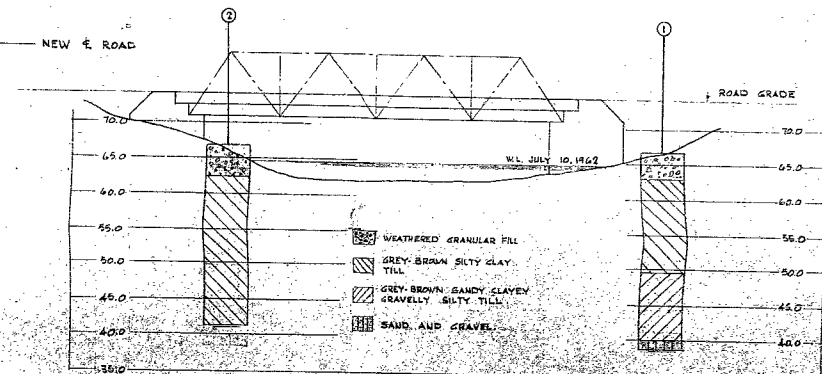
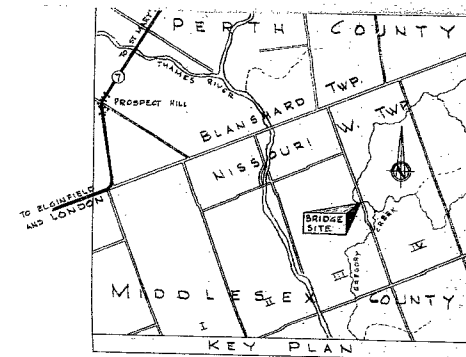
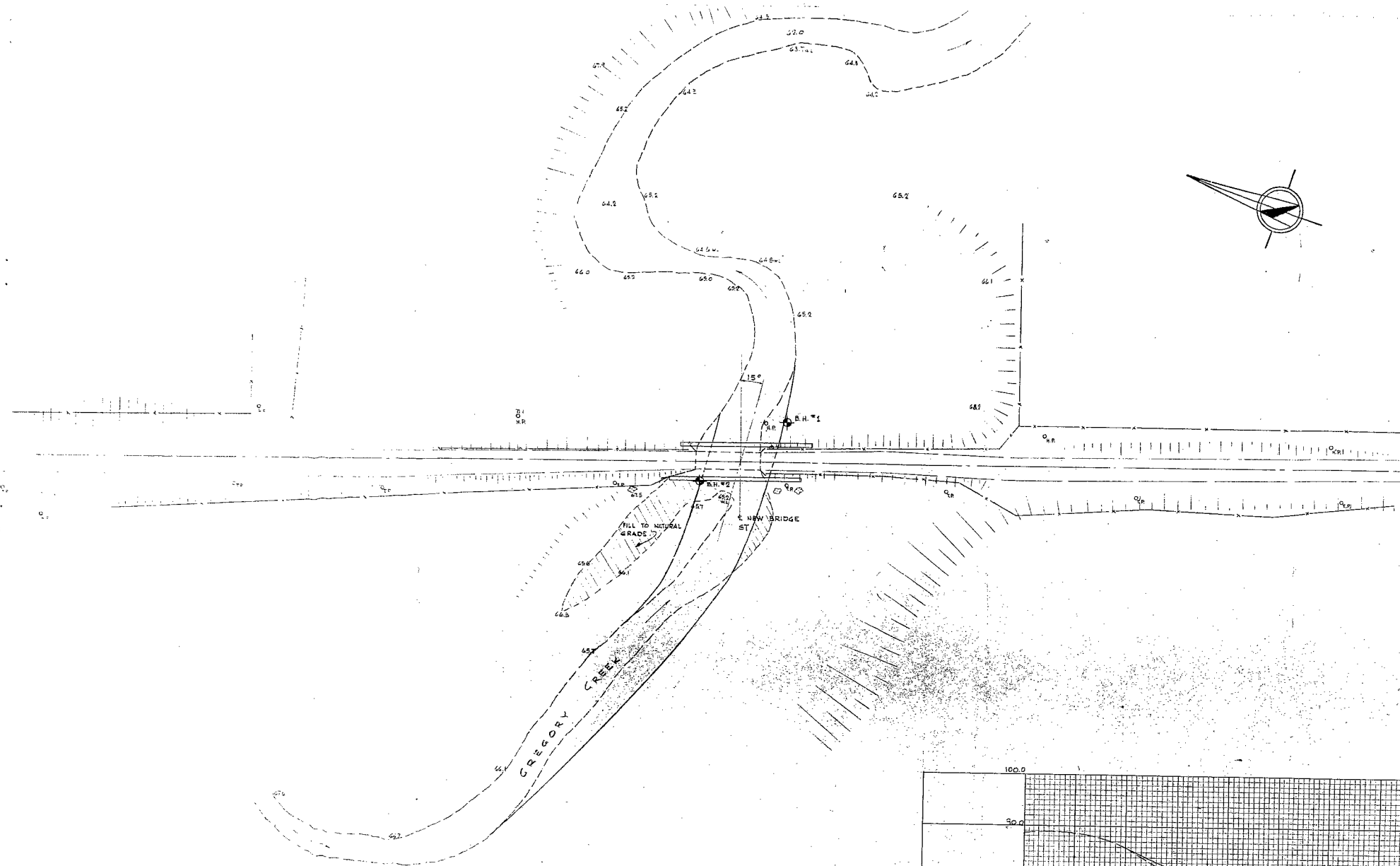
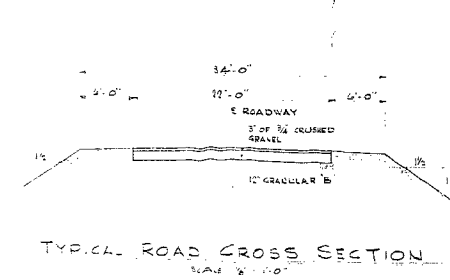


62-F-291M
LINDSAY BRIDEE
LOT. 33 CON. III/IV
W. MISSOURI
TWP.



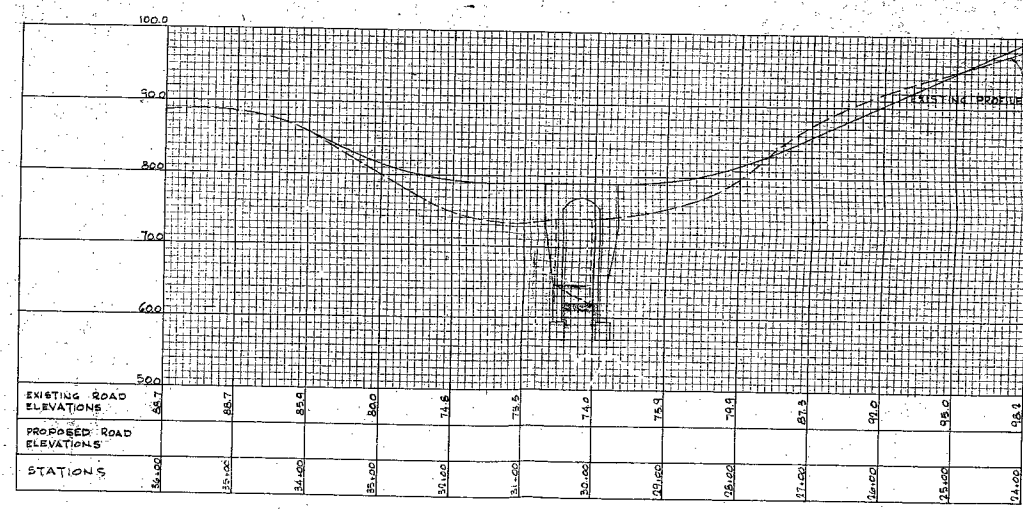
PROFILE OF BOREHOLE RESULTS

THE BORINGS INDICATED ARE TO BE USED AS A GUIDE ONLY. THE ACCURACY OF WHICH IS NOT GUARANTEED BY THE OWNER. FOR FULL DETAILS SEE SOIL REPORT NO. 7-7-L4 DOMINION SOIL INVESTIGATION LIMITED, DATED, JULY, 1962.



TYPICAL ROAD CROSS SECTION
SCALE 1" = 10'

SITE PLAN
SCALE 1" = 40'



PROFILE ALONG E ROAD
SCALE HORIZ. 1" = 100' VERT. 1" = 10'

STRUCTURE SITE No. 20-81

WEST NISSOURI TOWNSHIP	
R. C. DUNN & ASSOCIATES, LTD.	
CONSULTING ENGINEERS	
250 COMMISSIONERS RD. LONDON	GE 3-4079 ONTARIO
LINDSAY BRIDGE	
LOCATED ON ROAD ALLOWANCE BETWEEN CON. III AND CON. IV AT LOT 33, TOWNSHIP OF WEST NISSOURI	
SCALE AS NOTED	DATE
DRAWN C. LOCKHART	DATE 6-11-62
CHECKED	DATE P. 1
SITE PLAN AND PROFILE	

- BRIDGE SURVEY DATA -

- 1- SPECIAL FEATURES : Waterfalls, Dams, Exceptional
Floods, Ice, Driftwood, Sliding Banks, etc.
ROLLING AGRICULTURAL LAND
- 2- (A) Upstream & Downstream Bridges (Give location, length,
height above N.H.W.L., Net Cross-Sectional Area at High
Water & Estimated Age) :
UPSTREAM - 1955 CONCRETE RIBBON FRAME - 50' x 7' H.W.L. - 250 SQ. FT.
THE DRAINAGE AREA IS LONG AND NARROW. THE LOCATION OF THIS BRIDGE
RELATIVE TO UPSTREAM BRIDGE IN THIS AREA IS SUCH THAT INCREASED AREA
VS. INCREASED LENGTH OF THIS OFFSET EACH OTHER SO THAT REQUIRED SIZE
REMAINS THE SAME - 50' SPAN
(B) Reasons Why These Bridges Are, or Are Not, Fair Indication
of Size of Proposed Bridge : SEE ABOVE
- 3- Reasons for Changes in Height or Length from that of Old
Bridge : RATED FOR GRADE IMPROVEMENT AND SKEWED TO SUIT STREAM.
- 4- Is Ditch, Stream, or River Gradient Liable to be Lowered?
NO
- 5- Navigation Clearances Required, if any:
- 6- Railway Clearance Required, if any:
- 7- If Structure is Over or Under a Railway, has approval been obtained?
(A) From Railway Co. :
(B) From Board of Transport Commissioners : N.A.
- 8- Has Approval been obtained under Navigable Waters Protection
Act?
9- If Temporary Detour Required?
10- Who will build it?
11- Who will maintain it?
12- Has Evidence of Extreme Flooding been obtained from
local residents?
13- Does this reflect highest Water Elevation in
the Area of this construction to be 66.0 and the
lowest Water Elevation to be 66.0
- 11- Road Design Information:
Estimated A.D.T. :
Design Speed :
Stopping Sight Distance :

- BRIDGE STRUCTURE DATA -

- 1- Net Span Length and Type of Bridge : 50.1 WATERWAY OPENING
REINFORCED CONCRETE RIBBON FRAME BRIDGE
- 2- Roadway Width on Bridge : 24' - 0"
- 3- Number and Width of Sidewalks : NONE
- 4- Skew Angle : 15°
- 5- Total length & Type of Piling : N.A.
- 6- Approx. Volume of Concrete : 400 cu. yds.
- 7- Approx. Weight of Sin. Steel : tons
- 8- Approx. Weight of Reinforcement : 30 tons
- 9- Approx. Volume of Approach Fill 100 ft. Each Side of
Structure : cu. yds.
- 10- Drainage Area : 13.2 Sq. mi.

Field Investigation Made APRIL 19 1962
By : *William J. ...*
Survey Engineer

TOTAL ESTIMATED COST \$34,000.00

MEMORANDUM

To: Mr. A. Stermac,
Principal Foundation Engineer,
Room 107, Lab. Building,
DOWNSVIEW, Ontario.

From: G. C. E. Burkhardt

Date: September 5, 1962

Our File Ref.


In Reply To

Subject: Twp. of West Missouri, Lindsay
Bridge, County of Middlesex, Lot 33
Con. III/IV, Our File #BA 1494.

We are enclosing herewith one copy of the Foundation Report, by Dominion Soil Investigation Limited, and one copy of Preliminary Plans for your comments.

We intend to approve the preliminary design not later than September 28, 1962. We would appreciate it very much if we could have your comments within the next three weeks.

GCEB/rt


G. C. E. Burkhardt,
for K. L. Kleinsteinber,
Municipal Bridge Liaison Engineer.

No major comment to dated bridge report on Sept 5th 62 and enclosed
our comments.

MESSRS. R.C. DUNN AND ASSOCIATES LIMITED
250 Commissioners Road
LONDON ONTARIO

Job No. 62-110

62-F-291M

Report on
SOIL INVESTIGATION
for
LINDSAY BRIDGE
CONCESSIONS III/IV LOT 33
TOWNSHIP OF WEST NISSOURI

by
DOMINION SOIL INVESTIGATION LIMITED
363 Queens Avenue
LONDON ONTARIO

Reference No. 2-7-L4

July 1962

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I DESCRIPTION OF SITE AND GEOLOGY	2
II FIELD WORK	2
III SUBSURFACE CONDITIONS	2
IV BEARING CAPACITY AND SETTLEMENT	3
V CONSTRUCTION	4
VI SUMMARY	4
VII REFERENCES	4

ENCLOSURES

	<u>No.</u>
SYMBOLS, ABBREVIATIONS AND NOMENCLATURE	1
LOCATION OF BOREHOLES AND SUBSURFACE PROFILE	2
GEOTECHNICAL DATA SHEETS	3 & 4

INTRODUCTION

In accordance with a letter of authorization from Messrs. R.C. Dunn and Associates Limited dated July 4, 1962, a soil investigation has been carried out at a site in the Township of West Nissouri where it is proposed to replace an existing road bridge with a new structure. A site plan showing the positions of the existing and proposed new bridges was supplied by Messrs. R.C. Dunn and Associates Limited (Job No. 62-110, Dwg. No. P1) and the requirements of the work were discussed with Mr. N.M. Warner. It was indicated that the new bridge would be of single-span located in approximately the same position as the existing one.

The purpose of this investigation was to reveal the sub-surface conditions and to determine the necessary soil properties for the design and construction of foundations.

I DESCRIPTION OF SITE AND GEOLOGY

The site is located at the crossing of a gravel township road over Coleman Creek which flows westward to join the North Branch of the River Thames. The creek meanders through a wide, shallow, U-shaped valley which has been cut through the Stratford Till Plain apparently by a larger stream than the present one. This area was almost the first land in Ontario to be uncovered by the receding Wisconsin glacier, and consequently the otherwise flat plain is cut by many spillway valleys of which this may be one.

II FIELD WORK

Field work was carried out during the period 11th to 13th July 1962, and consisted of two boreholes at the locations shown on enclosure 2. The holes were wash-bored and lined with Bx casing. Standard Penetration tests were made at frequent intervals and dynamic cone penetration tests were made adjacent to each borehole. The former test provided disturbed samples of the strata and a measure of relative density or stiffness, while the latter test gave a continuous record of soil density in the upper layers.

Axt core was recovered from cobbles located at a depth of 23 to 25 feet in borehole 1.

The results of the field tests are recorded on geotechnical data sheets comprising enclosures 3 and 4. Elevations have been referred to a local benchmark (nail in hydro pole 200 feet south of bridge, El. 86.63) shown on the site plan.

III SUBSURFACE CONDITIONS

Details of the stratification at each borehole appear on the data sheets and a general picture is given in the form of a subsurface profile shown on enclosure 2. The principal strata are as follows:

- (a) A layer of weathered granular fill extends to 3 to 4 feet from surface.

- (b) A very stiff to hard grey-brown silty clay till extends to a depth varying in the two boreholes from 17 to 22 feet from surface. This is predominantly a cohesive material and contains less than 5% of rounded and sub-angular gravel, generally less than 1 inch in diameter. Towards the bottom of the layer a relative softening occurs as the character of the till changes to the more granular material below.
- (c) Below (b) above, the till is predominantly silty and contains all sizes of sand and angular gravel up to 2 or more inches in diameter. Borehole 2 was terminated in this layer which is very dense. Cobbles were encountered in borehole 1 between 23 and 25 feet.
- (d) In borehole 1 only, a layer of very dense graded silty granular material was encountered below El. 40.0 feet. The particle size varies from fine sand to coarse angular gravel.

IV BEARING CAPACITY AND SETTLEMENT

The lowest elevation found on the bed of the creek was 62.6 feet, so that allowing approximately 5 feet for scour, a footing elevation of 57.0 feet is proposed. The following gross soil pressures are recommended for the design of spread footings at this or lower elevations.

Borehole	Elevation (feet)	Soil Pressure (p.s.f.)
1 (south side)	57 to 55	6,000
	55 to 50	4,500 *
2 (north side)	57 to 50	10,000

Providing the footings are poured on an undisturbed grade, the total settlement associated with the above figures is not expected to exceed one inch. Most of the deflection will occur immediately as the loads are applied.

* A softening of the till near El. 51.0 feet necessitates a reduction in soil pressure if footings are located below El. 55.0.

V CONSTRUCTION

The clay till in which the footings should be located is hard and impervious. Once surface water has been diverted from the site, no construction difficulties are anticipated. Water from surface runoff or precipitation should be collected in a sump dug below the footing grade level, and removed by pumping.

A layer of lean concrete spread on the footing grade will help to prevent disturbance by construction equipment or personnel, but with normal care disturbance should not occur.

If local weaknesses are encountered at the grade level, the defective soil should be replaced with lean concrete. The soil is not suitable for recompaction in isolated areas.

VI SUMMARY

1. The soil consists of 3 to 4 feet of granular fill, covering a very stiff to hard clay till. At lower elevations the till becomes more granular and silty, but this change occurs well below the probable level of the footing grade.
2. A footing grade elevation of 57.0 feet is proposed. Recommended soil pressures for this and lower levels are tabulated on page 3.
3. No unusual construction problems are anticipated.

VII REFERENCES

1. The Physiography of Southern Ontario by L.J. Chapman and D.F. Putman of the Ontario Research Foundation, University of Toronto Press, 1951.
2. Procedures for Testing Soils, ASTM, April 1958, pp. 186 to 198 (Unified Soil Classification System, by A.A. Wagner).
3. Terzaghi and Peck: Soil Mechanics in Engineering Practice, John Wiley and Sons, New York, 1948.

4. The Application of Theories of Elasticity and
Placticity to Foundation Problems, Leo Jurgenson,
Sc.D., Boston Society of Civil Engineers, May, 1934.



JP/mc

DOMINION SOIL INVESTIGATION LIMITED

A handwritten signature in cursive script, appearing to read "James Park".

James Park, M.Sc., P.Eng.

LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE.

SOIL COMPONENTS AND GROUND WATER CONDITIONS.

BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANICS	BEDROCK	GROUND WATER LEVEL	DEPTH OF CAVE-IN
Ø	> 8"	3"	3/4"	4 7/6 mm	2.0	0.42	0.074	0.002	>	NO SIZE LIMIT		
J.S. Standard Sieve Size		No. 4		No. 10		No. 40		No. 200				

SAMPLE TYPES.

AS Auger sample

CS Sample from casing

ChS Chunk sample

RC Rock core

% Recovery

SS Split spoon sample

TP Piston, thin walled tube sample

TW Open, thin walled tube sample

WS Wash sample

SAMPLER ADVANCED BY static weight : w
 " pressure : p
 " tapping : t

OBSERVATIONS
 MADE WHILE
 CORING

Steady pressure
 No pressure
 Intermittent pressure

Washwater returns
 Washwater lost

PENETRATION RESISTANCES.

DYNAMIC PENETRATION RESISTANCE : to drive a 2" ϕ , 60° cone attached to the end of the drilling rods into the ground, expressed in blows per foot

STANDARD PENETRATION RESISTANCE, -N- : to drive a 2" outside dia. split spoon sampler 1 foot into the ground, expressed in blows per foot.

EXTRAPOLATED -N- VALUE

The energy for the penetration resistances is supplied by a 140 lb. hammer falling 30 inches

SYMBOL :



322

SOIL PROPERTIES.

W % Water content

LL % Liquid limit

PL % Plastic limit

PI % Plasticity index

LI Liquidity index

 γ

Natural bulk density (unit weight)

e

Void ratio

RD

Relative density

 C_v

Coeff. of consolidation

 m_v

Coeff. of volume compressibility

k Coeff. of permeability

C

Shear strength in terms of

 ϕ

Angle of int. friction total stress

 C'

Cohesion

 ϕ'

Angle of int. friction in terms of effective stress

UNDRAINED SHEAR STRENGTH.

- DERIVED FROM -

TRIAXIAL

COMPRESSION TEST

UNCONFINED

TEST

LABORATORY

VANE TEST

FIELD

POCKET PENETROMETER TEST

Strain at failure is represented by direction of stem

20%
 15% + 5%
 10%

St : sensitivity = $\frac{\text{shear strength in undisturbed state}}{\text{shear strength in remoulded state}}$

SOIL DESCRIPTION.

COHESIONLESS SOILS :

RD :

Very loose

0 - 15 %

Loose

15 - 35 %

Compact

35 - 65 %

Dense

65 - 85 %

Very dense

85 - 100 %

COHESIVE SOILS :

C lbs/sq.ft

Very soft

less than 250

Soft

250 - 500

Firm

500 - 1000

Stiff

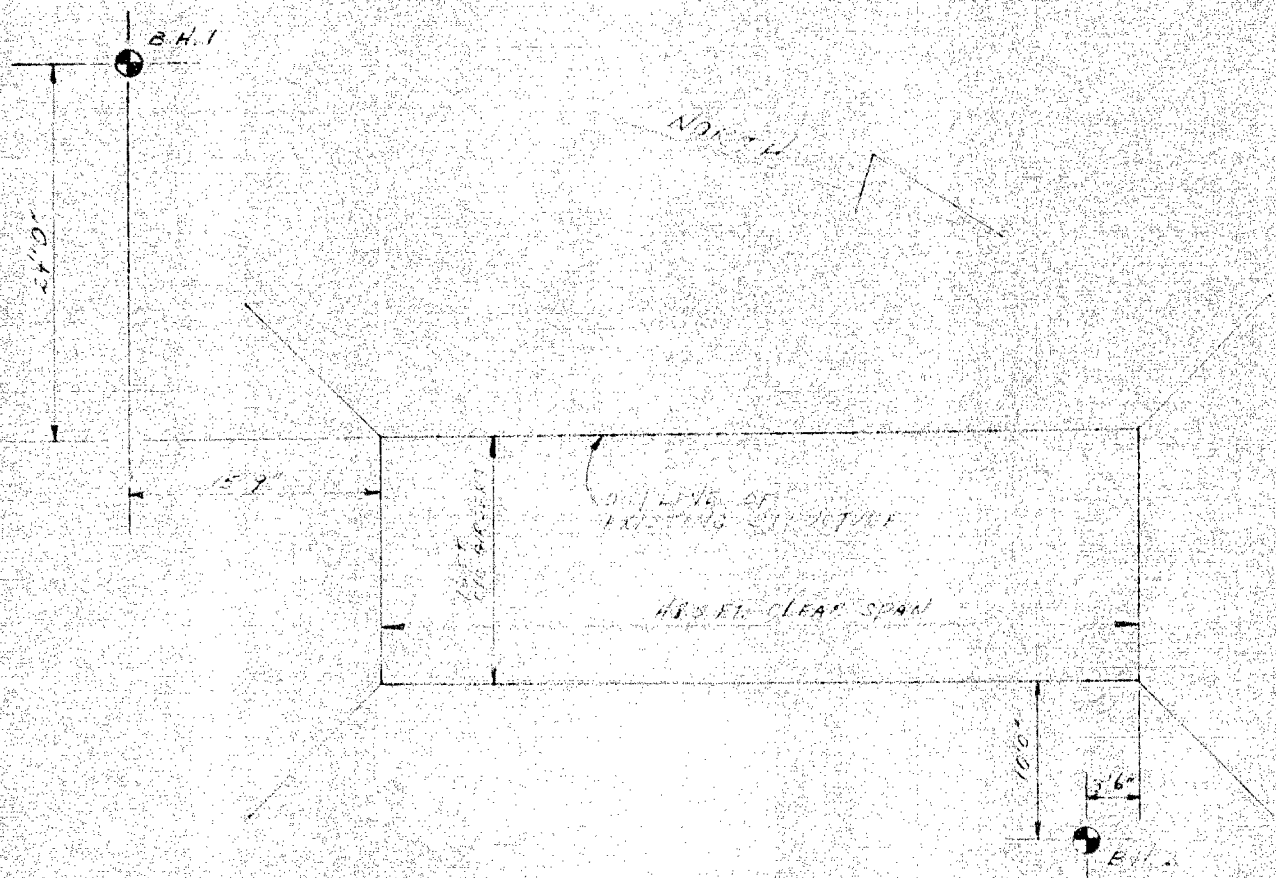
1000 - 2000

Very stiff

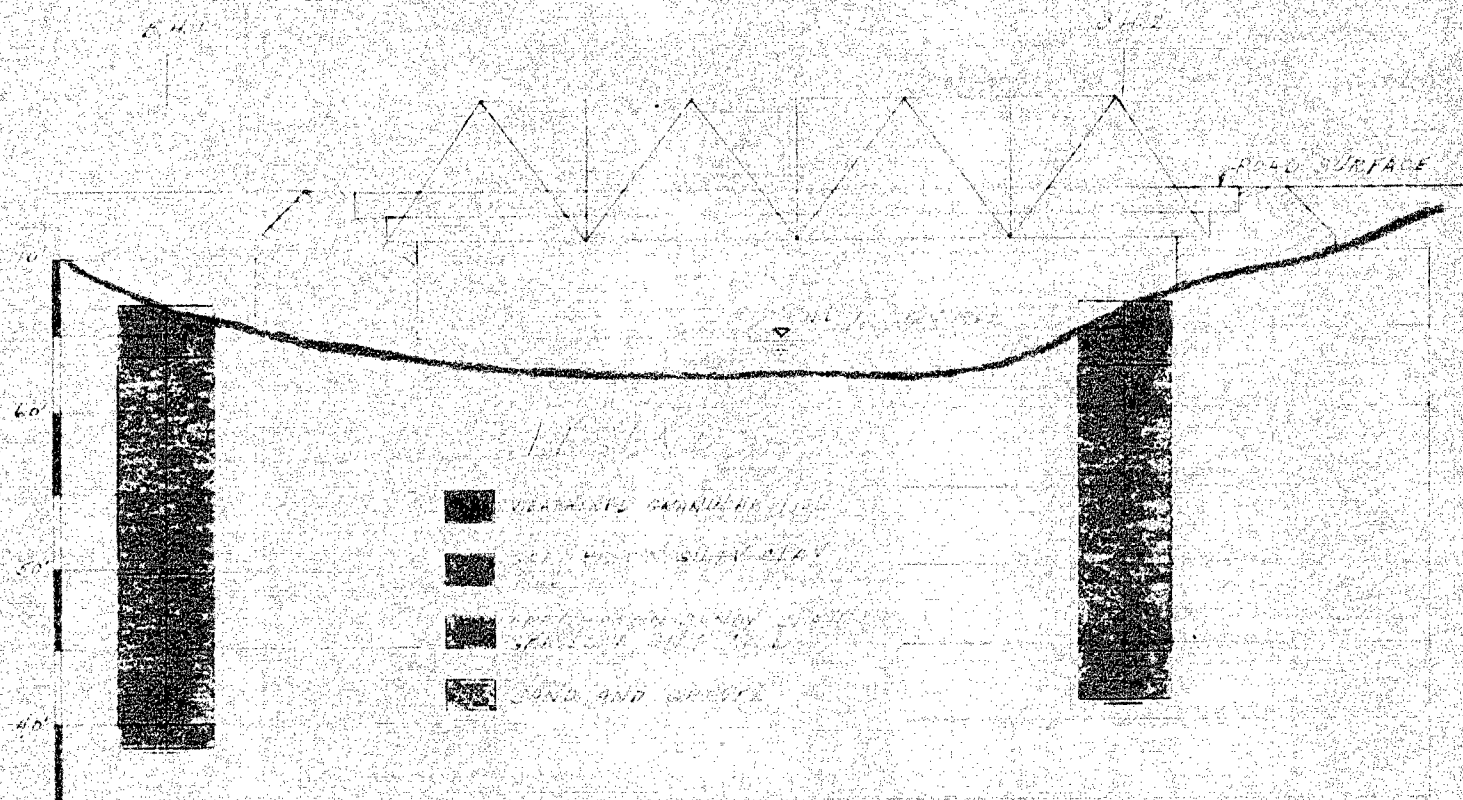
2000 - 4000

Hard

over 4000



LOCATION OF BOLLHOLES
 SCALE 1" = 10' 0"



SURFACE PROFILE
 SCALE 1" = 10' 0"
 (Looking West)

ENCLOSURE No. 2

GEOTECHNICAL DATA SHEET FOR BOREHOLE

OUR REFERENCE NO. 2-7-14

CLIENT: Messrs. R.C. Dunn & Associates Ltd.
 PROJECT: Lindsay Bridge
 LOCATION: Township of West Nissouri
 DATUM ELEVATION: See enclosure 2

METHOD OF BORING: Washboring
 DIAMETER OF BOREHOLE: 8x (2-7/8 ins.)
 DATE: 11 & 12 July 1962

ENCLOSURE NO. 3

ELEVATION ft	DEPTH ft	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLER			PENETRATION RESISTANCE Blows per foot					CONSISTENCY water content %			REMARKS
				NUMBER	TYPE	N _c or Advance- ment of Sampler	20	40	60	80	100	PL	W	LI	
67.0	0	Organic topsoil													
63.7	5	Weathered granular till		1	SS	16									
				2	SS	40									
				3	SS	48									
		Grey-brown silty clay till (<5% gravel)		4	SS	25									
				5	SS	19									
49.8					vane										
		Grey-brown sandy, clayey, gravelly silt till (5% to 20% gravel) 12 July		6	SS	125									
				7	RC	60%									
		cobbles		8	SS	100									
40.0				9	SS	172									
38.5		Graded silty sand & fine to coarse gravel													
	30	End of borehole													

2" dia. cone

Vane would not penetrate below El. 49.8

GEOTECHNICAL DATA SHEET FOR BOREHOLE 2...

OUR REFERENCE NO: 2-7-L4

CLIENT: Messrs. R.C. Dunn & Associates Ltd.
 PROJECT: Lindsay Bridge
 LOCATION: Township of West Nisssouri
 DATUM ELEVATION: See enclosure 2

METHOD OF BORING: Washboring
 DIAMETER OF BOREHOLE: Bx (2-7/8 ins.)
 DATE: 12 & 13 July 1962

ENCLOSURE NO. 4

ELEVATION ft.	DEPTH ft.	STRATIFICATION DESCRIPTION	STRATIFICATION SYMBOL	SAMPLES			PENETRATION RESISTANCE blows per foot					CONSISTENCY water content %		REMARKS
				NUMBER	TYPE	DEPTH of sample ft.	20	40	60	80	100	PL	W	
66.7	0	Organic topsoil												
		Weathered gravelly clay fill		1	SS	32								
62.7	5			2	SS	20								
				3	SS	48								
	10	Grey-brown silty clay till ($<5\%$ gravel)		4	SS	58								
	15			5	SS	85								
	20			6	SS	17								
44.4		Grey-brown sandy, clayey, gravelly silt till (5% to 20% gravel)			vane									
41.2	25			7	SS	180								
		End of borehole												

VERTICAL SCALE: 1 IN. TO 5 FT.

DOMINION SOIL INVESTIGATION LIMITED

MADE: MC

CHD: JP