4		28	13		53		.	78	
	4	5		29	10		54			79	
	5	4		30	17		55			80	
	6	5		31	17		56			81	
	7	4		32	22		57			82	
	8	5		33	28		58			83	
	9	3		34	43		59			84	
	10	2		35	55		60			85	
	11	5		36	70		61			86	
	12	6		37	93		62			87	
	13	6		38			63			88	
	14	8		39			64			89	
	15	10		40			65			90	
	16	11		41			66			91	
	17	11		42			67			92	
	18	10		43			68			93	
	19	10		44			69			94	
	20	7		45			70		.	95	
	21	6		46			71		.	96	
	22	12		47			72			97	
	23	14		48			73			98	
	24	10		49			74			99	
	25	13		50			75			100	

DETAILS FOR FINAL SIX INCHES OF PENETRATION	1	2	3	4	5	6
BLOWS PER INCH	8	8	7	7	8	9
MEASURED REBOUND IN INCHES	.3	.25	.2	.18	.15	.15
FINAL LENGTH OF PILE	37' 8"		FINAL CUT OFF ELEVATION 1074.0			

REPORT TO BE SENT TO: -

GEOTECHNICAL OFFICE *T1* *10361*
ATTENTION: PRODUCT & PROCESS IMPROVEMENT SECTION,
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS,
DOWNSVIEW, ONTARIO

SIGNED Walter W. Rood
NAME (PRINT) W. E. Rood
DATE Oct 18/75
ATTACH SKETCH OF PILE NUMBERING SYSTEM

NOTES:

In general this form should be completed for every tenth pile in a group, but at least one is required for every pier and abutment.

Piles driven vertically should be selected where possible.

Pile Details must include type, dimensions and weight per foot, details of shoe, and slope of batter: e.g. 12 3/4" O.D. steel tube x 0.251" @ 33 lbs. per foot vertical. 12 3/4" x 1/2" steel plate shoe.

Details for the final six inches of penetration must be completed for all piles except in the case of an end bearing pile driven to bedrock. Final length of pile, and final cut off elevation must always be given.

The total length being driven is the full length of the pile and remains unchanged until a length is cut off or spliced on.

The penetration in blows per foot must be recorded for every foot of penetration of the pile.

Measured rebounds recorded on this form must be the average for each individual inch for the final six inches of penetration.



Greeno Hog River Be.

Contract 75-13

39th Miles West Fort Huachuca
Western 700 ft.

ABUT.
EAST PIER

$\frac{1.3}{23}$	$\frac{1.8}{27}$
$\frac{1.3}{24}$	$\frac{1.3}{28}$
$\frac{1.3}{25}$	$\frac{1.3}{29}$
$\frac{1.3}{26}$	$\frac{1.8}{30}$



73-1097
MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

TO: Mr. A. G. Stermac,
Principal Foundation Eng.,
Downsview.

FROM: Structural Planning,
Northern Region,
North Bay.

ATTENTION: Mr. W. Selby

DATE: 1 November 1973.

OUR FILE REF.

IN REPLY TO

SUBJECT:

W.P. 58-67-02, Site 46-275,
Groundhog River Bridge,
Hwy. #101, District #14.

As you requested, I am confirming our discussions regarding the anomalies contained in the stratigraphic profile of your report and the site plan as run by Engineering Surveys. Since the borings were put down in 1970 under water and the alignment run in 1971, I do not believe there would be any means of tying in the borings to the proposed alignment.

It is my opinion that the two lines are extremely close, however, there is no way of proving it.

I agree with our conclusion that the only method of eliminating the irregularities is by further borings on the line, laid out by Engineering Surveys. Should you decide to take this action, I would be glad to arrange for a survey party, etc.



JCMcA/les

J. C. McALLISTER,
REG. STRUCTURAL PLANNING SUPVR.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS, ONTARIO

MEMORANDUM

42 B - 4

TO: Mr. J. C. McAllister, (2) FROM: Foundations Office,
Regional Structural Planning Supervisor, Design Services Branch,
Northern Region, West Bldg., Downsview.
North Bay, Ontario.

ATTENTION: DATE: December 24, 1973.

OUR FILE REF. IN REPLY TO DEC 28 1973

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For
Groundhog River Bridge
Hwy. #101, Line 'B', District #14
Site 46-275
W.O. 73-11093 -- W.P. 58-67-02
DEC 25 1973

Attached we are forwarding to you our detailed foundation investigation report on the subsoil conditions existing at the above-mentioned site.

We believe that the factual data and recommendations contained therein will prove adequate for your design requirements. Should additional information be required, please do not hesitate to contact our Office.

AGS/ao
Attech.

c.c. E. J. Orr
B. R. Davis
A. Rutka
H. McArthur
T. A. Sharpe
B. J. Giroux
J. E. Gruspier
G. A. Wrong
B. A. Singh
S. McCombie

A. G. Stermac
A. G. Stermac,
PRINCIPAL FOUNDATIONS ENGINEER.

Foundations Files
Documents

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-

FOUNDATIONS INVESTIGATION REPORT
For
Groundhog River Bridge
Hwy. #101, Line 'B', District #14
Site 46-275
W.O. 73-11093 -- W.P. 58-67-02

1. INTRODUCTION:

A foundations investigation was undertaken at the above site to determine the stratigraphical profile along Line 'B'. A previous investigation has been carried out in the vicinity for different lines and was presented in Foundations Report 70-11075. A request for this latest investigation was received in a memorandum from Mr. J. C. McAllister, Regional Structural Planning Supervisor for the Northern Region, dated November 1st, 1973. This report contains the results of the field and laboratory investigations together with recommendations concerning the structure foundations.

2. FIELD WORK AND LABORATORY INVESTIGATION:

The field work consisted of four sampled boreholes and ten dynamic cone tests, with four of the cone tests being adjacent to the four boreholes. The drilling was done by a conventional diamond drill set up on a raft. The boreholes were washbored using NX and BX casing and the bedrock in Borehole #101 was cored using AX size core bit and core barrel. Split spoon samples were taken at regular intervals. All field and laboratory test results are recorded on the accompanying borelog sheets.

Soil samples were examined in the field and again upon arrival in the laboratory. Laboratory tests to determine:

Natural Moisture Content
Grain-Size Distribution
Atterberg Limits
Organic Content

were carried out on representative samples.

The river level and borehole locations were determined by personnel from the Northern Region Engineering Surveys Office. The locations and elevations of the boreholes as well as a stratigraphical profile are plotted on Drawing 73-11093A attached at the end of this report.

3. SUBSOIL CONDITIONS:

3.1) General:

At the site of the crossing, the river is about 280 ft. wide and about 19 ft. deep and had, at the time of the investigation a water level of 1066.4 ft. All the boreholes were placed in the river. The subsoil at this site consists of, on the west bank, a layer of organic silt with sand traces of clay and across most of the site silty sand some gravel traces of clay, followed by sand and gravel, traces of silt and clay with occasional cobbles and boulders followed by sound schist bedrock.

3.2) Organic Silt with Sand Traces of Clay:

This deposit was encountered in Borehole #101 and extends from near the edge of the water to some point between Borehole #101 and #102. In the borehole the depth of the deposit, which extends to bedrock, was 11 ft. The 'N' values measured within this layer indicate that the denseness is very loose to loose. The organic content of the samples was measured to be 1.8 to 4.2% by weight. The moisture content and grain-size distribution and Atterberg Limits are as follows:

Gravel: 0 - 1 %

Sand:	43 - 48 %
Silt:	48 - 55 %
Clay:	1 - 2 %
Liquid Limit:	25 - 36 %
Plastic Limit:	21 - 32 %
Natural Moisture Content:	28 - 59 %

A typical grain-size curve envelope is included in the Appendix as Figure 1.

3.3) Silty Sand Some Gravel Traces of Clay:

This layer was encountered in Boreholes #104 and #103. The average depth of the silty sand in these boreholes was 18 ft. The top 2 feet in Borehole #104, which was placed near the east shore was found to contain some organics. The 'N' values within this layer varied from less than 1 to 67 blows per foot with an average of 25. The corresponding denseness varies from very loose to very dense. The natural moisture content and grain-size distribution are as follows:

Natural Moisture Content:	10 - 24 %
Gravel:	2 - 17 %
Sand:	40 - 92 %
Silt and Clay:	6 - 58 %

A typical grain-size distribution envelope is included in the Appendix as Figure 2.

3.4) Sand and Gravel Traces of Clay and Silt Occasional Cobbles and Boulders:

The sand and gravel layer was encountered in Boreholes #102, #103 and #104. In Borehole #102 it was the only layer sampled where as in Borehole #103 and #104 the silty sand overlaid it. The three boreholes in which it was found terminated in this layer and penetrated from 8 to 14 ft. into it. This material was encountered

between elevation 1042 to 1022 ft. All the 'N' values were greater than 100 blows per foot corresponding to a very dense denseness. Occasional cobbles and boulders were encountered through out and in 2 boreholes (102 and 104) cobbles and/or boulders were cored on the assumption they were bedrock. The natural moisture content and grain-size distribution are as follows:

Natural Moisture Content:	7 - 26 %
Gravel:	0 - 59 %
Sand:	37 - 66 %
Silt and Clay:	4 - 34 %

A typical grain-size curve distribution is included in the Appendix as Figure 3.

4. DISCUSSION AND RECOMMENDATIONS:

4.1) General:

The proposal at this site consists of a three span structure (65'-100'-65') for the realignment of Hwy 101, Line 'B'. The proposed grade of the highway is at elevation 1088 and the approach embankments are about 38' high. The subsoil consists of organic silt with sand traces of clay on the west bank, silty sand some gravel traces of clay, followed by sand and gravel, traces of silt and clay occasional cobbles and boulders and finally sound schist bedrock.

4.2) Foundations:

4.2.1) Perched Abutments Supported on Piles in Conventional Earth Fill Embankments:

Earth fill embankments may be constructed with 2:1 side and forward slopes. Protection to H.W.L. should be provided by means of rip rap. Piles should be fitted

with Oslo tips when keyed into the bedrock in which case steel H piles utilizing maximum allowable design load are recommended. All pile caps should have a minimum of 6 ft. of earth cover. No bouldery fill should be placed at locations where piles are to be driven. Maximum grain-size should be limited to 3 inches in these zones.

At the west abutment the piles will encounter bedrock at elevation 1053 ft. For the east abutment the piles should reach refusal at about elevation 1038 ft. within the sand and gravel with occasional cobbles and boulders layers. The maximum design load for the particular steel section may be used.

All organic material should be removed and replaced with granular fill when it exists under the approach embankments.

4.2.2) Piers:

It is estimated that the piles will reach refusal within the sand and gravel layer if driven, for the west pier to elevation 10³45 ft., and for the east pier to elevation 1032 ft. Driving is likely to be very difficult due to the presence of frequent boulders and actual pile lengths may vary considerably from the estimated lengths based on the above tip elevations. To ensure permanent lateral support for the pier piles, rock fill up to elevation 1060+ should be placed at least 10 ft. in front of and behind both piers. Rip rap should also be provided according to Hydrological requirements for embankment scour protection.

5. MISCELLANEOUS:

The field work was carried out from November 20th to November 27th, 1973 under the supervision of Mr. I. E. Pynor, Soils Technician with H. Q. Golder and Associates.

The equipment used was owned and operated by Master Soils Investigation Weston, Ontario.

This report was prepared by Mr. P. Korgemagi,
Project Foundations Engineer and reviewed by Mr. K. G. Selby,
Supervising Foundations Engineer.



P. Korgemagi

P. Korgemagi, P. Eng.,

K. G. Selby

K. G. Selby, P. Eng.,

PK/ji
Dec. 20, 1973.

APPENDIX I

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 101

JOB 73-11093 LOCATION Sta. 306+65 o/s 15' R. & Hwy. 101 Line 'B' ORIGINATED BY JP
 W.P. 58-67-02 BORING DATE November 20th and 21st, 1973 COMPILED BY NJA
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing 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		20	40	60	80	100	w_p			w
1066.6	Water Level														
0.0	Water														
1063.6	River bottom														
3.0	Organic silt with sand traces of clay.		1	SS	2	1060						100			Org. 3.627 1.92%
			2	SS	1 1/4"							1		0	4.20%
1052.8	Very loose to loose		3	SS	3 3/4"							1		0	1.80%
13.8	Schist bedrock		4	RC	907	1050									1 45 53 1
1047.8	sound														
18.8	End of Borehole														
						1040									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 102

JOB 73-11093

LOCATION Sta. 307+30 o/s 15th E. Hwy. 101 Line 'B'

ORIGINATED BY IP

WP 58-67-02

BORING DATE November 26th and 27th, 1973

COMPILED BY WJA

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT — w_L		BULK DENSITY γ P.C.F. GR SA SI CL	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT PLOT	NUMBER	TYPE	BLOWS/FOOT		BLOWS / FOOT		PLASTIC LIMIT — w_p			
							20	40	60	80		
							SHEAR STRENGTH P.S.F.		WATER CONTENT %			
							○ UNCONFINED + FIELD VANE		w_p — w — w_L			
							● QUICK TRIAXIAL * LAB VANE					
1066.2	Water Level											
0.0	Water											
1048.9	River bottom					1060						
17.3	Sand, gravel, cobbles & boulders					1050						
1042.9	Very dense											
23.3	End of borehole					1040						
1035.4	Probable sand and gravel											
30.8	End of Cone Test					1030						

20
15 5 % STRAIN AT FAILURE
10

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 103

JOB 73-11093 LOCATION Sta. 30R+30 o/s 15' Pt. & Hwy. 101 Line 'B' ORIGINATED BY JP
 W.P. 58-67-02 BORING DATE November 24th and 25th, 1973 COMPILED BY WJA
 DATUM Geodetic BOREHOLE TYPE Washboring, 1 1/2" Casing CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					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		BLOWS / FOOT					SHEAR STRENGTH P.S.F.					WATER CONTENT % w_p — w — w_L
							20	40	60	80	100	O UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					
1066.2	Water Level														GR SA SI. CL		
	Water					1060											
1051.2	River bottom																
15.0	Silty sand some gravel traces of clay. Grey Very Loose to very dense		1A	SS	37	1050									16 42 36 6		
			1	SS	1/36"										0 94 (6)		
			2	SS	8												
			3	WS		1040											
			3A	SS	40												
1033.2	Gravel with sand traces of silt and clay. Occasional cobbles & boulders, very dense		4	WS													
33.0			4A	SS	1007 1/4"	1030									59 37 (4) 0 66 29 5		
			5	SS	1007 1/4"												
1022.2	Probable boulders		6	WS													
44.0	End of Borehole					1020											

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 104

JOB 73-11093 LOCATION Sta. 308+95 o/s 15' Lt. of Hwy. 101 Line 'B'
 WP 58-67-02 BORING DATE November 21st, 22nd, and 23rd, 1973
 DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing

ORIGINATED BY JP
 COMPILED BY WJA
 CHECKED BY ---

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					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	ELEV SCALE	BLOWS / FOOT 20 40 60 80 100					SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				WATER CONTENT % w_p — w — w_L 20 40 60	
1066.4	Water Level																
0.0	Water																
1059.6	River bottom					1060											
6.8	some organics		1	SS	27											2 40 (58)	
	Silty sand some gravel Grey		2	SS	4												
	Loose to very dense		3	SS	20	1050										17 44 34 5	
			4	SS	67												
1042.2																	
24.0	Sand with gravel traces of silt & clay occasional cobbles & boulders grey		5	SS	100/	8" 1040										32 53 (15)	
1033.6	Very dense		6	SS	100/	9"											
32.8	End of Borehole					1030											

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 105

JOB 73-11093 LOCATION Sta. 306+65 o/s 15' Lt. of Hwy. 101 Line 'B' ORIGINATED BY IP
W.P. 58-67-02 BORING DATE November 21st, 1973 COMPILED BY WJA
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT w_L			BULK DENSITY	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	ELEV SCALE	BLOWS / FOOT	20	40	60	80	100	WATER CONTENT w		
1066.6	Water Level														
0.0	Water														
1064.7	River bottom														
1.9															
	Probable sandy silt with organics					1060									
1053.2	Probable bedrock														
13.4	End of Cone Test					1050									

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 106

JOB 73-11093 LOCATION Sta. 307+30 o/s 15' Rt. of Hwy. 101 Line 'B'
 W.P. 58-67-02 BORING DATE November 26th, 1973
 DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test

ORIGINATED BY JP
 COMPILED BY WJA
 CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE BLOWS / FOOT				LIQUID LIMIT <u>WL</u> PLASTIC LIMIT <u>WP</u> WATER CONTENT <u>W</u>		BULK DENSITY <u>Y</u> P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS/FOOT		20	40	60	80	100	W _p		
1066.2	Water Level													
0.0	Water					1060								
1048.9	River bottom					1050								
17.3	Probable sand and gravel					1040								
1035.4	End of Cone Test					1030								
30.8														

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE No 107

JOB 73-11093 LOCATION Sta. 308+30 o/s 15' Lt. of Hwy. 101 Line 'B'
W.P. 58-67-02 BORING DATE November 24th, 1973
DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test

ORIGINATED BY IP
COMPILED BY WJA
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		20	40	60	80	100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				
1066.2	Water Level															
	Water					1060										
1051.4	River bottom					1050										
14.8																
	Probable sandy silt					1040										
1036.2																
30.0	End of Cone Test					1030										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 108

JOB 73-11093 LOCATION Sta. 308+95 o/s 15' Rt. of Hwy. 101 Line 'B'
 W.P. 58-67-02 BORING DATE November 21st, 1973
 DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test

ORIGINATED BY IP
 COMPILED BY WJA
 CHECKED BY GP

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		20	40	60	80	100	SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE				
1066.6	Water Level															
1061.1	River bottom															
5.5	Probable silty sand					1060										
1050.9	End of Cone Test					1050										

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 109

JOB 73-11093 LOCATION Sta. 306+80 o/s 15'Rt. of Hwy. 101 Line 'B'
 W.P. 58-67-02 BORING DATE November 26th, 1973
 DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test

ORIGINATED BY IP
 COMPILED BY WJA
 CHECKED BY WJA

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				
							20	40	60	80	100	WATER CONTENT — w				
SHEAR STRENGTH P.S.F.							WATER CONTENT %					w_p — w — w_L				
○ UNCONFINED + FIELD VANE															P.C.F.	GR SA SI CL
● QUICK TRIAXIAL x LAB VANE																
1066.2	Water Level															
0.0	Water															
1059.2	River bottom					1060										
7.0																
	Probable silty sand															
1048.4						1050										
17.8	End of Cone Test															
													</			

DESIGN SERVICES BRANCH

FOUNDATIONS OFFICE

RECORD OF BOREHOLE NO 110

JOB 73-11093 LOCATION Sta. 306+80. o/s 15' lt. of Hwy. 101 line 'B'

W.P. 58-67-02 BORING DATE November 26th, 1973

ORIGINATED BY TP

DATUM Geodetic BOREHOLE TYPE Dynamic Cone Penetration Test

COMPILED BY WJA

CHECKED BY

SOIL PROFILE			SAMPLES			DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— w_L			BULK DENSITY γ P.C.F.	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS/FOOT	ELEV SCALE	BLOWS / FOOT					PLASTIC LIMIT ——— w_p				
							20 40 60 80 100					WATER CONTENT ——— w				
							SHEAR STRENGTH P.S.F.					w_p ——— w ——— w_L				
○ UNCONFINED + FIELD VANE							WATER CONTENT %									
● QUICK TRIAXIAL x LAB VANE																
1066.2	Water Level														GR SA SI CL	
1059.0	Water					1060										
7.2	River bottom															
	Probable silty sand					1050										
1045.4																
20.8	End of Cone Test					1040										

GRAIN SIZE DISTRIBUTION

UNIFIED SOIL CLASSIFICATION SYSTEM

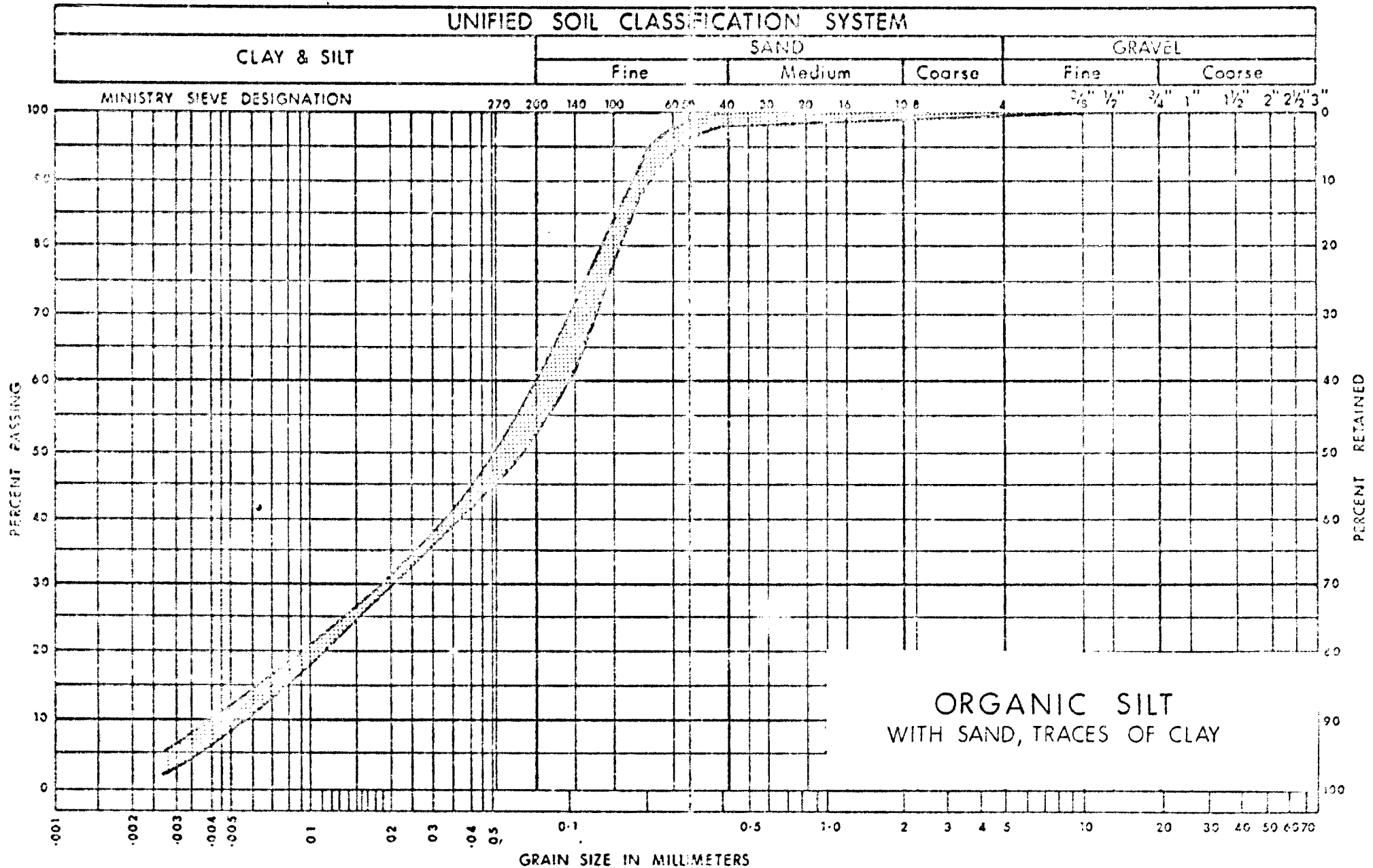


FIG. 1

GRAIN SIZE DISTRIBUTION

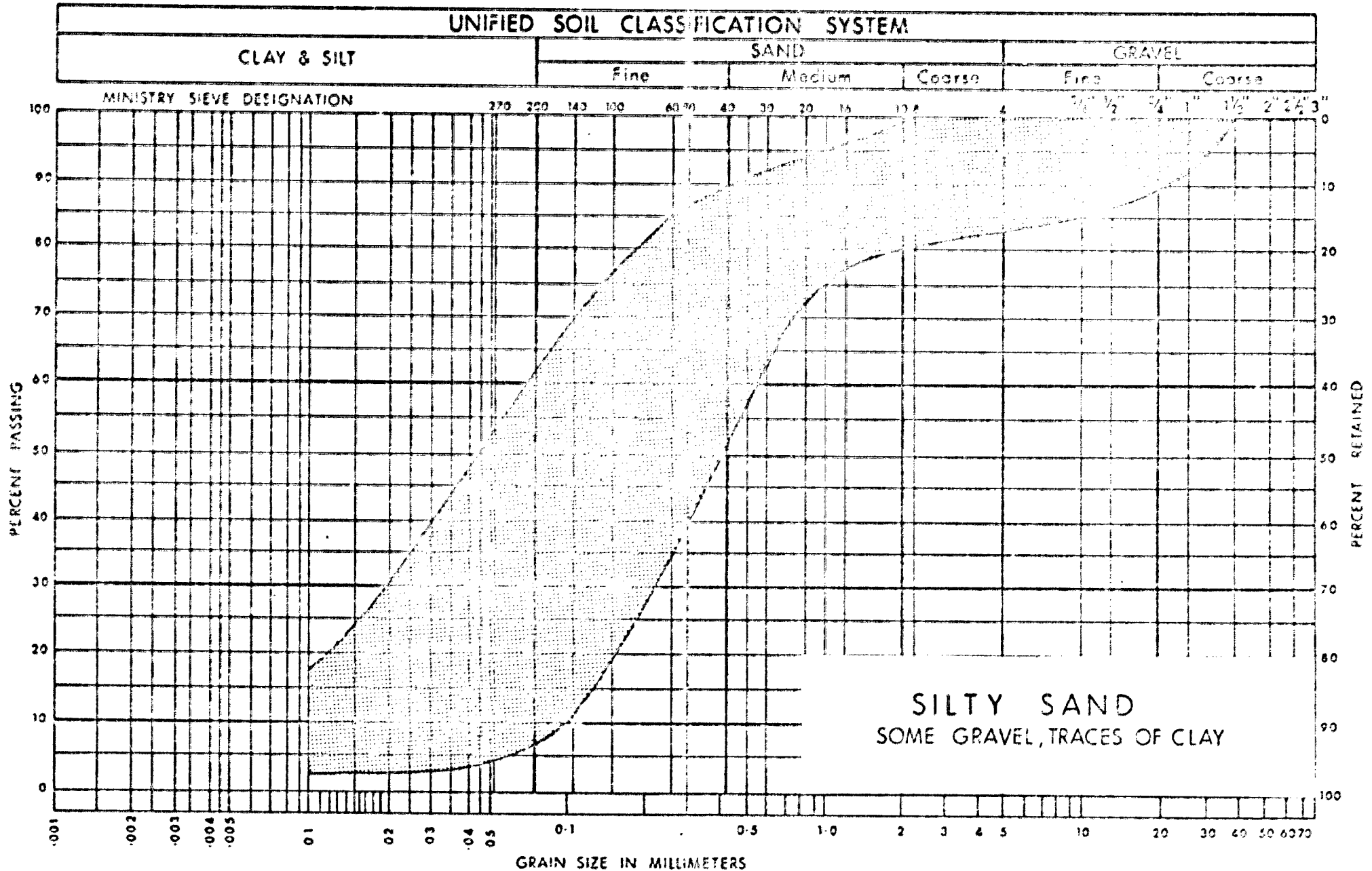


FIG. 2

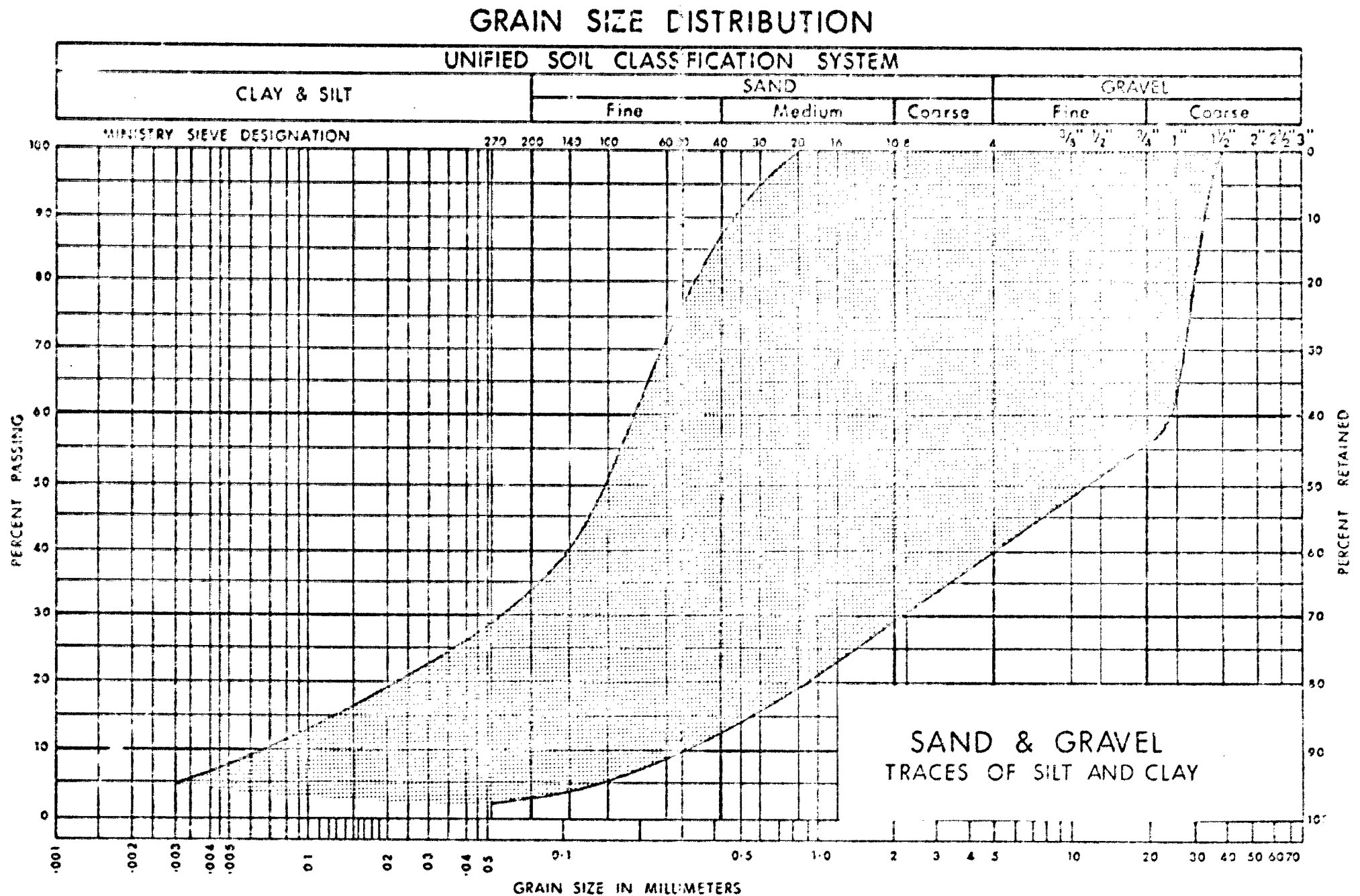


FIG. 3

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

'N' STANDARD PENETRATION RESISTANCE -- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE -- THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSINESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>c LB/SQ FT</u>	<u>DENSINESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 250	VERY LOOSE	0 - 4
SOFT	250 - 500	LOOSE	4 - 10
FIRM	500 - 1000	COMPACT	10 - 30
STIFF	1000 - 2000	DENSE	30 - 50
VERY STIFF	2000 - 4000	VERY DENSE	> 50
HARD	> 4000		

TERMS TO BE USED IN DESCRIBING SOILS:-

THACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S	SPLIT SPOON	T.W	THINWALL OPEN
W.S	WASHED SAMPLE	T.P	THINWALL PISTON
S.T	SLOTTED TUBE SAMPLE	O.S	OESTERBERG SAMPLE
A.S	AUGER SAMPLE	F.S	FOIL SAMPLE
C.S	CHUNK SAMPLE	R.C	ROCK CORE

P.H SAMPLE ADVANCED HYDRAULICALLY

P.M SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V	FIELD VANE
CU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
w_s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX $= \frac{w - w_p}{I_p}$
I_c	CONSISTENCY INDEX $= \frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX $= \frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE $= \frac{-\Delta e}{(1+e)\Delta\sigma}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX $= \frac{\Delta e}{\Delta \log_{10} \sigma}$
T_v	TIME FACTOR $= \frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION INTERCEPT
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_i	SENSITIVITY

GENERAL

π	$= 3.1416$
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

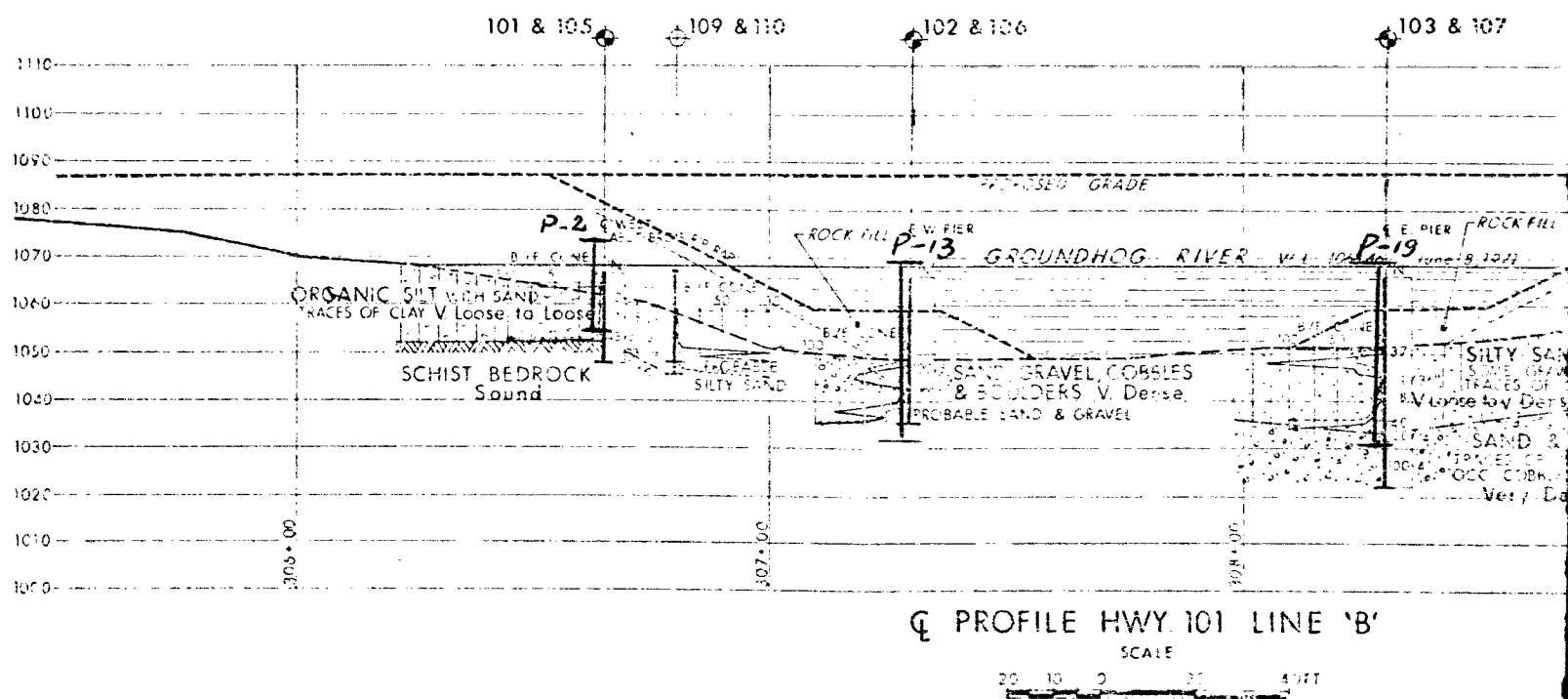
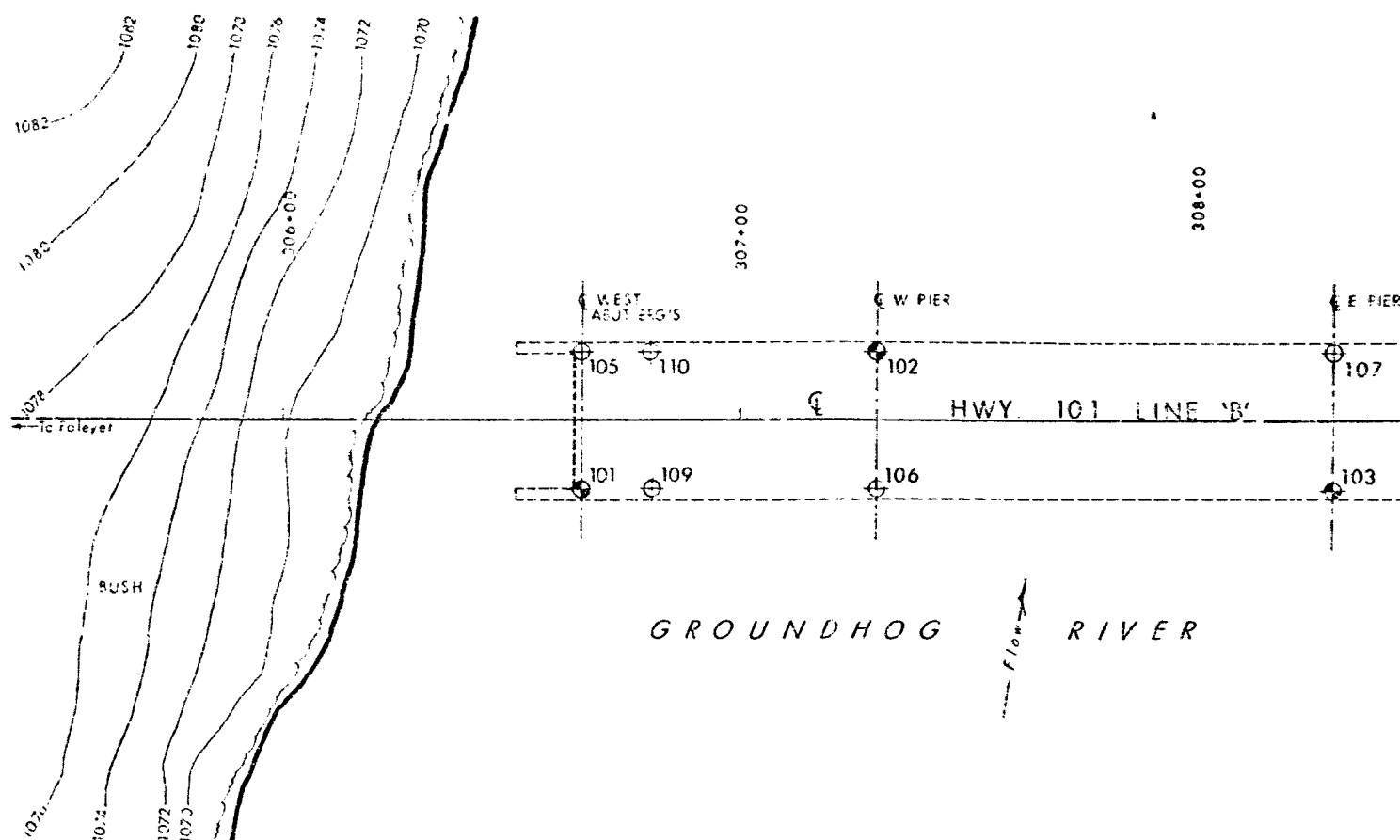
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

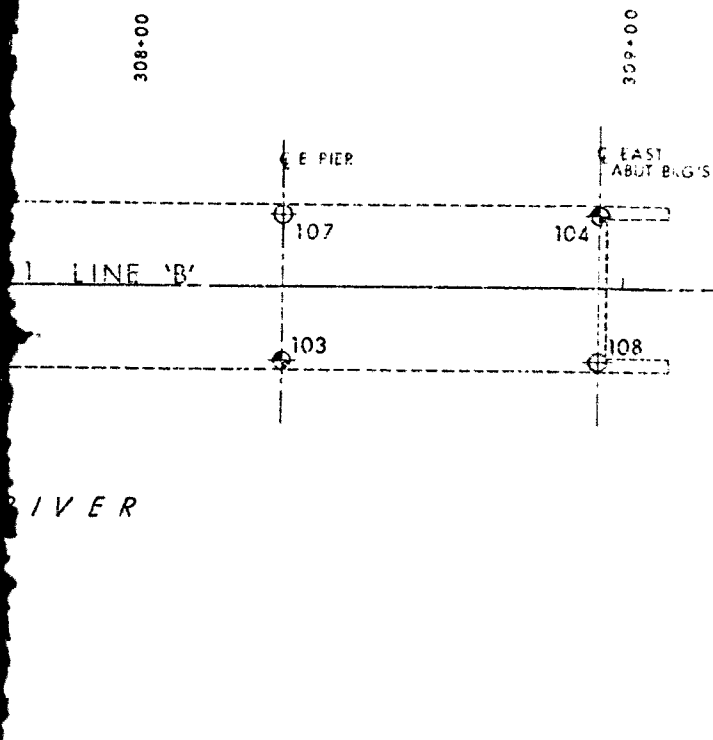
FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

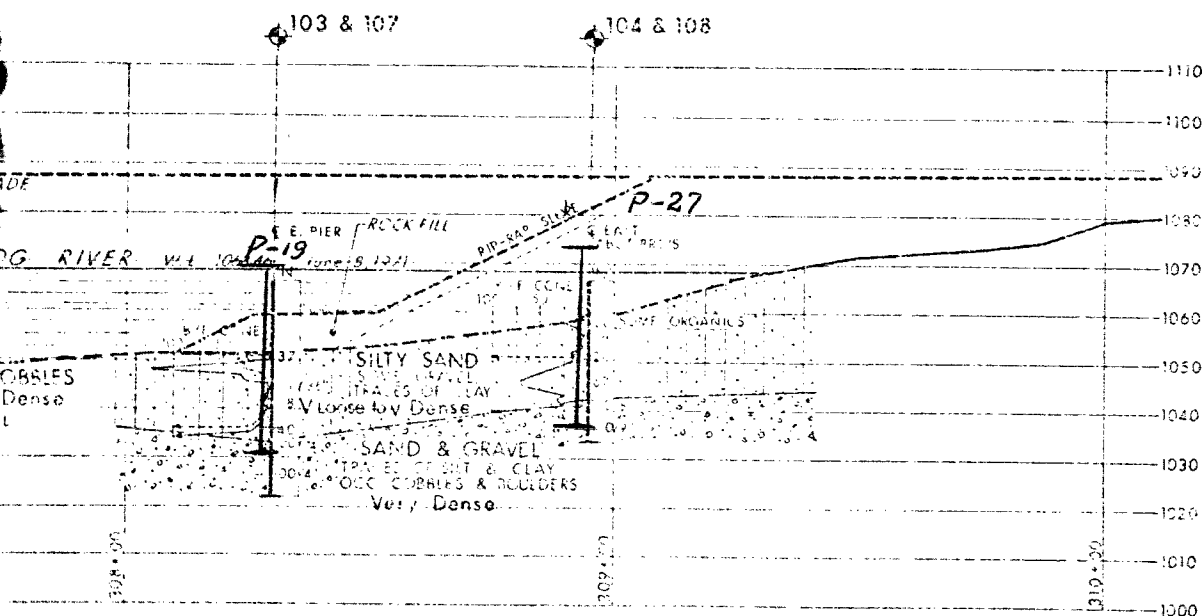




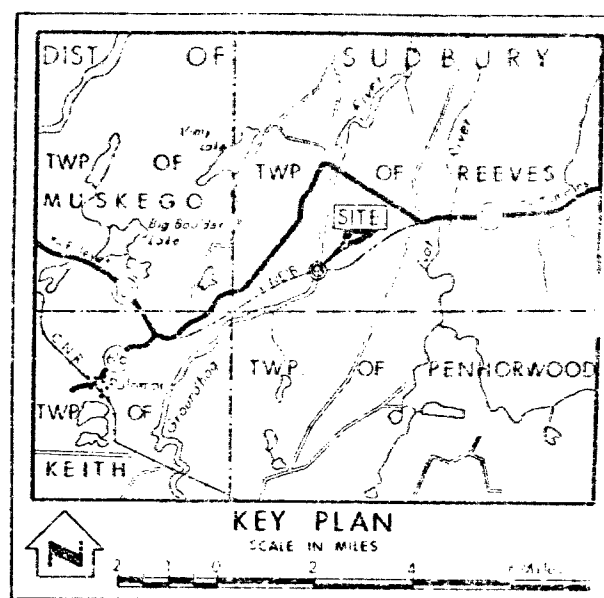
PLAN
SCALE
20 40 FT.

NOTE: FOR CONTRACT DOCUMENT

The complete foundation investigation report for this structure may be examined at the Structural Office and Foundations Office, Downsview, and at the Newmarket District Office.



HWY. 101 LINE 'B'
SCALE
20 40 FT.



KEY PLAN
SCALE IN MILES

LEGEND

- Bore Hole
- ⊕ Cone Penetration Test
- ⊕ Bore Hole & Cone Test
- ⊕ Water Levels established at time of field investigation November 20 to 27, 1973

NO.	ELEVATION	STATION	OFFSET
101	1066.6	306+65	15' RT.
102	1066.2	307+30	15' LT.
103	1066.2	308+30	15' RT.
104	1066.4	308+95	15' LT.
105	1066.6	306+65	15' LT.
106	1066.2	307+30	15' RT.
107	1066.2	308+30	15' LT.
108	1066.6	308+95	15' RT.
109	1066.2	306+80	15' RT.
110	1066.2	306+80	15' LT.

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	DESCRIPTION

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

GROUNDHOG RIVER

HIGHWAY NO. 101 LINE 'B' DIST. NO. 14
Dist. of SUDBURY
TWP. REEVES LOT CON.

BORE HOLE LOCATIONS & SOIL STRATA

SUBMITTAL CHECKING	WP NO. 58-67-99	DRAWING NO.
DRAWN BY	AC NO. 73-11093	73-11093A
DATE	DEC. 1973	BRIDGE DRAWING NO.
APPROVED	OUT NO.	

MEMORANDUM

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

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

DATE: March 15, 1971

OUR FILE REF.

IN REPLY TO

SUBJECT:

FOUNDATION INVESTIGATION REPORT
For

Groundhog River
And

New Hwy. #101, Line 'F'
District No. 14 (New Liskeard)
W.O. 70-11075 -- W.P. 58-67-02
CONF 75-13

Enclosed, please find our foundation investigation report for the above mentioned project.

The investigation was carried out for functional planning purposes to enable cost comparisons to be made between two possible crossings. We believe the report contains sufficient information to achieve this objective.

If further information is required, please contact this Office.

AGS/MdeF
Attach.

cc: Messrs. B. R. Davis
F. G. Allen
D. W. Farren
H. McArthur
T. A. Sharpe
J. C. McAllister (2)
T. G. Smith
E. R. Saint
E. J. Giroux
B. A. Singh

Foundations Files
Gen. Files

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

TABLE OF CONTENTS

1. INTRODUCTION.
 2. LINE 'P'.
 3. LINE 'P-P'.
 4. SUMMARY.
 5. MISCELLANEOUS.
-

FOUNDATION INVESTIGATION REPORT
For
Groundhog River
And
New Hwy. #101, Line 'F'
District No. 14 (New Liskeard)
W.O. 70-11075 -- W.P. 58-67-02

1. INTRODUCTION:

The Foundation Section was requested verbally by Mr. J. C. McAllister, Regional Bridge Planning Supervisor, Northern Region, to carry out an investigation at the above mentioned site.

Borings were carried out at this site and also, on a line 170 ft. upstream of Line 'F' and parallel to it. The former line will be denoted in the text as Line 'F-F'. Locations of boreholes and estimated subsoil stratigraphy are shown on Drawing 70-11075A.

The proposed structure will have a total span of 320 ft. and an elevation 20 ft. above the lowest water level. It was estimated that the water level was at its lowest point at the time of the investigation - i.e., elev. 1072.0.

Results of the investigation and recommendations concerning the structure foundations, are as follows:

2. LINE 'F':

The river at this location is 270 ft. wide and slopes down to a maximum depth of 17 ft.

The subsoil consists of 6 to 8 ft. of loose to compact sand with occasional pockets of gravel overlying compact to very dense glacial till (non-cohesive) and this, in turn, overlying schist bedrock.

2. LINE 'F': (cont'd.) ...

A deposit of soft organic silt with sand was found in the borehole nearest the west bank only, extending to a depth of 8 feet below river bottom and overlying the sand deposit.

It is recommended that the whole structure be founded on steel H-piles driven down to the surface of the bedrock or into the very dense portion of the glacial till - whichever is the case.

The organic silt layer found near the west bank should be excavated and replaced with well compacted granular material.

3. LINE 'F'F':

The river at this site was again some 270 ft. wide and sloped down to a maximum depth of 21 ft. below low water level.

Bedrock outcrops were observed on both banks of the river, and boreholes undertaken in the river indicated that the surface of the bedrock sloped down to a maximum depth of 25 ft. below the water level. Overlying the bedrock is some 0 to 5 ft. of sand and gravel with occasional boulders.

Both the piers and abutments can be founded on spread footings placed directly on the bedrock - in this case, a safe bearing pressure of 20 tons/sq. ft. can be adopted.

An alternative would be to found the piers on steel H-piles driven down to the surface of the bedrock.

4. SUMMARY:

Whichever scheme is adopted, the following points apply:

1) The design load for the steel H-piles depend on the particular section adopted.

4. SUMMARY: (cont'd.) ...

2) The H-piles need to be keyed into the bedrock due to the possibility of scour in Line 'P', and the shallow overburden in alternative Line 'P-P'; this can be achieved by the use of Oslo points affixed to the pile tips. Information regarding Oslo points may be obtained from the Norwegian Technical Institute, Publication No. 23, or Geotechnique, Vol. VII, P. 73, 1957.

3) Further protection against scour should be provided against the pile bents by placing suitably sized rip-rap around the actual bents to a distance of about 10 ft.

5. MISCELLANEOUS:

The field work for this project was carried out during the period August 26 - September 5, 1970.

Equipment used was owned and operated by Dominion Soil Investigation Ltd., under the supervision of Mr. G. Allen, Project Foundation Engineer, who also prepared this report.

The report was reviewed by Mr. K. G. Selby, Supervising Foundation Engineer.

March, 1971

APPENDIX I

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 1

FOUNDATION SECTION

JOB 70-11075

LOCATION Co-ords. 462,948 N; 398,642 E.

ORIGINATED BY GA

W.P. 58-67-02

BORING DATE August 26, 1970

COMPILED BY SR

DATUM Geodetic

BOREHOLE TYPE Washboring, NX Casing & BX Core

CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE		LIQUID LIMIT ——— w_L		BULK DENSITY γ P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		PLASTIC LIMIT ——— w_p			
							20	40	60	80		
							SHEAR STRENGTH P.S.F.		w_p ——— w ——— w_L		WATER CONTENT %	
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE				20 40 60	
							500 1000 1500 2000 2500					
1072.0	Water Level											
1069.5	Water					1070						
2.5	Organic silt, some clay, traces of sand.											
1064.0	Very Soft to Firm		1	SS	1							
8.0	Silty sand, occ. gravel		2	TW	PM							
	Very Loose to Loose		3	SS	-	1060						
	Compact to Very Dense		4	SS	112							
1053.5			5	SS	27							
18.5	Bedrock Schist Fissured		6	BXT	66%	1050						
1048.5												
23.5	End of Borehole											
						1040						

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 2

FOUNDATION SECTION

JOB 70-11075 LOCATION Co-ords. 462,930 N; 398,800 E.

ORIGINATED BY GA

W.P. 58-57-02 BORING DATE Sept. 1, 1970

COMPILED BY SR

DATUM Geodetic BOREHOLE TYPE Washboring, NX Casing, BiCone

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. PLT	NUMBER	TYPE	BLOWS / FOOT		20	40	60	80	100	WATER CONTENT % w_p — w — w_L				
1072.0	Water Level						SHEAR STRENGTH P.S.F. ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE 500 1000 1500 2000 2500									
	Water					1070										
						1060										
1055.0	17.0 Silty sand, occ. gravel		1	SS	3	1050										
	Loose to Compact		2	SS	11											
1047.0	25.0 Het. mix of sand, silt & gravel		3	SS	14											
	Compact Dense to Very Dense		4	SS	42											
			5	SS	116/9"	1040										
			6	SS	100/2"											
1032.0	40.0 End of Borehole					1030										

6 62 26 6

DEPARTMENT OF HIGHWAYS- ONTARIO
MATERIALS & TESTING OFFICE

RECORD OF BOREHOLE No. 3

FOUNDATION SECTION

JOB	70-11075	LOCATION	Co-ords. 462,922 N; 398,885 E.	ORIGINATED BY	GA
W.P.	58-17-02	BORING DATE	September 2, 1970	COMPILED BY	SR
DATUM	Geodetic	BOREHOLE TYPE	Washboring, NX Casing & BX Core	CHECKED BY	

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION	RESISTANCE	LIQUID LIMIT ——— w_L	BULK DENSITY γ P.C.F.	REMARKS	
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT		PLASTIC LIMIT ——— w_p			
							20	40	60			80
							SHEAR STRENGTH P.S.F.		w_p ——— w ——— w_L	WATER CONTENT %		
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE					
1072.0	Water Level											
1066.5	Water					1070						
5.5	Silty sand, occ. gravel											
1061.0	Loose		1	SS	4						11 52 31 6	
11.0	Het.mix. of sand, gravel & silt	Compact Very Dense	2	SS	15	1060						
			3	SS	18							
			4	SS	158							
			5	RC	5%	1050						
			6	SS	100/3"							
			7	RC	12%							
1041.0			8	SS	100/2"							
31.0	Bedrock					1040						
1036.0	Schist		9	BXT	80%							
36.0	End of Borehole					1030						

FOUNDATION SECTION

ORIGINATED BY GA

COMPILED BY SR

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	RESISTANCE	PLASTIC LIMIT ——— w_p	WATER CONTENT ——— w		
							20 40 60 80 100					
							SHEAR STRENGTH P.S.F.		WATER CONTENT %			
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB. VANE		w_p ——— w ——— w_L 20 40 60			
1072.0	Water Level											
0.0	Water					1070						
1055.0						1060						
17.0	Silty sand, occ. gravel					1050						
1049.0	Very Dense		1	SS	85							
23.0	Het. mix. of sand, gravel & silt		2	SS	33							
			3	SS	33							
	Dense to Very Dense		4	SS	62	1040						
1039.0												
33.0	Bedrock Schist		5	BXT	33%							
1034.0												
38.0	End of Borehole					1030						

FOUNDATION SECTION

CHECKED BY 

SOIL PROFILE			SAMPLES			ELEV. SCALE ELEV. / FOOT	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 %			
1072.0	Water Level										
	Water					1070					
						1060					
1051.5						1050					
20.5	Sand & gravel, occ. boulders.		1	SS	120/3"						
1041.0	Very Dense		2	RC	25%						
25.0	Bedrock										
1043.5	Schist		3	RC	92%						
28.5	End of Borehole					1040					

ABBREVIATIONS USED IN THIS REPORT

PENETRATION RESISTANCE

STANDARD PENETRATION RESISTANCE 'N' - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

DYNAMIC PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A 2 INCH, 60 DEGREE CONE, FITTED TO THE END OF DRILL RODS, 12 INCHES INTO THE SUBSOIL, THE DRIVING ENERGY BEING 350 FOOT POUNDS PER BLOW.

DESCRIPTION OF SOIL

THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>'N' BLOWS / FT.</u>	<u>c LB. / SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 2	0 - 250	VERY LOOSE	0 - 4
SOFT	2 - 4	250 - 500	LOOSE	4 - 10
FIRM	4 - 8	500 - 1000	COMPACT	10 - 30
STIFF	8 - 15	1000 - 2000	DENSE	30 - 50
VERY STIFF	15 - 30	2000 - 4000	VERY DENSE	> 50
HARD	> 30	> 4000		

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.B.	SCRAPER BUCKET SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE
S.T.	SLOTTED TUBE SAMPLE		
	P.H. SAMPLE ADVANCED HYDRAULICALLY		
	P.M. SAMPLE ADVANCED MANUALLY		

SOIL TESTS

Qu	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	F.V.	FIELD VANE
Qcu	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

ABBREVIATIONS USED IN THIS REPORT

SOIL PROPERTIES

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
γ_w	UNIT WEIGHT OF WATER
γ_d	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
γ'	UNIT WEIGHT OF SUBMERGED SOIL
G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
e	VOID RATIO
n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
w_p	PLASTIC LIMIT
I_p	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I_L	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e_{max}	VOID RATIO IN LOOSEST STATE
e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
h	HYDRAULIC HEAD OR POTENTIAL
q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
j	SEEPAGE FORCE PER UNIT VOLUME
m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma'}$
c_v	COEFFICIENT OF CONSOLIDATION
C_c	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma'}$
T_v	TIME FACTOR = $\frac{c_v t}{d^2}$ (d, DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
τ_f	SHEAR STRENGTH
c'	EFFECTIVE COHESION
ϕ'	EFFECTIVE ANGLE OF SHEARING RESISTANCE, OR FRICTION
c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_f	SENSITIVITY

GENERAL

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e a$ OR $\ln a$	NATURAL LOGARITHM OF a
$\log_{10} a$ OR $\log a$	LOGARITHM OF a TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
$\bar{\sigma}$	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

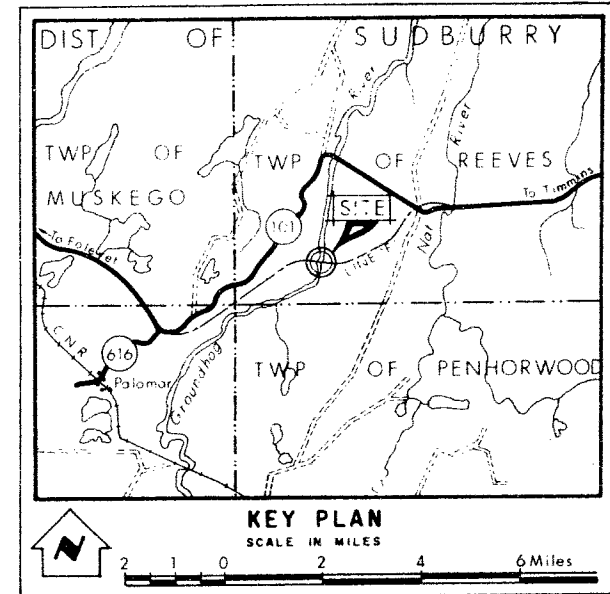
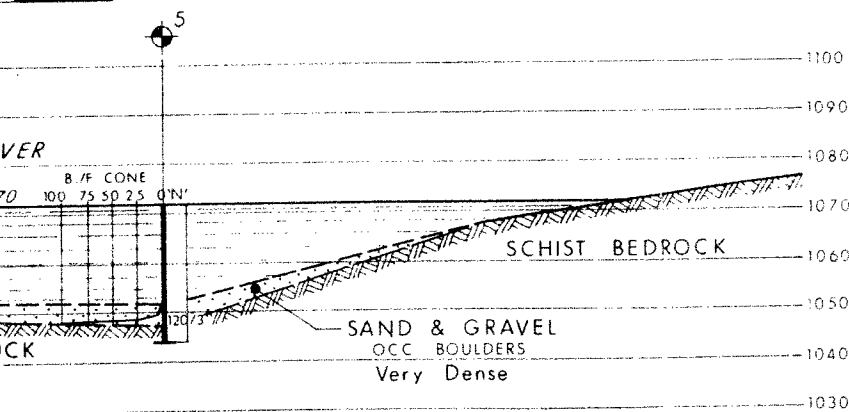
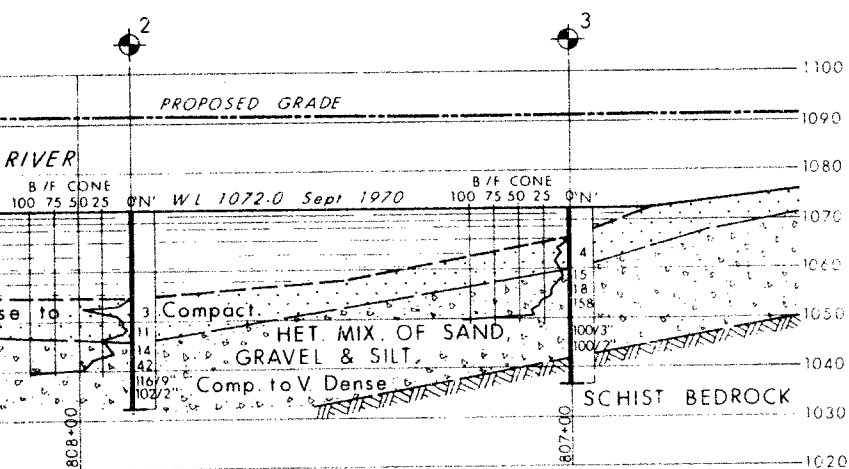
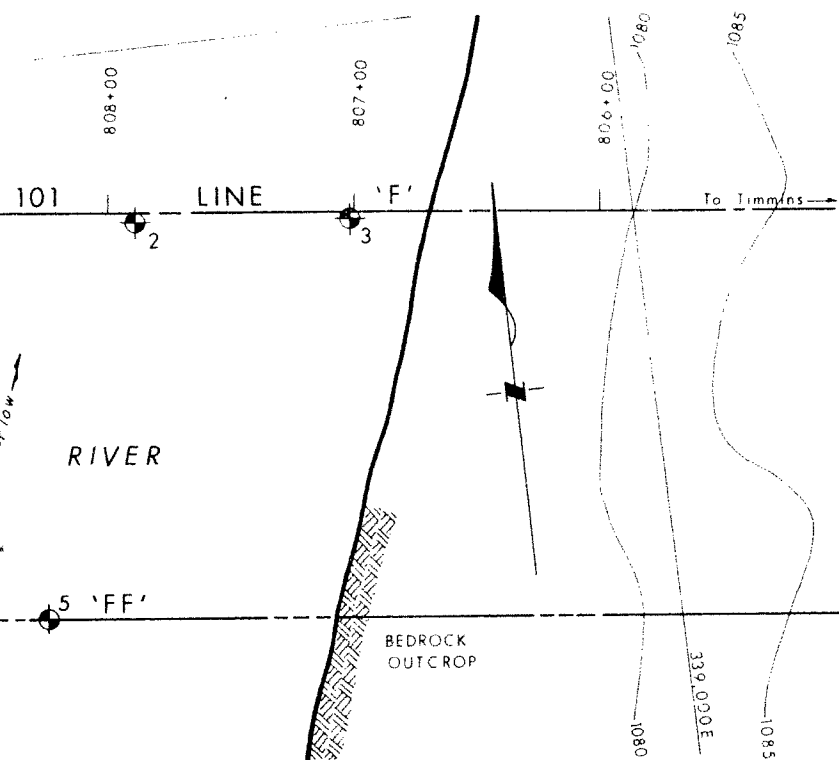
d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
L	LENGTH OF FOUNDATION
D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL



LEGEND			
	Bore Hole		
	Cone Penetration Hole		
	Bore & Cone Penetration Hole		
	Water Levels established at time of field investigation. Sept. 1970		
NO.	ELEVATION	CO-ORDINATES	
		NORTH	EAST
1	1072.0	462,948	398,642
2	1072.0	462,930	398,800
3	1072.0	462,922	398,885
4	1072.0	462,940	398,732
5	1072.0	462,772	398,745
6	1072.0	462,780	398,660

- NOTE -

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

REVISIONS	DATE	BY	DESCRIPTION
	Mar 71	G.P.	SUPERCEDES DWG 70-11075A DATED Oct 2, 1970

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & TESTING OFFICE - FOUNDATION SECTION			
GROUNDHOG RIVER			
KING'S HIGHWAY NO. 101 LINE 'F'		DIST. NO. 14	
Dist. of SUDBURY			
TWP. REEVES		LOT	CON.
BORE HOLE LOCATIONS & SOIL STRATA			
SUBM'D G. A.	CHECKED <i>AS</i>	W.P. NO. 58-67-02	M.B.T. DRAWING NO.
DRAWN <i>GP</i>	CHECKED <i>GP</i>	JOB NO. 70-11075	70-11075A
DATE March 25, 1971		SITE NO.	BRIDGE DRAWING NO.
APPROVED <i>A.B. Thomas</i>		CONT. NO.	
PRINCIPAL FOUNDATION ENGINEER			

REQUESTS FOR
SERVICES OF THE FOUNDATIONS OFFICE

W.O. 73-11093

W.P. No 58-67-02 CONT. No _____ SITE No _____

LOCATION: 50 MI WEST OF TIMMINS

SERVICES REQUESTED: ADDITIONAL FIELD INVESTIGATION
(70-11075)

REQUESTED BY: DECIDED BY THIS OFFICE AFTER
DISCUSSIONS WITH J. McALLISTAIR & A. RADKOWSKI

DATE OF REQUEST: Nov. 9/73

DUE DATE JAN 11/74

FOUNDATIONS OFFICE

REVIEW OF DESIGN DRAWINGS:

W.P. 58-67-02

W.O. 73-11093

Foundation Report By: P. Korgemae!

Review of Design Drawings By: P. Korgemae

Design Drawing No.'s: 46-275 SA 1

1. Does footing design comply with our report or subsequent memos? *yes*
2. If answer to 1. is No, is present design acceptable?
3. Has sufficient field work been done? *yes*
4. Are estimated pile lengths shown on Drawings correct? If not, make a new list. *yes*
5. If excavation of unsuitable soil is recommended, is this shown on Drawings? *yes*
6. Are approaches designed in accordance with our report? Check slopes and berm lengths.
7. Do you anticipate any construction problems? i.e., dewatering, stability of temporary slopes or excavations. *No*
8. Summarize your comments; on separate sheet if necessary.

Forward sloping piles for west abutment may need special tips because of slope of bedrock

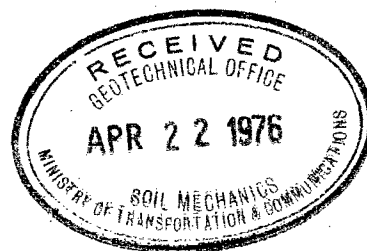
Drawings Received *Feb. 12* 19*74*

Reviewed *Feb. 12* 19*74*

Signed *P. Korgemae*

FOUNDATION INVESTIGATION REPORT

CONTRACT NO 76-09



Ministry of
Transportation and
Communications

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2-3	Abbreviations & Symbols
4-18	Foundation Investigation Report Strawberry Creek Bridge No. 1 W.P. 129-62-00
19-26	Foundation Investigation Report Strawberry Creek Bridge No. 2 W.P. 128-62-00
27-34	Foundation Investigation Report Strawberry Creek Bridge No. 3 W.P. 127-62-00

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

PENETRATION RESISTANCE

'N' - STANDARD PENETRATION RESISTANCE - THE NUMBER OF BLOWS REQUIRED TO ADVANCE A STANDARD SPLIT SPOON SAMPLER 12 INCHES INTO THE SUBSOIL, DRIVEN BY MEANS OF A 140 POUND HAMMER FALLING FREELY A DISTANCE OF 30 INCHES.

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THE CONSISTENCY OF COHESIVE SOILS AND THE RELATIVE DENSITY OR DENSENESS OF COHESIONLESS SOILS ARE DESCRIBED IN THE FOLLOWING TERMS:-

<u>CONSISTENCY</u>	<u>c LB./SQ. FT.</u>	<u>DENSENESS</u>	<u>'N' BLOWS / FT.</u>
VERY SOFT	0 - 250	VERY LOOSE	0 - 4
SOFT	250 - 500	LOOSE	4 - 10
FIRM	500 - 1000	COMPACT	10 - 30
STIFF	1000 - 2000	DENSE	30 - 50
VERY STIFF	2000 - 4000	VERY DENSE	> 50
HARD	> 4000		

TERMS TO BE USED IN DESCRIBING SOILS:-

TRACE < 10% , SOME 10-25% , WITH 25-40% , > 40% SILTY, SANDY, GRAVELLY, CLAYEY ETC.

TYPE OF SAMPLE

S.S.	SPLIT SPOON	T.W.	THINWALL OPEN
W.S.	WASHED SAMPLE	T.P.	THINWALL PISTON
S.T.	SLOTTED TUBE SAMPLE	O.S.	OESTERBERG SAMPLE
A.S.	AUGER SAMPLE	F.S.	FOIL SAMPLE
C.S.	CHUNK SAMPLE	R.C.	ROCK CORE

P.H. SAMPLE ADVANCED HYDRAULICALLY

P.M. SAMPLE ADVANCED MANUALLY

SOIL TESTS

U	UNCONFINED COMPRESSION	L.V.	LABORATORY VANE
UU	UNCONSOLIDATED UNDRAINED TRIAXIAL	F.V.	FIELD VANE
CIU	CONSOLIDATED ISOTROPIC UNDRAINED TRIAXIAL	C	CONSOLIDATION
CID	" " DRAINED "	S	SENSITIVITY
CAU	" " ANISOTROPIC UNDRAINED "		
CAD	" " DRAINED "		

ABBREVIATIONS & SYMBOLS USED IN THIS REPORT

SOIL PROPERTIES

GENERAL

γ	UNIT WEIGHT OF SOIL (BULK DENSITY)
γ_s	UNIT WEIGHT OF SOLID PARTICLES
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G	SPECIFIC GRAVITY OF SOLID PARTICLES $G = \frac{\gamma_s}{\gamma_w}$
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n	POROSITY
w	WATER CONTENT
S_r	DEGREE OF SATURATION
w_L	LIQUID LIMIT
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I_p	PLASTICITY INDEX
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I_C	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
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e_{min}	VOID RATIO IN DENSEST STATE
I_D	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D_r IS ALSO USED
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q	RATE OF DISCHARGE
v	VELOCITY OF FLOW
i	HYDRAULIC GRADIENT
k	COEFFICIENT OF PERMEABILITY
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m_v	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
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c_u	APPARENT COHESION
ϕ_u	APPARENT ANGLE OF SHEARING RESISTANCE, OR FRICTION
μ	COEFFICIENT OF FRICTION
S_t	SENSITIVITY

π	= 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
$\log_e \sigma$ OR $\ln \sigma$	NATURAL LOGARITHM OF σ
$\log_{10} \sigma$ OR $\log \sigma$	LOGARITHM OF σ TO BASE 10
t	TIME
g	ACCELERATION DUE TO GRAVITY
V	VOLUME
W	WEIGHT
M	MOMENT
F	FACTOR OF SAFETY

STRESS AND STRAIN

u	PORE PRESSURE
σ	NORMAL STRESS
σ'	NORMAL EFFECTIVE STRESS ($\bar{\sigma}$ IS ALSO USED)
τ	SHEAR STRESS
ϵ	LINEAR STRAIN
γ	SHEAR STRAIN
ν	POISSON'S RATIO (μ IS ALSO USED)
E	MODULUS OF LINEAR DEFORMATION (YOUNG'S MODULUS)
G	MODULUS OF SHEAR DEFORMATION
K	MODULUS OF COMPRESSIBILITY
η	COEFFICIENT OF VISCOSITY

EARTH PRESSURE

d	DISTANCE FROM TOP OF WALL TO POINT OF APPLICATION OF PRESSURE
δ	ANGLE OF WALL FRICTION
K	DIMENSIONLESS COEFFICIENT TO BE USED WITH VARIOUS SUFFIXES IN EXPRESSIONS REFERRING TO NORMAL STRESS ON WALLS
K_0	COEFFICIENT OF EARTH PRESSURE AT REST

FOUNDATIONS

B	BREADTH OF FOUNDATION
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D	DEPTH OF FOUNDATION BENEATH GROUND
N	DIMENSIONLESS COEFFICIENT USED WITH A SUFFIX APPLYING TO SPECIFIC GRAVITY, DEPTH AND COHESION ETC. IN THE FORMULA FOR BEARING CAPACITY
k_s	MODULUS OF SUBGRADE REACTION

SLOPES

H	VERTICAL HEIGHT OF SLOPE
D	DEPTH BELOW TOE OF SLOPE TO HARD STRATUM
β	ANGLE OF SLOPE TO HORIZONTAL

FOUNDATION INVESTIGATION REPORT

For

W.P. 129-62-00

Strawberry Creek Bridge #1

4.4 Miles East of Jct. Hwys. 11 & 17

Hwy. 102, Line 'M', District #19

TABLE OF CONTENTS

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Sandy Silt With Traces of Clay

Bedrock

Groundwater

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INTRODUCTION

This report contains the results of a foundation investigation carried out at the following site:

W.P. 129-62-00 Strawberry Creek Bridge #1
4.4 Miles East of Jct. Hwys. 11 & 17
Hwy. 102, Line 'M', District #19, Thunder Bay

For purposes of the contract, all other Foundation Investigation Reports prepared by or for the Ministry in connection with the above project, are superceded by this report.

SITE DESCRIPTION

The site is located at the crossing of Hwy. 102, Line 'M' and Strawberry Creek, Lot 13, Con. A, Dawson Road Lots, Municipal District of Thunder Bay. Line 'M' is some 60 to 65 ft. north of existing Hwy. 102 which crosses the creek via a 90 ft. long timber trestle bridge which is rated by the Maintenance Operations Section as being in generally poor condition.

Strawberry Creek follows a meandering course and at the site in question, flows in a northeast to southwest direction. The width of the creek ranges from 25 to 35 ft. and the depth, under normal flow conditions, from 2 to 4 ft. During the annual spring run off the water level in the creek rises to about 6 ft. above normal. The topography of the area may be described as rolling terrain. Several gravel pits are under operation in the immediate area.

SUBSURFACE CONDITIONS

General

Subsoil at this site consists of deposits of silty clay and sandy silt overlying granite bedrock. Depth to bedrock over the site area ranges from 10 to about 20 ft. Boundaries of different deposits are shown on the Record of Borehole Sheets which are contained in the Appendix of this report. The locations and elevations of all borings are shown on Drawing #48W-1-2 of the Contract Drawings, together with the inferred subsoil stratigraphy. A description of the soil and rock types encountered in the boreholes follows:

Silty Clay With Sand

This deposit occurs on the right bank of the creek from the ground surface to a depth of about 8 ft. From a visual inspection the material is classified as silty clay with sand. Based on a single standard penetration test (N=12) and, on a visual inspection of the sampled soil, the undrained shear strength is estimated to range from 1000 to 2000 p.s.f., indicating a generally stiff consistency.

Sandy Silt With Traces of Clay

This deposit occurs on both banks of the river and appears to be of recent alluvial origin. The maximum thickness encountered was 13 ft. On the basis of visual inspections the material is classified as sandy silt with traces of clay. Standard Penetration Test 'N' values ranged from 5 to 12 blows/ft., indicating a loose to compact relative density.

Bedrock

Bedrock was proven in two borings, #4 and #7 by recovering AX size (1 9/16 in. dia.) rock cores. The cores indicated bedrock consisting of sound granite. In all other boreholes the bedrock surface has been inferred from the results of dynamic cone penetration tests.

Groundwater

At the time of the field investigation, April 2-3, 1973, the following groundwater levels were recorded:

B.H. #4 Elev. 1044.7

B.H. #7 Elev. 1045.9

The creek water level at that time was elev. 1045 \pm . It may be assumed that groundwater at all times of the year will correspond closely to the prevailing creek water level.

P. Payer
P. PAYER
Senior Engineer

K.G. Selby
K.G. SELBY
Supervising Engineer



March, 1976

APPENDIX

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 4

WP 129-62-00 LOCATION Sta. 15 + 57 @ Line 'M' ORIGINATED BY PP
 DIST 19 HWY 102 BORING DATE April 2, 1973 COMPILED BY PP
 DATUM Geodetic BOREHOLE TYPE Washbore - BX Casing CHECKED BY EP

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w		
1048.7	Ground Level														
0.0	Silty clay with sand														
	Stiff		1	SS	12										
1040.5															
8.2	Sandy silt, trace of clay.		2	SS	5										
1034.7	Loose														
14.0	Granite Bedrock		3	RC AXT	Rec 92%										
1029.7															
19.0	End of Borehole														

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 5

WP 129-62-00 LOCATION Sta. 15+47 o/s 19' Rt. & Hwy. 102 Line 'M' ORIGINATED BY PP
 DIST 19 HWY 102 BORING DATE April 2, 1973 COMPILED BY PP
 DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY JP

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE					
1050.2	Ground Level								
0.0									
1037.8					1040				
12.4	End of Cone Test Probable Bedrock					refusal			

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 6

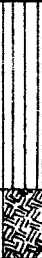

WP 129-62-00 LOCATION Sta. 14 + 55 o/s 19' Rt. of Hwy. 102 Line 'M' ORIGINATED BY PP
 DIST 19 HWY 102 BORING DATE April 3, 1973 COMPILED BY PP
 DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY *PP*


SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT 20 40 60 80 100 SHEAR STRENGTH ○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE	LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w w_p — w — w_L WATER CONTENT %	UNIT WEIGHT Y	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES					
1049.9	Ground Level									
0.0										
1039.1						1040				
10.8	End of Cone Test Probable Bedrock						Refusal			

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 7

WP 129-62-00 LOCATION Sta. 14 + 67 ℓ Line 'M' ORIGINATED BY PP
 DIST 19 HWY 102 BORING DATE April 3, 1973 COMPILED BY EP
 DATUM Geodetic BOREHOLE TYPE Washbore - NX Casing CHECKED BY EP


SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20 40 60 80 100					w_p — w — w_L				
							SHEAR STRENGTH									
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					WATER CONTENT %				
1051.1	Ground Level					ELEV										
0.0	Sandy silt with trace of clay.		1	SS	8	1050										
	Loose to Compact		2	SS	12	1040										
1037.8																
13.3	Granite Bedrock		3	RC AXT	84%											
1032.8																
18.3	End of Borehole															

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE - SOIL MECHANICS SECTION															
RECORD OF BOREHOLE NO 8															
WP 129-62-00			LOCATION Sta. 14 + 77 @ Line 'M'					ORIGINATED BY PP							
DIST 19 HWY 102			BORING DATE April 3, 1973					COMPILED BY PP							
DATUM Geodetic			BOREHOLE TYPE Cone Test Only					CHECKED BY 							
SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w		UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p — w — w_L WATER CONTENT %			
1048.7	Ground Level														
0.0															
1038.6						1040									
10.1	End of Cone Test Probable Bedrock										Refusal				

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 9

WP 129-62-00 LOCATION Sta. 14 + 81 o/s 18' Lt. of Hwy. 102 Line'M' ORIGINATED BY PP
 DIST 19 HWY 102 BORING DATE April 3, 1973 COMPILED BY PP
 DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY PP

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS	
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	SHEAR STRENGTH					WATER CONTENT %
												○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					
1051.8	Ground Level																
0.0						1050											
1039.3						1040											
12.5	End of Cone Test Probable Bedrock						Refusal										

RECORD OF BOREHOLE № 10

WP 129-62-00 LOCATION Sta. 14 + 57 @ Line 'M' ORIGINATED BY PP
DIST 19 HWY 102 BORING DATE April 3, 1973 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Cone Test Only CHECKED BY [Signature]

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		SHEAR STRENGTH					WATER CONTENT %				
							○ UNCONFINED + FIELD VANE ● QUICK TRIAXIAL x LAB VANE					w_p w w_L				
1054.4	Ground Level															
0.0						1050										
1040.4	End of Cone Test Probable Bedrock						Refusal									

FOUNDATION INVESTIGATION REPORT

For

W.P. 128-62-00

Strawberry Creek Bridge #2

3.9 Miles East of Jct. Hwys. 11 & 17

Hwy. 102, Line 'L', District #19

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INTRODUCTION

This report contains the results of a foundation investigation carried out at the following site:

W.P. 128-62-00 Strawberry Creek Bridge #2
 3.9 Miles East of Jct. Hwys. 11 & 17
 Hwy. 102, Line 'L', District 19, Thunder Bay

For purposes of the contract all other Foundation Investigation Reports prepared by or for the Ministry in connection with the above project are superceded by this report.

SITE DESCRIPTION

The site is located at the crossing of Hwy. 102, Line 'L', and Strawberry Creek, Lot 16, Con. A, Dawson Road Lots, Municipal District of Thunder Bay. Line 'L' is some 40 ft. and 60 ft. north of the extremities of a 120 ft. long timber trestle bridge which carries existing Hwy. 102 over Strawberry Creek. This bridge is assessed by the Maintenance Operations Section as being in poor condition. Strawberry Creek flows in a south to north direction and is about 45 feet wide and 2 feet deep under normal flow conditions. The mean annual flood level is about 6 ft. above normal. The terrain in the immediate area of the site is generally flat.

SUBSURFACE CONDITIONS

General

Subsoil at this site consists of a deep deposit of compact to very dense sand containing frequent cobbles and boulders in the upper 6 to 8 ft., followed by a very dense deposit of boulders. Depth to the surface of the boulder deposit ranges approximately from 65 to 94 ft. The boundaries of different deposits are shown on the Record of Borehole Sheets contained in the Appendix of this report. The locations and elevations of the borings are shown on Drawing No. 48W-2-2 of the Contract Drawings, together with the inferred subsoil stratigraphy. A description of the soil types encountered in the borings follows:

Sand, Some Gravel and Traces of Silt

This deposit extends from ground level to a maximum depth of about 94 ft. Boulders and/or cobbles were encountered in the upper 6 to 8 ft. and it was necessary to relocate the borings in order to penetrate this zone by driving methods. The material is classified as sand, some

gravel, traces of silt. Mechanical analyses of samples recovered from the deposit indicate the following grain size composition:

Gravel size	9% - 41%
Sand size	53% - 88%
Silt and Clay sizes	3% - 10%

Laboratory tests to determine natural moisture content gave results ranging from 7 to 23%, with a weighted average of about 14%. Standard penetration test 'N' values ranged from 14 to 81 blows/ft. and in general increase with depth. These test results indicate a degree of denseness ranging from compact at the surface to very dense with depth.

Boulders

This stratum underlies the abovementioned deposit and is identified as 'boulders' on the basis of AXT (2 9/32 inch dia.) rock core samples recovered. The maximum depth penetrated was 5 ft. Core samples consisted of portions of boulders up to 14 inches in size. Attempts to advance casing into the stratum by driving were not successful.

Groundwater

Groundwater in the borings was found to correspond closely to the creek water level, which at the time of the investigation (Jan. 11-24, 1973) was approximately elev. 1032. It may be assumed that groundwater at all times of the year will correspond closely to the prevailing creek water level.

P. Payer
P. PAYER
Senior Engineer

K.G. Selby
K.G. SELBY
Supervising Engineer



March, 1976

APPENDIX

RECORD OF BOREHOLE No 1

WP 128-62-00 LOCATION Sta. 45 + 44 o/s 14' Lt. of Hwy. 102 Line 'L' ORIGINATED BY PP
DIST 19 HWY 102 BORING DATE January 11-19, 1973 COMPILED BY PP
DATUM Geodetic BOREHOLE TYPE Washbore - BX Casing CHECKED BY PP

[illegible]

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 3

WP 128-62-00

LOCATION Sta. 44 + 67 o/s 15' Rt. of Hwy. 102 Line 'L'

ORIGINATED BY PP

DIST 19 HWY 102

BORING DATE January 22 - 24, 1973

COMPILED BY PP

DATUM Geodetic

BOREHOLE TYPE Washbore - BX Casing

CHECKED BY *PP*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w			UNIT WEIGHT γ	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100	w_p	w	w_L		
1038.5	Ground Level															
0.0																
	Occasional Boulders		1	SS	100	5"										
			2	SS	30	1030										
			3	SS	26											
	Sand with Gravel,		4	SS	16	1020										
	Trace of Silt		5	SS	25											
						1010										
	Compact to		6	SS	43	1000										
	Very Dense					990										
			7	SS	44											
						980										
						970										
			8	SS	81											
						960										
			9	SS	70											
						950										
944.3			10	RC	-											
942.4	Boulders		11	RC	-											
96.1	End of Borehole															

FOUNDATION INVESTIGATION REPORT

For

W.P. 127-62-00

Strawberry Creek Bridge No. 3
3.4 Miles East of Jct. Hwys. 11 & 17
Hwy. 102, Line 'L', District #19

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Silty Clay

Sand and Gravel With Silt

Silty Sand & Sandy Silt

Boulders

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RECORD OF BOREHOLE SHEETS

INTRODUCTION

This report contains the results of a foundation investigation carried out at the site of the following project:

W.P. 127-62-00 Strawberry Creek Bridge No. 3
3.4 Miles East of Jct. Hwys. 11 & 17
Hwy. 102, Line 'L', District 19, Thunder Bay

For purposes of the contract all other foundation investigation reports carried out by or for the Ministry in connection with the above project are superceded by this report.

SITE DESCRIPTION

The site is located at the crossing of Hwy. 102, Line 'L' and Strawberry Creek, Lot 18, Con. 'A', Dawson Road Lots, Municipal District of Thunder Bay. Line 'L' is some 50 ft. south of a 90 ft. long, 5 span timber trestle bridge which carries existing Hwy. 102 over Strawberry Creek. This structure, according to available records, is founded on timber piles which were driven about 30 ft. into original ground. The structure is presently rated by the Maintenance Operations Section as being in generally poor condition. Strawberry Creek at this location flows in a general north to south direction and is some 50 ft. wide and 4 to 5 ft. deep during conditions of normal flow. The mean annual flood level is some 5 to 6 ft. above normal. The stream follows a somewhat meandering course through a relatively shallow valley, the high ground being approximately 3 ft. above normal water level on the east side and about 8 ft. on the west side.

SUBSURFACE CONDITIONS

General

Subsoil at the site consists of 5 to 6 ft. of soft silty clay followed by 12 to 25 ft. of compact to very dense sand and gravel with silt, followed by about 50 to 70 ft. of loose to very dense silty sand to sandy silt, all underlain by boulders. The boundaries between the different deposits are shown on the Record of Borehole Sheets contained in the Appendix. The locations and elevations of the borings are shown on Drawing 48W-3-2 of the Contract Drawings, together with the estimated subsoil stratigraphy. A description of the soil types encountered during the investigation follows:

Silty Clay

This is the uppermost deposit at the site and occurs on both banks of the river. The depth is about 5 to 6 ft. and the material is classified as soft silty clay, some sand and traces of organics, on the basis of a visual inspection of samples only.

Sand and Gravel With Silt

This deposit ranges from 12 to 25 ft. in thickness and consists of a mixture of gravel sand and silt in varied proportions. On the basis of mechanical analyses tests and visual inspections of samples, the bulk of the deposit is classified as sand and gravel with silt. The average moisture content is about 10%. Standard penetration test 'N' values ranged from 9 to 73 blows/ft. However, the higher values probably do not reflect the denseness of the soil matrix because of the effect on the sampler of gravel sizes and the overall denseness of the layer is assessed to be 'compact'.

Silty Sand & Sandy Silt

This stratum underlies the sand & gravel deposit and consists of a mixture of sand and silt in varied proportions containing traces of clay. The depth ranges from about 50 to 70 ft. Mainly from visual inspections of samples recovered, the deposit is classified as silty sand & sandy silt, traces of clay. Standard penetration test 'N' values ranged from 7 to 93 blows/ft. A review of these results and the results of dynamic cone penetration tests indicate the upper 10 ft. of the deposit to be generally 'loose' and the remainder to increase from 'compact' to 'very dense' with depth. The natural moisture content decreases with depth, being about 22% at the surface of the deposit to about 15% at the bottom.

Boulders

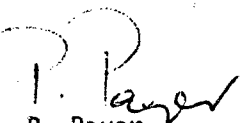
To penetrate this layer it was necessary to use diamond drilling techniques since casing could not be driven into it. AXT size (2 9/32 in. dia.) rock core samples were recovered to a maximum depth of 20 ft. These samples consisted of portions of granite cobbles and boulders up to 7 inches in length. The stratum is assessed as consisting of a densely packed deposit of boulders, the cavities being filled with gravel sand and silt.

Groundwater

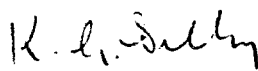
The following groundwater levels were observed during the field investigation.

B.H. #1	Elev. 1018.3	(Jan. 7, 1973)
B.H. #2	Elev. 1016.5	(Jan. 17, 1973)

Ice level in the creek was 1019 \pm . It should be assumed that groundwater levels at all times of the year will be close to the prevailing water level of the creek.


P. Payer
Senior Engineer




K.G. Selby
Supervising Engineer

March, 1976

APPENDIX

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 1

WP 127-62 -00 LOCATION Sta. 69+00 E Hwy. 102 Line 'L' ORIGINATED BY PP
 DIST 19 HWY 102 BORING DATE November 30, 1972 - January 8, 1973 COMPILED BY PP
 DATUM Geodetic BOREHOLE TYPE Washbore - NX & AX Casing CHECKED BY *EP*

SOIL PROFILE		SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT w_L PLASTIC LIMIT w_p WATER CONTENT w			UNIT WEIGHT Y	REMARKS
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	VALUES	20	40	60	80	100	w_p	w	w_L		
1022.6	Ground Level														
0.0	Silty clay, some sand & trace of organics														
1017.9	Soft		1	SS	2										
4.7	Sand and gravel, trace of silt		2	SS	73										
			3	SS	19										
			4	SS	41										
			5	SS	24										
	Compact														
			6	SS	14										
992.6															
30.6															
	Silty sand and sandy silt		7	SS	7										
			8	SS	28										
	Loose to Dense														
			9	SS	43										
942.5															
80.1	Boulders		10	SS	55/2"										
	(Gravel, Sand & Silt)		11												
			12	RC											
			13												
923.3															
99.3	End of Borehole														

20
 15 ϕ 5 % STRAIN AT FAILURE
 10

ENGINEERING SERVICES BRANCH-GEOTECHNICAL OFFICE-SOIL MECHANICS SECTION

RECORD OF BOREHOLE NO 2

WP 127-62-00 LOCATION Sta. 69 + 75 o/s 3' Rt. of Hwy. 102 Line 'L' ORIGINATED BY PP
 DIST 19 HWY 102 BORING DATE December 13, 1972 - January 16, 1973 COMPILED BY PP
 DATUM Geodetic BOREHOLE TYPE Washbore - BX & AX Casing CHECKED BY *[Signature]*

SOIL PROFILE			SAMPLES			GROUND WATER ELEV	DYNAMIC CONE PENETRATION RESISTANCE PLOT					LIQUID LIMIT — w_L PLASTIC LIMIT — w_p WATER CONTENT — w w_p — w — w_L WATER CONTENT % 10 20 30	UNIT WEIGHT γ	REMARKS % GR SA SI CL
ELEV DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	'N' VALUES		20	40	60	80	100			
1021.9	Ground Level													
0.0	Silty clay some sand & trace of organics					1020								
1015.8	Soft		1	SS	4									
6.1	Sand & gravel with silt, trace of clay		2	SS	15	1010								
	Loose to Compact		3	SS	9									35 25 35 5
1003.9			4	SS	11	1000								0 29 69 2
18.0	Sandy silt and silty sand, Trace of clay		5	SS	11	990								
	Compact to Very Dense		6	SS	52	980								
			7	SS	93	970								0 57 (43)
			8	SS	85	960								
931.7	Boulders (Gravel, sand and silt)		9			930								
90.3			10	RC	-									
920.7														
101.2	End of Borehole													

20
15 \diamond 5 % STRAIN AT FAILURE
10

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS AND TESTING OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT <u>70-1075</u>		SITE <u>Groundhog R</u>		BOREHOLE No. <u>5</u>		GROUND ELEVATION _____								
SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE										
				GRAVEL	SAND	SILT & CLAY								
1	23.0 233	31	Round	90.15								120/3"	Gravelly fine sand	

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS AND TESTING OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT 70-11075 SITE Groundhog R BOREHOLE No. 1 & 2 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
<u>Borehole #1</u>																
1	8.0 6.5	1" 3	Sub Round	—	20	80		Dull	Slow		Org.	Dr Grey to Green	None	1	Organic Silt with traces of Organics. Some Sand *	
3	11.0 12.5	40			60	40			Quick		Earthy	Dr Grey	Strong	—	Silty Fine Sa. traces Shells *	
4	14.0 15.5											"	"		" " " " "	
5	17.0 18.5	10 3	Sub Round	4	81	15						Grey to Dr Grey	"		Silt (F-M) Sand (with some med) & trace of Gravel *	
<u>Borehole #2</u>																
1	20.0 21.5	5	Sub Round	—	40	60			Quick		Earthy	Light Grey	Strong	3	Sandy Silt (sub)	
2	23.0 24.5	1 5										Light Grey	Strong	11	(100/200) Silt Sand & fine Gravel (100/200)	
3	26.0 27.5	1 5												14	(100/200) Silt Sand	
4	29.0 30.5	1 4			3	60	37							42	(100/200) * Mix Sand - (100/200)	
5	32.0 33.5	1 3	Sub Round		60	25	15			Quick		Light Grey	"	16/3"	" (100/200) with trace of Gravel	
6	35.0 35.2													100/2"		

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

DEPARTMENT OF HIGHWAYS — ONTARIO
MATERIALS AND TESTING OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT <u>70-11075</u>		SITE <u>Groundhog R.</u>		BOREHOLE No. <u>3 & 4</u>		GROUND ELEVATION _____								
SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION			DRY STRENGTH	SHINE	DILATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE										
				GRAVEL	SAND	SILT & CLAY								
<i>Borehole #3</i>														
1	5.0 10.5	1/2"	Sub Ang.	5	70	35	—	Quick		Earthy	Light Grey	Strong	4	Silt (sand & gravel) (saturated)
2	12.0 13.5											15	(poor recovery) Sand & Gravel (Till?)	
3	15.0 16.5	3/4"	Sub Ang.	7	50	33	—	Quick		"	Light Grey	"	18	(Till approx.) Sand & Gravel *
4	18.0 19.5	1"	Sub Ang.									158	Large piece gravel only.	
<i>Borehole #4</i>														
1	23.0 24.0	3/4"	Sub Ang.	80	70	—	—	Quick		"	"	85	Coarse Sand & Gravel	
2	24.0 25.5	1/2"	Sub Ang.	8	50	32		"				33	Silt & Sand, trace gravel - <u>TILL</u>	
3	27.0 28.5	2"	"	12	58	30		"				33	as above *	
4	30.0 31.3	1 1/4"	"					"				62	as above	
4A	31.3 31.8	1 1/4"	Sub Ang.	70	20	10				Orange Brown	"		Helminthoid? Gravel, Silt, Sand & Clay	

NOTES:— VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:—

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
FOUNDATIONS OFFICE

VISUAL CLASSIFICATION SHEET

PROJECT 71-11093 SITE _____ BOREHOLE No. 101 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1A	3.0 4.5				50	30	no	dull	slow		organic silty	grey-black			organic silt & sand; tr. clay	OL
1B	4.5 5.0				15	85	no	dull	no		earthy silty	grey			grey clayey silt; some sand	CL
2	8.3 9.8				40	60	no	dull	slow		organic oily	grey-black			organic silt with sand; tr. clay trace organics	OL
3	13.9 15.8				50	50	no	dull	slow		oily	grey			silt and sand; tr. clay; tr organics	ML

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

VISUAL CLASSIFICATION SHEET

PROJECT 73-11023 SITE _____ BOREHOLE No. 103 GROUND ELEVATION _____

SAMPLE No.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
* 1	19.5 23.5	1"	sub-ang	20	30	50		dull	slow	no	earthy	grey			silt with sand, some gravel, tr. clay.	ML
3	24.0 28.0	1/8"			90	10		-	quick	no	earthy	grey			well graded sand, trace silt	SW
4	29.0 33.0	"			"	"			"	"	"	"			" " " "	SW
5	39.5 39.9	1/2"	sub-ang	60	30	10		-	quick	no	"	"			gravel with coarse sand; trace silt & clay	GP
6	40.0 45.0				10	90		dull	quick	no	earthy	siliceous grey	strong		calcareous silt; tr. sand.	ML

NOTES:- VISUAL CLASSIFICATION MUST BE CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:- * JAR CRACKED.

MINISTRY OF TRANSPORTATION AND COMMUNICATIONS - ONTARIO
FOUNDATIONS OFFICE
VISUAL CLASSIFICATION SHEET

PROJECT 73-11095 SITE _____ BOREHOLE No. 104 GROUND ELEVATION _____

SAMPLE NO.	DEPTH	GRAIN SIZE DISTRIBUTION					DRY STRENGTH	SHINE	DIALATANCY	TOUGHNESS	ODOR	COLOUR	ACID TEST	CONSISTENCY OR UNDRAINED SHEAR STRENGTH	CLASSIFICATION WITH DESCRIPTION	SYMBOL
		LARGEST GRAIN SIZE	SHAPE	PERCENTAGE												
				GRAVEL	SAND	SILT & CLAY										
1	6.5 8.3				20	80	no	ball	quick		earthy	grey (dark)	strong		silt with some sand.	ML
2	9.2 10.7				20	80	no	"	slow		earthy	grey light			silt with some sand	ML
3	14.8 16.3	1"	sub- rounded	25	15	60		"	slow - quick		earthy	grey			silt with gravel and some sand; tr. clay.	ML
4	19.3 20.8			10	15	75		"	quick		earthy	grey			silt with sand; tr. gravel	ML
5	24.8 26.0	1"	sub- rounded	30	50	25	no	"	quick	no	earthy	grey			sand with gravel; some silt	GF
6	29.8 31.1	1 1/2"	sub- ang	40	35	25	"	"	"	"	"	"			gravel with sand; some silt	GF
NOTE: UNMARKED SAMPLE:																
					90	10						grey			fine sand; tr. silt.	

NOTES:- VISUAL CLASSIFICATION MUST BY CARRIED OUT ON ALL SAMPLES BY THE ENGINEER AS SOON AS POSSIBLE AFTER THE SAMPLES REACH THE LABORATORY.

REMARKS:-

OVERSIZED DRAWINGS

General Layout
Footings "