

BRIDGE 19

PUNKEY DOODLES

CORNERS.

WILMOT TWP.

40 P 7 - 39

**DOMINION SOIL INVESTIGATION LIMITED**

CONSULTING SOIL & FOUNDATION ENGINEERS

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40P7-39.

GEOCRES No.

REPORT ON SUBSURFACE INVESTIGATION  
PROPOSED RECONSTRUCTION OF BRIDGE 19  
PUNKEYDOODLES CORNERS  
TOWNSHIP OF WILMOT

Ref. No. 74-3-K6

April 1974

Prepared for:

Township of Wilmot  
c/o Kelley & Smart Limited  
Consulting Engineers  
18 Spetz Street  
Kitchener, Ontario.

Distribution:

6 copies - Kelley & Smart  
1 copy - Dominion Soil Investigation Limited (Toronto)  
1 copy - Dominion Soil Investigation Limited (Kitchener)

## C O N T E N T S

	<u>Page No.</u>
1.0 INTRODUCTION	1
2.0 METHOD OF INVESTIGATION	1
3.0 THE SITE	2
4.0 SUBSOIL CONDITIONS	2
5.0 GROUNDWATER CONDITIONS	3
6.0 DISCUSSION	4
6.1 Bearing Capacity and Settlement	4
6.2 Excavation and Dewatering	5
6.3 Backfilling and Abutment Drainage	5

## E N C L O S U R E S

Borehole Location Plan and Inferred Subsoil Profile	Dwg. No. 1
List of Symbols, Abbreviations and Nomenclature	Enclosure No. 1
Borehole Logs	Enclosures 2&3

## 1.0 INTRODUCTION

This report describes the results of a subsurface investigation carried out along the new centreline of the alignment of Bridge 19 located at the crossing by Wilmot Township Road 11 and Wilmot Creek, south of Punkeydoodles Corners.

The investigation was authorized verbally by Mr. Wm. Kelley of Kelley & Smart Limited, Consulting Engineers for the project.

The purpose of the investigation was to disclose the subsurface conditions at the site and make recommendations for the design and construction of the bridge foundations.

## 2.0 METHOD OF INVESTIGATION

Two exploratory boreholes were put down along the centreline of the proposed structure at the locations shown on Dwg. No. 1. The boreholes were advanced to the sampling depth by a continuous flight power auger and samples of the subgrade were taken using the Standard Penetration Test method. In the first borehole, hollow-stem augers were used but those were changed for smaller diameter augers because of the hard consistency of the subsoil.

Elevations have been referred to a local benchmark provided by the Consulting Engineers. The benchmark used was a nail in tree assigned an assumed elevation of 100.0 feet by the Consulting Engineers. The location is shown on Dwg. No. 1.

### 3.0 THE SITE

The proposed structure will be located approximately 20 feet east of the existing single span steel bridge. The structure will span Wilmot Creek which will be realigned. The creek flows in a southerly direction in a small shallow meandering channel across a large flat flood plain with poorly defined sides.

The present roadway embankment is 5 to 6 feet high and the road surface is gravel. The high water level is El. 99.0 and the stream bed is at El. 93. The normal flow is very small with only one foot of water measured at the time of the investigation.

### 4.0 SUBSOIL CONDITIONS

Subsoil conditions were very uniform in the two boreholes. Details of the subsoil conditions are given on the individual borehole logs of Enclosures 2 & 3 and are summarized on the inferred subsoil profile on Dwg. No. 1. These conditions may be summarized as follows.

- (i) TOPSOIL - 6 inches of topsoil was encountered in the boreholes.
- (ii) CLAYEY SILT TILL - beneath the topsoil firm to hard brown to grey clayey silt till was encountered. The upper few feet of the stratum was weathered and had a firm consistency ( 'N' - 7 and 9 blows per foot). Beneath this weathered zone, the clayey silt till had a hard consistency ( 'N' - 38 to 100 blows per foot). The stratum was proven to a depth of 14 feet.

#### 5.0 GROUNDWATER CONDITIONS

The free surface of the groundwater table was not encountered during drilling but was measured 4 days later at El. 95.0 which is the same as the water level in Wilmot Creek.



## 6.0 DISCUSSION

The new bridge over Wilmot Creek will have a single 30 foot clear span and will be located 20 feet east of the present centreline.

The site is underlain by clayey silt till having a firm consistency near the surface and a hard consistency below 5 feet.

### 6.1 Bearing Capacity and Settlement

The proposed single span bridge can be supported on spread footings cast at El. 92 or below. A safe net bearing pressure of 5 T.S.F. may be used for the design of the footings; a value which incorporates a factor a safety of 3 against a general shear failure of the soil.

The footings should have at least four feet of earth cover to ensure protection against frost action. In addition adequate protection against scouring of the stream bed should be provided.

The total settlement is expected to be less than one inch and differential settlement will be negligible due to the uniform consistency of the subsoil.

## 6.2 Excavation and Dewatering

The excavation will be adjacent to and below the creek bed and hence a tight enclosure on the creek side of the excavation will be required. The enclosure will provide a cut-off for water flow when driven into the hard clayey silt till.

The bottom of the excavation should be kept dry to protect the stability of the clayey silt till. This may necessitate installing gravity sumps in the corner of the excavation and pumping.

## 6.3 Backfilling and Abutment Drainage

The abutments should be backfilled with granular fill and Granular 'B' (M.T.C. Specification 1010) is suggested. The backfill should be compacted to 95% Standard Proctor maximum dry density in 8 inch layers loose.

Drainage of the backfill should be provided and a filter medium consisting of crushed stone placed around the inlet of each drain.

DOMINION SOIL INVESTIGATION LIMITED.

*J.B. England*  
J. Byron England, P. Eng.  
Kitchener Branch Manager.





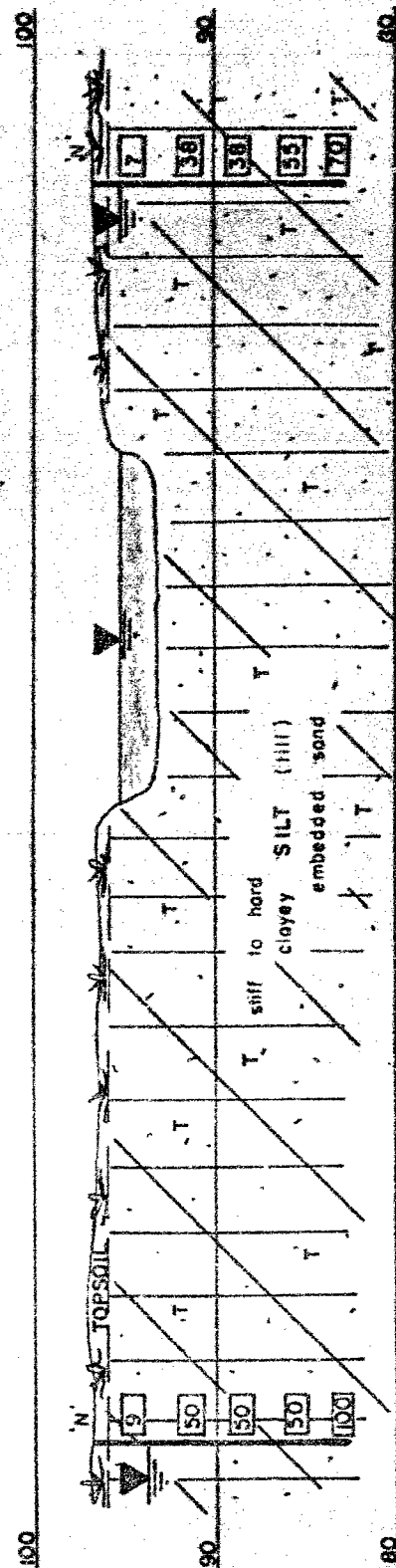
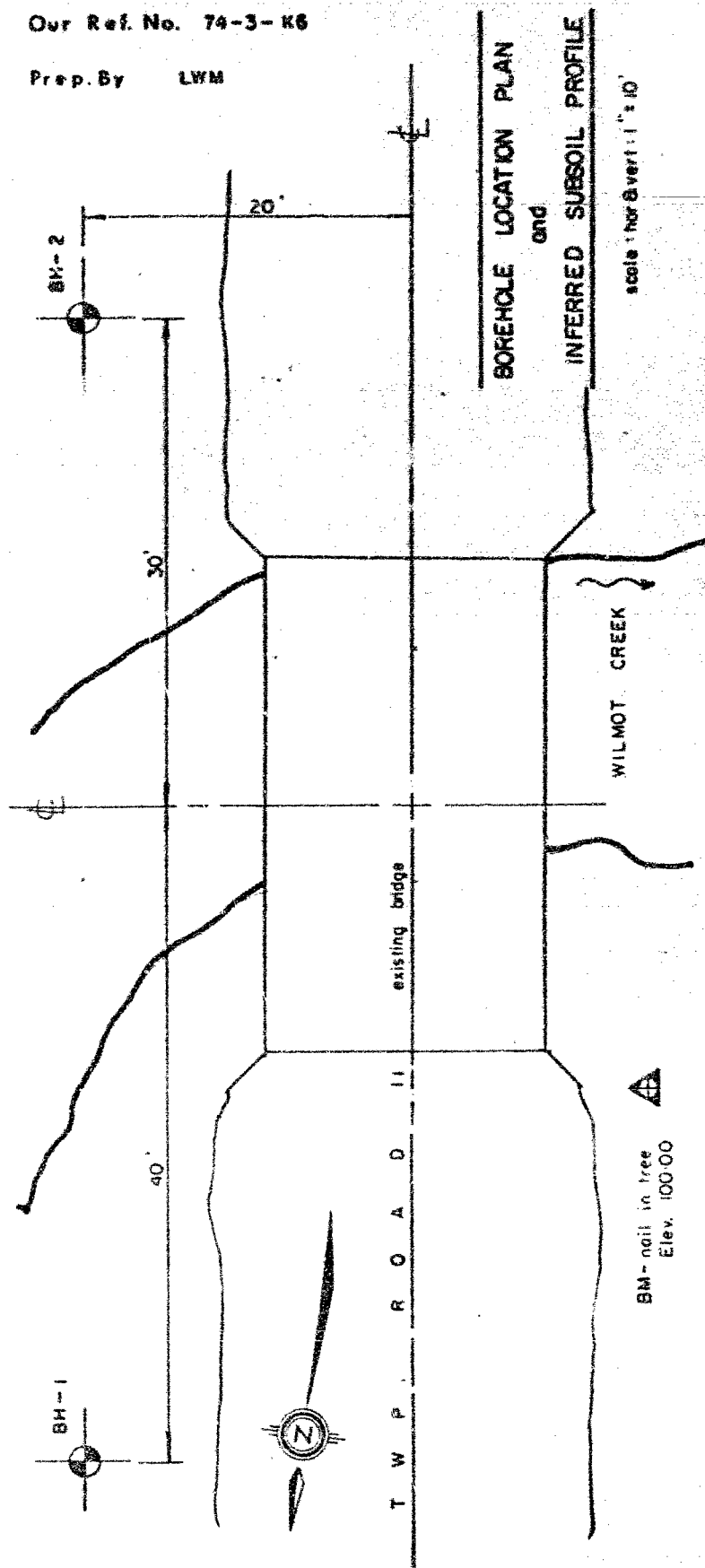
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Our Ref. No. 74-3-K6

Prep. By LWM

DWG No. 1

40P7-39  
GEOCRETS No.



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## LIST OF SYMBOLS, ABBREVIATIONS AND NOMENCLATURE

### SOIL COMPONENTS AND GROUND WATER CONDITIONS

											Ground Water Level	
BOULDER	COBBLE	GRAVEL		SAND			SILT	CLAY	ORGANIC	BEDROCK		Depth of Core-in
		coarse	fine	coarse	medium	fine						
6"	< 8"	4"	3/4"	4-75mm	20	0-42	0-004	0-002	<	no size limit		

### SAMPLE TYPES

AS Auger Sample

RC Rock Core

% Recovery

SS Split Spoon Sample

TP Piston, thin walled tube sample

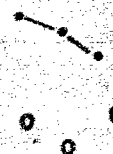
TW Open, thin walled tube sample

### PENETRATION RESISTANCES

**DYNAMIC PENETRATION RESISTANCE:** to drive a 2"  $\phi$ , 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

#### SYMBOL



### SOIL PROPERTIES

W% Water content

LL% Liquid limit

PL% Plastic limit

 $\gamma$  Natural bulk density (unit wt.)

Cv Coeff. of consolidation

k Coeff. of permeability

C Shear strength — in terms of total stress

 $\phi$  Angle of int. friction

C Cohesion — in terms of effective stress

 $\phi$  Angle of int. friction

### UNDRAINED SHEAR STRENGTH

— DERIVED FROM —

TRIAXIAL

UNCONFINED

LABORATORY

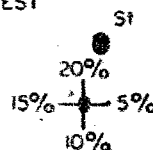
FIELD

POCKET  
PENETROMETER  
TEST

COMPRESSION TEST

VANE TEST

Strain at failure is represented by direction of arrow



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

# LOG OF BOREHOLE .....1.....

Enclosure No. 2.....

Our Reference No. 74-3-K6..

CLIENT: Kelley & Smart Limited

PROJECT: Proposed Reconstruction of

LOCATION: Punkeydoodles Corners Bridge 19

DATUM ELEVATION: Local

## DRILLING DATA

Method: Augering

Diameter: 6 1/2" & 4 1/2"

Date: March 29, 1974

SUBSURFACE		PROFILE		SAMPLES			PENETRATION RESISTANCE Blows/Foot					WATER CONTENT %			REMARKS				
ELEVATION Ft.	DEPTH Ft.	DESCRIPTION	SYMBOL	GROUND WATER	NUMBER	TYPE	'N' Blows/Ft.	20	40	60	80	100	PLASTIC LIMIT	NATURAL		LIQUID LIMIT			
								UNDRAINED SHEAR STRENGTH p.s.f.											
								+ FIELD VANE TEST					• COMPRESSION TEST					W <sub>p</sub> ————— W ————— W <sub>L</sub>	
96.8	0	GROUND SURFACE																	
96.3	0.5	TOPSOIL																	
		Stiff			1	SS	9	0											
		to hard																	
	5	clayey			2	SS	50	0											
		SILT																	
		brown			3	SS	50	0											
	10	grey TILL			4	SS	50	0											
		embedded sand																	
					5	SS	100												
82.8	14.0	END OF BOREHOLE																	

VERTICAL SCALE: 1 inch to 5 feet

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DRAWN: SP

CHECKED: JBE.

# LOG OF BOREHOLE 2

Enclosure No. 3

Our Reference No. 74-3-K6

CLIENT: Kelley & Smart Limited  
PROJECT: Proposed Reconstruction of  
LOCATION: Punkeydoodles Corners Bridge 19  
DATUM ELEVATION: Local

## DRILLING DATA

Method: Augering  
Diameter: 6½" & 4½"  
Date: March 29, 1974

SUBSURFACE		PROFILE		SAMPLES			PENETRATION RESISTANCE Blows/Foot					WATER CONTENT %			REMARKS	
ELEVATION F <sub>L</sub>	DEPTH F <sub>L</sub>	DESCRIPTION	SYMBOL	GROUND WATER	NUMBER	TYPE	'N' Blows/Ft.	20	40	60	80	100	PLASTIC LIMIT	NATURAL		LIQUID LIMIT
UNDRAINED SHEAR STRENGTH p.s.f.																
+ FIELD VANE TEST      @ COMPRESSION TEST								W <sub>p</sub> W      W <sub>L</sub>								

96.9	0	GROUND SURFACE																
96.4	0.5	TOP SOIL																
		<div><div></div><div>Brown grey</div></div>		1	SS	7	0											
	5			2	SS	38	0											
				3	SS	38	0											
	10			4	SS	55	0											
				5	SS	70	0											
82.9	14.0	END OF BOREHOLE																

VERTICAL SCALE: 1 inch to 5 feet

DOMINION SOIL INVESTIGATION LIMITED

DRAWN: LWM

CHECKED: JBE