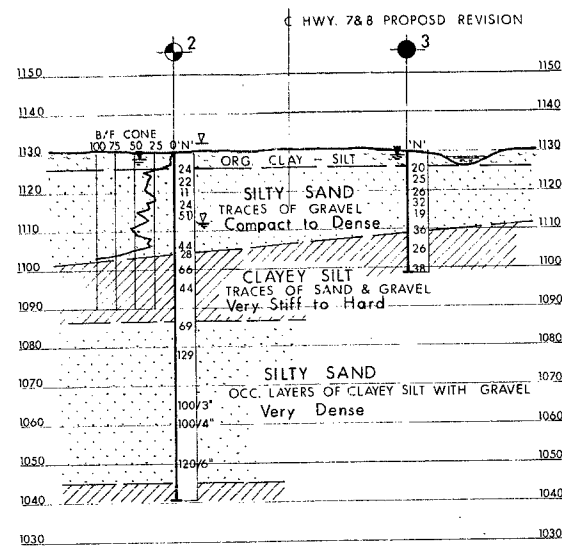


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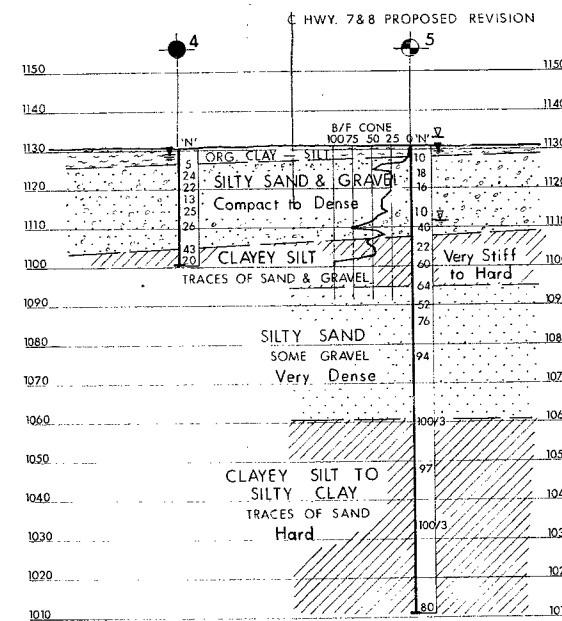
W.P.#475-64-01

HWYS. #79#8

ALDER CREEK



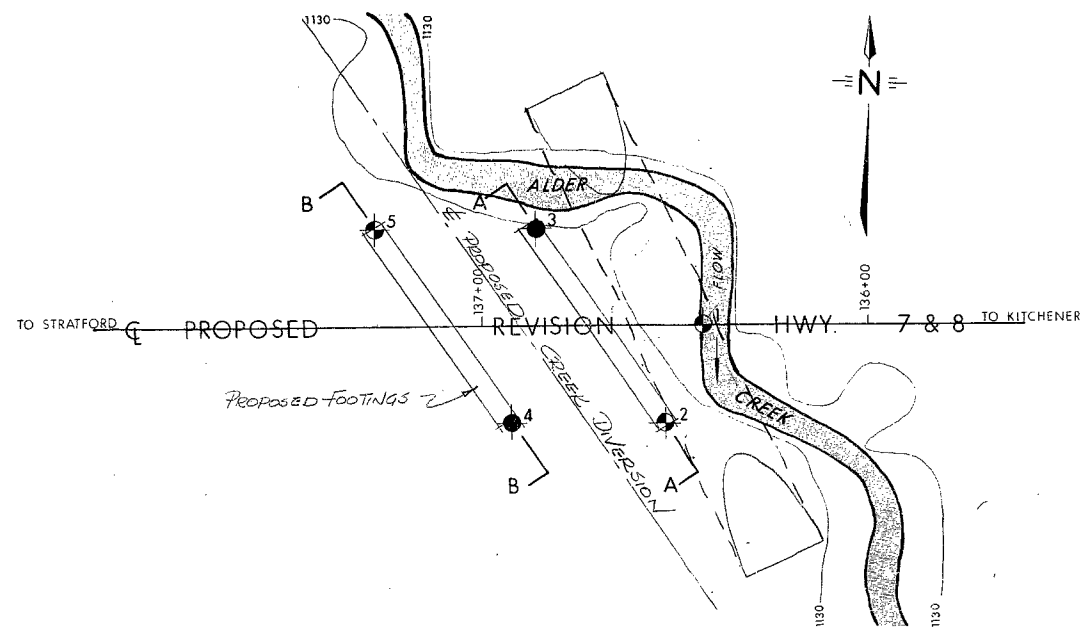
SECTION A-A



SECTION B-B

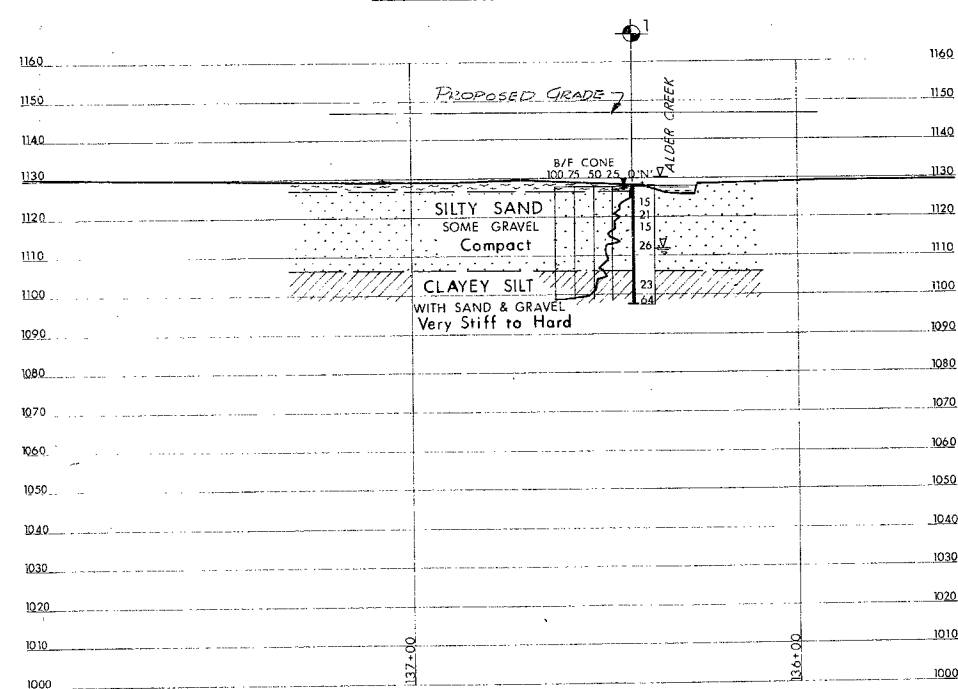
SECTIONS

SCALE  
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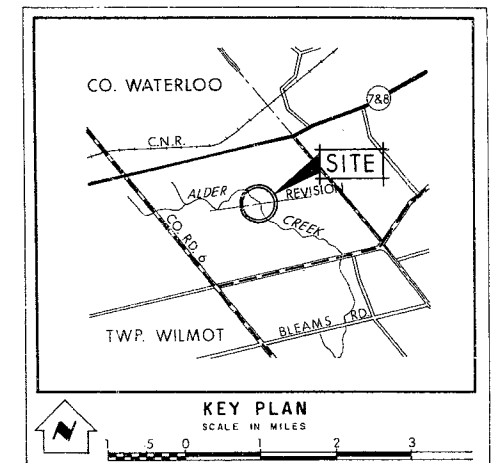
PLAN

SCALE  
20 10 0 20 40 FT.



PROFILE

SCALE  
20 10 0 20 40 FT.



LEGEND

- Bore Hole
- ⊕ Cone Penetration Hole
- ⊕ Bore & Cone Penetration Hole
- Water Levels established at time of field investigation, AUG. 68.
- ▽ Head
- ▽ Artesian Condition
- ▽ Encountered

NO.	ELEVATION	STATION	OFFSET
1	1128.3	136+43	CL
2	1130.4	136+53	25' LT.
3	1130.0	136+86	25' RT.
4	1130.8	136+93	25' LT.
5	1130.7	137+27	25' RT.

NOTE

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

NO.	DATE	BY	DESCRIPTION
1			
2			
3			
4			
5			

DEPARTMENT OF HIGHWAYS - ONTARIO			
MATERIALS & TESTING DIVISION - FOUNDATION SECTION			
<b>ALDER CREEK</b>			
KING'S HIGHWAY NO. 7 & 8 REVISION		DIST. NO. 3	
CO. WATERLOO		TWP. WILMOT	
LOT 3		CON. S. of Snider Rd.	
<b>BORE HOLE LOCATIONS &amp; SOIL STRATA</b>			
SUBM'D. V. K.	CHECKED: /	W.P. NO. 475-64-01	M.B.T. DRAWING NO.
DRAWN D.M.	CHECKED: /	JOB NO. 68-F-68	<b>68-F-68A</b>
DATE SEPT. / 68	SITE NO.	BRIDGE DRAWING NO.	
APPROVED: <i>[Signature]</i>	CONT. NO.		

REF. No. W.O. 9392-475-64-01

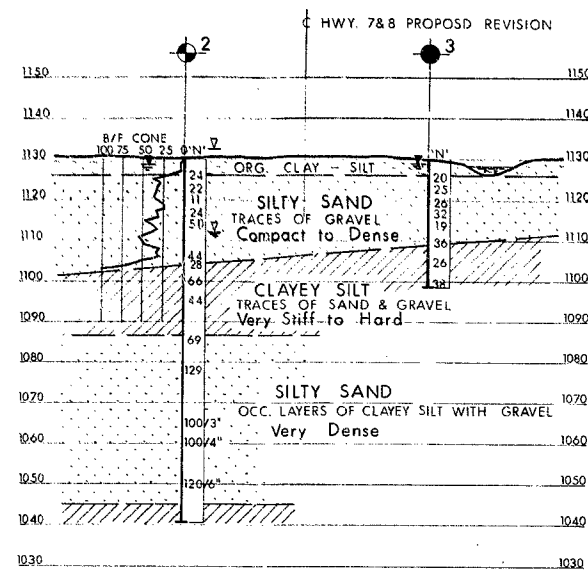


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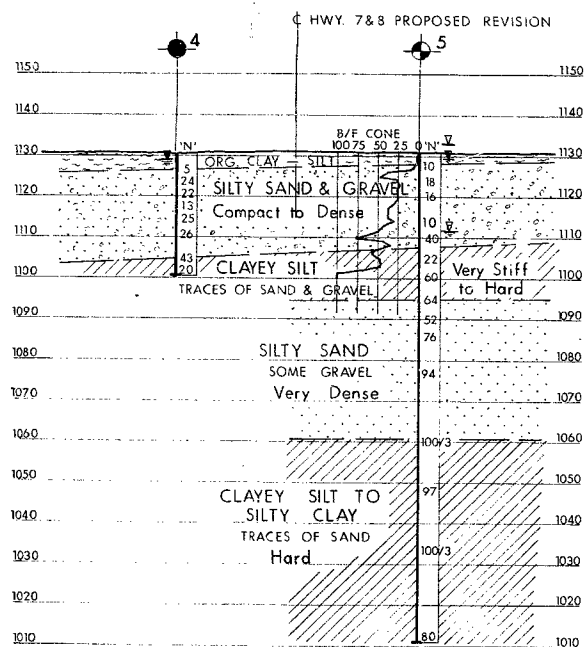
W.P. #475-64-01

HWYS. #79#8

ALDER CREEK



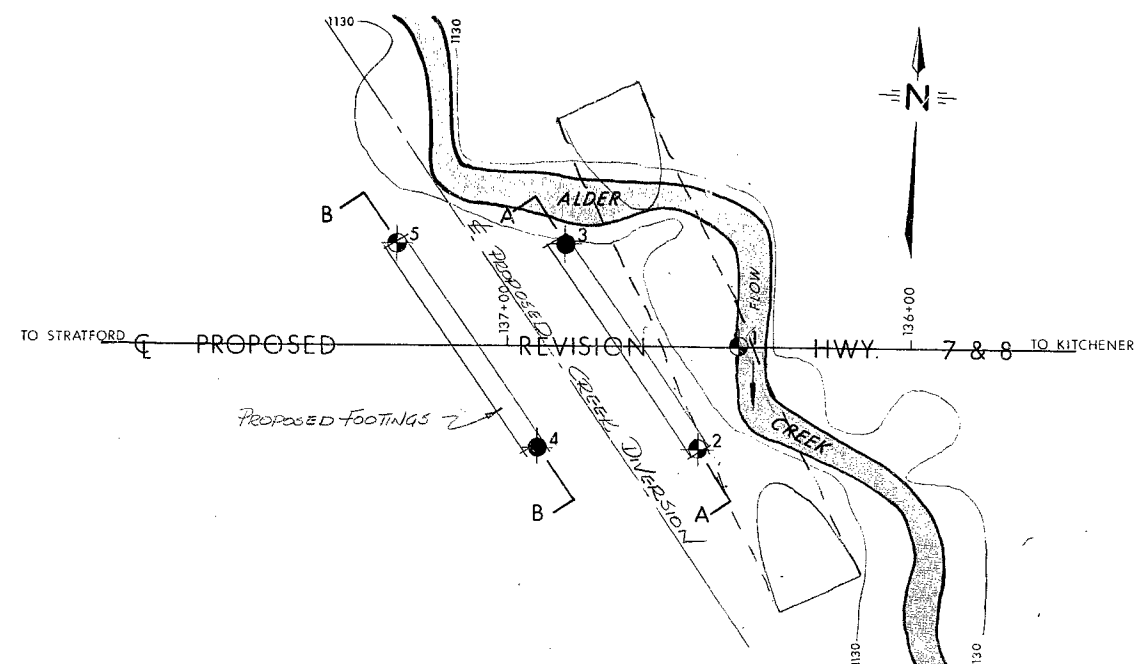
SECTION A-A



SECTION B-B

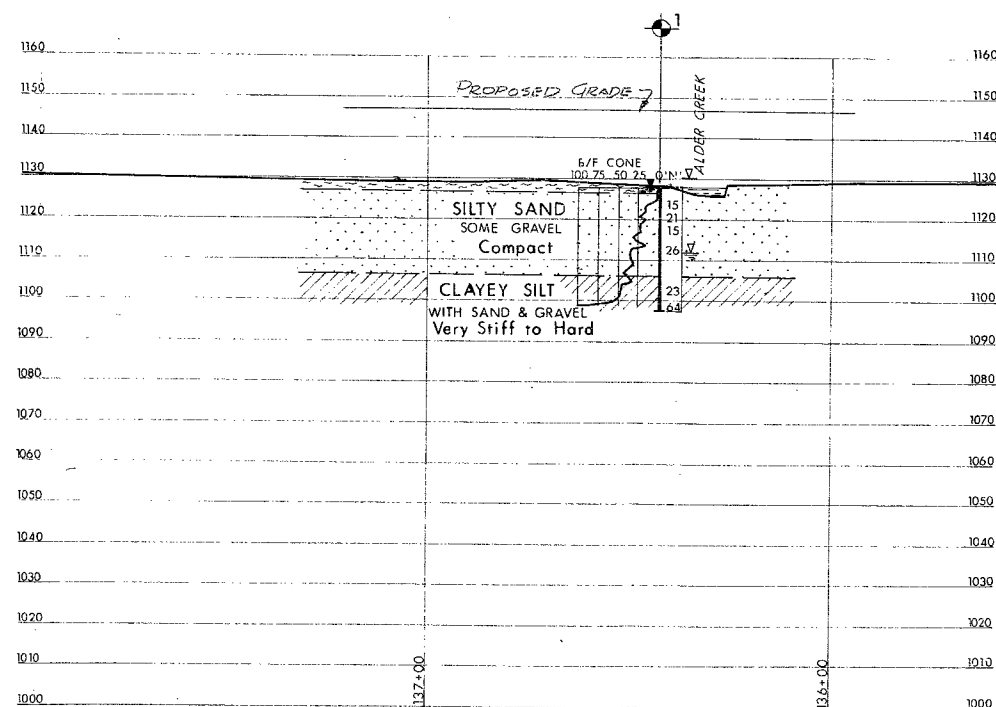
SECTIONS

SCALE  
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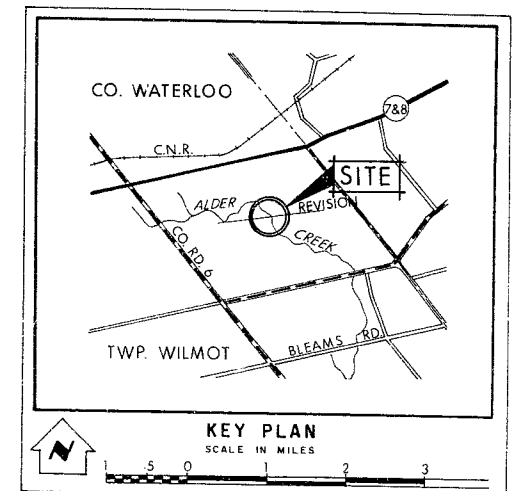
PLAN

SCALE  
20 10 0 20 40 FT.



PROFILE

SCALE  
20 10 0 20 40 FT.



LEGEND

- Bore Hole
- ⊕ Cone Penetration Hole
- ⊕ Bore & Cone Penetration Hole
- Water Levels established at time of field investigation, AUG. 68.
- ▽ Head
- ▽ Artesian Condition
- ▽ Encountered

NO.	ELEVATION	STATION	OFFSET
1	1128.3	136+43	€
2	1130.4	136+53	25' LT.
3	1130.0	136+86	25' RT.
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5	1130.7	137+27	25' RT.

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

DEPARTMENT OF HIGHWAYS - ONTARIO  
MATERIALS & TESTING DIVISION - FOUNDATION SECTION

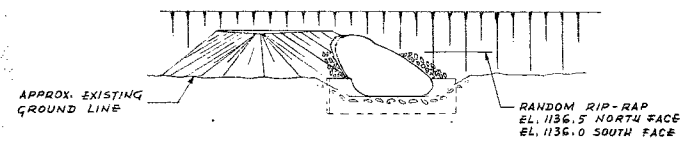
ALDER CREEK

KING'S HIGHWAY NO. 7 & 8 REVISION DIST. NO. 3  
CO. WATERLOO  
TWP. WILMOT LOT 3 CON. S. of Snider Rd.

BORE HOLE LOCATIONS & SOIL STRATA

SUBM'D. V. K.	CHECKED ✓	W.P. NO. 475-64-01	M.S.T. DRAWING NO.
DRAWN D. M.	CHECKED ✓	JOB NO. 68-F-68	68-F-68A
DATE SEPT. 1968	SITE NO.	BRIDGE DRAWING NO.	
APPROVED <i>[Signature]</i>	CONT NO.		

REF. No. W.O. 9392-475-64-01



A hand-drawn profile view of a road section. The horizontal axis represents stationing, with labels  $STA. 140+70$  and  $STA. 136+50$ . The vertical axis represents elevation. A solid line represents the **FINISHED GRADE**, and a dashed line represents the **PROFILE GRADE**. The vertical curve is defined by two grades:  $+0.44\%$  and  $-0.96\%$ . Key points on the profile include a vertical curve intersection (V.P.) and a **PIPE ARCH**. Elevation values are noted as  $EL. 114.72$  and  $EL. 114.81$ . A vertical offset of  $0.25$  is indicated. The profile is bounded by  $1800' V.C.$  and  $1260' L.V.C.$ .

[illegible]

Diagram illustrating the cross-section of a bridge deck with a 3% camber. The diagram is divided into two sections by a vertical centerline labeled "LINE 'B'".

- DOWNSTREAM:** The left side of the centerline, labeled "DOWNSTREAM". It shows a slope of "EL. 1124.70" and a "DOWN" arrow.
- UPSTREAM:** The right side of the centerline, labeled "UPSTREAM". It shows a slope of "EL. 1125.0" and an "UP" arrow.
- Stream Bed:** Indicated on the left side of the diagram.
- Camber:** The bottom of the deck is labeled "3% CAMBER" and "C".

B. M. ELEV. 1132.68

GEODETI<sup>C</sup> DATUM: N. 4 W. IN S. ROOT OF  
1.0 CEDAR 175.0 RT. OF STA. 136+40

<b>DEPARTMENT OF HIGHWAYS ONTARIO</b> <b>BRIDGE DIVISION</b>	
<i>68-15-68</i>	
<u><b>ALDER CREEK STRUCTURE (WESTBOUND LANES)</b></u> 1.6 MI. EAST OF CTY. RD. # 6	
<b>KING'S HIGHWAY No. 7 N. &amp; 8 N.</b>	<b>DIST. No. 3</b>
<b>CO. WATERLOO</b>	<b>STA. 136 + 50</b>
<b>TWP. WILMOT</b>	<b>LOT 3 CON. S.O.F. SNIDER RD.</b>
<b>GENERAL LAYOUT &amp; DETAILS</b>	

MEMORANDUM

To: Mr. B. R. Davis,  
Bridge Engineer,  
Bridge Division,  
Admin. Bldg.

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

Attention: Mr. S. McCombie

DATE: November 7, 1968

OUR FILE REF.

IN REPLY TO

NOV 12 1968

SUBJECT:

FOUNDATION INVESTIGATION REPORT  
For

The Proposed Crossing at Alder Creek  
And Hwys. 7 & 8 (Revision Line 'E')  
Twp. of Wilmot -- County of Waterloo  
District No. 3 (Stratford)  
W.J. 68-P-68 -- W.P. 475-64-01

Attached, we are forwarding to you, our detailed foundation investigation report on the subsoil conditions existing at the above structure 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/MdeF  
Attach.

cc: Messrs. B. R. Davis (2)

H. A. Tregaskes

D. W. Farren

W. Zonnenberg

J. G. Tillcock

A. P. Watt

J. Roy

B. A. Singh

Foundations Files  
Gen. Files

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

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  2. DESCRIPTION OF THE SITE AND GEOLOGY.
  3. FIELD AND LABORATORY WORK.
  4. SUBSOIL CONDITIONS:
    - 4.1) General Conditions.
    - 4.2) Organic Clay - Silt.
    - 4.3) Silty Sand with Gravel (Upper Deposit).
    - 4.4) Clayey Silt.
    - 4.5) Silty Sand with some Gravel (Lower Deposit).
    - 4.6) Clayey Silt to Silty Clay.
  5. GROUNDWATER CONDITIONS.
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FOUNDATION INVESTIGATION REPORT  
For  
The Proposed Crossing at Alder Creek  
And Hwys. 7 & 8 (Revision Line 'E')  
Twp. of Wilmot -- County of Waterloo  
District No. 3 (Stratford)  
W.J. 68-P-68    --    W.P. 475-64-01

1. INTRODUCTION:

The Foundation Section was requested to carry out a subsoil investigation at the proposed crossing of Alder Creek and Hwys. 7 & 8 (Revision Line 'E') in the Twp. of Wilmot, County of Waterloo. The request was contained in a memo from the Bridge Location Section (Mr. A. P. Watt, Regional Bridge Location Engineer, London), dated August 16, 1968. Subsequently, an investigation was carried out by this Section to determine the subsoil conditions existing at the site.

This report contains the results of the investigation, together with recommendations pertaining to the foundations of the structure as well as the stability of the approach embankments.

2. DESCRIPTION OF THE SITE AND GEOLOGY:

The site is located some 5 miles west of the City of Kitchener and one mile south of existing Hwy. 8. In the vicinity of the crossing, Alder Creek meanders across the terrain in a north-south direction; this creek is about 7 to 10 feet wide and about 2 to 3 feet deep. The surrounding terrain is covered with light brush growth.

Physiographically, the site is situated in the "Waterloo Hills" region. The characteristic surficial features of this region are the sandy hills which rise above the surrounding ground surface. Some of these hills are composed of sandy tills, while others are kames or kame moraines. Outwash sands occupy the intervening hollows. A number of kettle lakes appear in the area; in addition, small swamps are quite numerous.

cont'd. /2 ...

### 3. FIELD AND LABORATORY WORK:

The field work consisted of putting down five sampled boreholes, three of which were accompanied by a dynamic cone penetration test. The borings were advanced by a conventional diamond drill adapted for soil sampling purposes. Samples were recovered at required depths in a 2" O.D. split-spoon sampler; the method of driving the split-spoon sampler conformed to the specifications for the Standard Penetration Test. The same method was used to advance the dynamic cone penetration tests.

The locations and elevations of the boreholes are shown on Drawing 68-F-68A, together with the estimated stratigraphical profile across the site.

All the samples were subjected to a careful visual inspection in the laboratory prior to any tests being carried out. Following this inspection, tests were carried out on certain samples to determine the physical properties of the various soil types, namely:

- Organic Contents
- Natural Moisture Contents
- Bulk Densities
- Grain-size Distributions
- Atterberg Limits

The results of these tests are plotted on the Record of Borelog sheets and summarized on the figures, all contained in Appendix I of the report.

### 4. SUBSOIL CONDITIONS:

#### 4.1) General Conditions:

The site is surficially covered by from 1.5 to 4 feet of organic clay - silt which is underlain by a compact to dense stratum of silty sand and gravel, varying between 18 and 22 feet in thickness. The silty sand deposit is underlain by a very stiff

cont'd. /3 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.1) General Conditions: (cont'd.) ...

to hard deposit of clayey silt some 17 to 22 feet thick. Underlying the clayey silt is a deposit of very dense silty sand with some gravel, which in turn, is underlain by a hard clayey silt to silty clay with traces of sand and gravel.

The boundaries between the various deposits, as determined in the boreholes, are shown on the accompanying borehole sheets. The stratigraphical profile, shown on Drawing 68-F-68A, is inferred from this boring data.

From ground surface downwards, the various soil types encountered, are as follows:

4.2) Organic Clay - Silt:

This surficial cover was encountered in all five boreholes. Its thickness varies from 1.5 ft. in B.H. 1, to 4 ft. in B.H. 4. The layer is mainly composed of a mixture of soft clay - silt and organic matter. The organic content of the deposit, as determined by laboratory testing, is about 13% (by weight).

The natural water content of this layer is generally between 80 and 108%.

4.3) Silty Sand with Gravel (Upper Deposit):

Immediately below the surficial organic layer is a stratum of silty sand with gravel. The thickness of this deposit varies from 17.5 to 22 feet. Below elevation 1115, in B.H.'s 3 and 4, the coarse particle sizes predominate - i.e., this portion of the stratum can be described as a well graded sand and gravel. Occasional seams of clayey silt were encountered throughout the stratum. Typical grain-size distribution curves of the soil in this stratum are plotted on Figure #1, in the Appendix of this report.

cont'd. /4 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.3) Silty Sand with Gravel (Upper Deposit): (cont'd.) ...

The natural water content throughout the stratum ranges from 6 to 23%.

The standard penetration resistance testing, carried out within the deposit, gave 'N' values which vary randomly from 10 to 50 blows per foot, being on the average, about 25 blows per foot. Based on these values, it is estimated that the relative density of the stratum ranges from compact to dense.

4.4) Clayey Silt:

Underlying the silty sand stratum is a layer composed of clayey silt with traces of sand and gravel. Its thickness varies from 13 ft. (B.H. 5) to 18 ft. (B.H. 2). In the upper portion of the stratum, at B.H.'s 1 and 5, very thin silt partings were encountered at irregular intervals.

The physical properties of the cohesive layer, as determined from field and laboratory tests, are summarized as follows:

	<u>Range</u>
Liquid Limit .....	18% - 23%
Plastic Limit .....	10% - 15%
Plasticity Index .....	4 - 11
Moisture Content .....	12% - 19%
'N' Values (Blows/ft.) .....	22 - 66

The results of the Atterberg limit tests, which are summarized on the Plasticity Chart, Figure #2, indicate that the clayey silt is inorganic and of low plasticity. Based on the standard penetration resistance values, it is estimated that the consistency of this layer ranges from very stiff to hard.

cont'd. /5 ...

4. SUBSOIL CONDITIONS: (cont'd.) ...

4.5) Silty Sand with some Gravel (Lower Deposit):

This deposit underlies the clayey silt layer. The encountered thickness at B.H.'s 5 and 2 (the only boreholes which fully penetrated the deposit), was 34 and 42 feet, respectively. Below elevation 1050, at B.H. 2, the silty sand is interbedded with layers of clayey silt up to 2 feet thick. The natural water content of the deposit is of the order of 20%.

The standard penetration resistance testing, carried out within this granular deposit, gave 'N' values ranging from 69 blows per foot to 100 blows/3 inches. Based on these results, it is estimated that the relative density of the deposit is very dense.

4.6) Clayey Silt to Silty Clay:

A deposit of clayey silt to silty clay with a trace of sand and gravel, underlies the silty sand at B.H.'s 2 and 5. This deposit was not fully penetrated at either of these locations; it was proven, however, to extend for a depth of greater than 50 feet at B.H. 5.

The physical properties of the deposit, as determined from field and laboratory testing, are summarized as follows:

	<u>Range</u>
Liquid Limit .....	33% - 48%
Plastic Limit .....	16% - 21%
Plasticity Index .....	8 - 28
Moisture Content .....	25% - 27%
'N' Values (Blows/ft.) .....	30 - over 100 Blows/ft

Based on the Atterberg limit tests carried out, it is estimated that the cohesive soil is inorganic and of low to intermediate plasticity. From the standard penetration resistance values given above, it is estimated that the consistency is in the hard range.

cont'd. /6 ...

5. GROUNDWATER CONDITIONS:

The groundwater level observations, carried out in the borings during the period of the investigation, are recorded on the borehole logs and summarized on Drawing 68-F-68A. The groundwater level was encountered at about elevation 1128 to 1129, which corresponds closely with the water level in the creek.

In advancing B.H.'s 1, 2 and 5, an artesian water pressure was encountered when the BX casing reached about elevation 1112. At this point the groundwater instantaneously rose in the casing; equilibrium was realized about 2 feet above existing ground surface. It is believed that this artesian head probably occurs within a saturated coarse granular or gravelly zone which is more permeable than the surrounding silty sand.

6. DISCUSSION AND RECOMMENDATIONS:

6.1) General:

It is proposed to construct a 40-ft. single-span structure at the crossing of Hwys. 7 & 8 (Revision Line 'E') and the realigned Alder Creek. The associated approach fills will have a maximum height of the order of 18 ft. above the existing ground surface.

Subsoil at the site consists of a surficial organic clay - silt (1.5 ft. to 4 ft. thick). This surficial cover is underlain by extensive deposits composed of complexly interbedded silty sand and gravel, clayey silt and silty clay.

6.2) Structure Foundations:

6.2.1) Spread Footings:

The abutments for the proposed single-span structure can be supported on spread footings founded within the silty sand stratum at or below elev. 1125, with an allowable net pressure of 2.0 t.s.f. The depth of the footings should be sufficient so as to ensure at least 4 ft. of cover for frost protection. Settlements

cont'd. /7 ...

6. DISCUSSION AND RECOMMENDATIONS: (cont'd.) ...

6.2) Structure Foundations: (cont'd.) ...

6.2.1) Spread Footings: (cont'd.) ...

of the foundations will be negligible and should be well within tolerable limits. The excavations for the footings will be carried out below creek water level in the granular deposit; therefore, a dewatering scheme will be necessary. It is important to note that the granular subsoil is susceptible to 'boiling' under conditions of unbalanced hydrostatic head and it will, therefore, be necessary to take adequate precautions to prevent 'boiling' of the footing excavations. If steel sheeting is incorporated in a dewatering scheme, this should be driven to a minimum depth below the excavation bottom equal to the height of prevailing water above it in order to prevent boiling.

6.2.2) File Foundations:

As an alternative, the proposed abutments can be supported on end-bearing piles driven to practical refusal into the very dense silty sand deposit. The piles may be designed for the maximum allowable load for the pile section chosen (e.g., 12 BP 74 steel H-piles may be designed for 90 tons per pile). For estimating pile lengths, it can be assumed that the piles will meet refusal at approx. tip elev. 1075. However, the driving of piles in the field should be controlled by the use of the Hiley Formula as per current D.H.O. Standards DD 1218 and DD 1219. Excavation for pile caps will be carried out below groundwater level and, therefore, a dewatering scheme may be required.

6.3) Approach Embankments:

The proposed profile grade of the Revision - Hwys. 7 & 8 - will be at elev. 1147. At this grade the associated approach embankments will have a maximum height of about 18 ft. above the existing ground surface. No stability problems are anticipated for the proposed approach fills with standard 2:1 slopes, provided that all surface organic material is sub-excavated and backfilled with suitable granular material as per current D.H.O. methods.

cont'd. /8 ...

7. MISCELLANEOUS:

The field work, performed between August 21 and September 5, 1968, was supervised by Mr. V. Korlu, Project Foundation Engineer, who also wrote this report.

The investigation was carried out under the general supervision of Mr. M. Devata, Supervising Foundation Engineer, who also reviewed this report.

The equipment used in the field was provided and operated by P.V.K. and Sons Company of Burford, Ontario.

November 1968



APPENDIX I

## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 1

FOUNDATION SECTION

JOB 68-F-68 LOCATION Prp. Hwy. 7 & 8 @ Adler Cr. 136+43 @ L ORIGINATED BY VK  
 W.P. 475-64-01 BORING DATE August 23, 1968 COMPILED BY VK  
 DATUM Geodetic BOREHOLE TYPE Drive BX Casing and Wash CHECKED BY AK

SOIL PROFILE		SAMPLES			ELEV SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT ——— WL PLASTIC LIMIT ——— WP WATER CONTENT ——— W			BULK DENSITY	REMARKS
LEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE		BLOWS / FOOT	20	40	60	80	100	WP	WL		
128.3	Ground Level														
128.3	Organic clay - silt.														Art. Head 1128.1
1.5	Silty sand, some gravel & occasional seams of clayey silt.		1	SS	15										2 45 50 3
			2	SS	21										
			3	SS	15										
	Compact.		4	SS	26										
			5	SS	-										
23.0	Clayey silt with sand & gravel (glacial till)		6	SS	23										Artesian Water Pressure El. 112.0
27.8	Very stiff to hard.		7	SS	64										12 35 33 20
30.5	End of Borehole														

## RECORD OF BOREHOLE NO. 2

FOUNDATION SECTION

## MATERIALS &amp; TESTING DIVISION

JOB 68-F-68

LOCATION Prop. Hwy. 7 &amp; 8 @ Adler Cr. 136+53 25' Lt.

ORIGINATED BY VK

W.P. 475-64-01

BORING DATE August 26, 1968

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Drive BX Casing &amp; Wash

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					WATER CONTENT %				
							20	40	60	80	100	WP	W	WL		
							SHEAR STRENGTH P.S.F.									
1130.1	Ground Level															
0.0	Organic clay - silt & some sand.		1B	ss	24											1128.5
3.5	Silty sand, trace of gravel. (Fine to medium)		2	SS	22											0 70 28 2
			3	SS	11	1120										
			4	SS	24											
	Compact to very dense		5	SS	51											
						1110										

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 3

FOUNDATION SECTION

JOB 68-F-68

LOCATION Prop. Hwy. 7 &amp; 8 @ Adler Cr. 136+86 25' Rt.

ORIGINATED BY VK

W.P. 475-64-01

BORING DATE September 5, 1968

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Drive BX Casing &amp; Wash

CHECKED BY

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE					LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT					WATER CONTENT %				
							20	40	60	80	100	15	30	45		
							SHEAR STRENGTH P.S.F.									
30.0	Ground Level														Gr. Sa. Si. Cl	
0.0	Organic clay with trace of silty sand & gravel.														1129.0	
3.5	Silty sand, with gravel.		1	SS	20										1 71 24	
			2	SS	25											
			3	SS	26	1120										
	Compact to dense.		4	SS	32											
			5	SS	19										52 46 ( 2 )	
26.5			6	SS	36	1110										
21.0	Clayey silt, traces of sand & gravel. (Glacial Till)		7	SS	26											
	Very stiff to hard.															
21.5	End of Borehole		8	SS	38	1100										
						1090										

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

DEPARTMENT OF HIGHWAYS - ONTARIO

## MATERIALS &amp; TESTING DIVISION

## RECORD OF BOREHOLE NO. 4

FOUNDATION SECTION

JOB 68-F-68

LOCATION Prop. Hwy. 7 &amp; 8 @ Adler Cr. 136+93 25' Lt.

ORIGINATED BY VK

W.P. 475-64-01

BORING DATE Sept. 4, 1968

COMPILED BY VK

DATUM Geodetic

BOREHOLE TYPE Drive BX Casing &amp; Wash

CHECKED BY *SR*

SOIL PROFILE			SAMPLES			ELEV. SCALE	DYNAMIC PENETRATION RESISTANCE				LIQUID LIMIT — WL PLASTIC LIMIT — WP WATER CONTENT — W			BULK DENSITY P.C.F.	REMARKS
ELEV. DEPTH	DESCRIPTION	STRAT. PLOT	NUMBER	TYPE	BLOWS / FOOT		BLOWS / FOOT				WATER CONTENT %				
							SHEAR STRENGTH P.S.F.				15 30 45				
1130.8	Ground Level														Gr. Sa Si. Cl
0.0	Organic clayey silt with trace of sand & gravel.														1128.8
1126.8			1	SS	5										
4.0	Silty sand and gravel.		2	SS	24										20 74 2
			3	SS	22	1120									
			4	SS	13										
	Compact to dense.		5	SS	25										49 44 7
			6	SS	26	1120									
1104.8			7	SS	43										
26.0	Clayey silt, traces of sand and gravel.														
1100.3	Very stiff.		8	SS	20	1100									
30.5	End of Borehole (Glacial Till)														

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

## RECORD OF BOREHOLE NO. 5

FOUNDATION SECTION

## MATERIALS &amp; TESTING DIVISION

JOB 68-F-68

LOCATION Prop. Hwy. 7 &amp; 8 @ Adler Cr. 137+27 25' Rt.

ORIGINATED BY VK

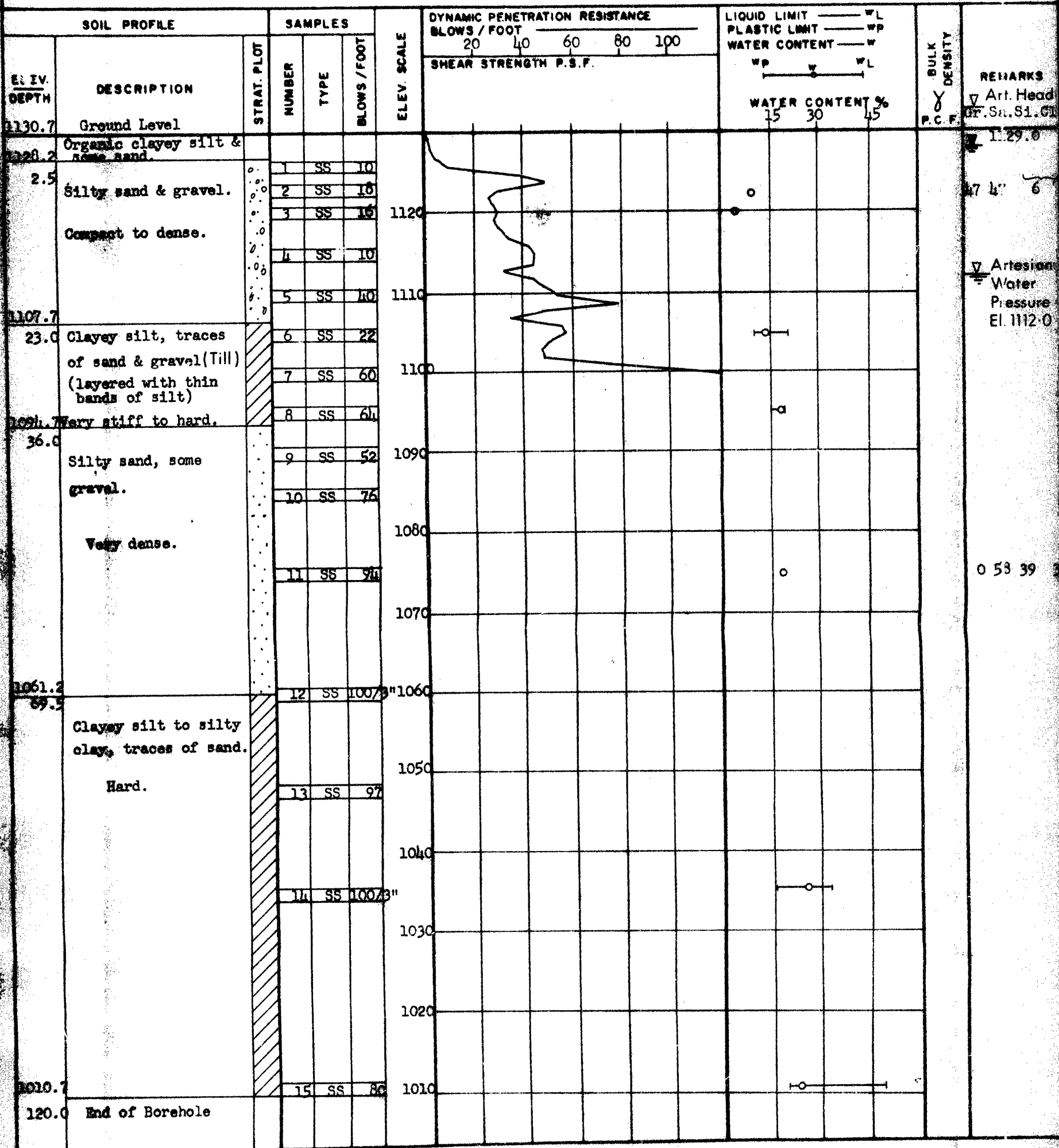
W.P. 475-64-01

BORING DATE August 30, 1968

COMPILED BY VK

DATUM Geodetic

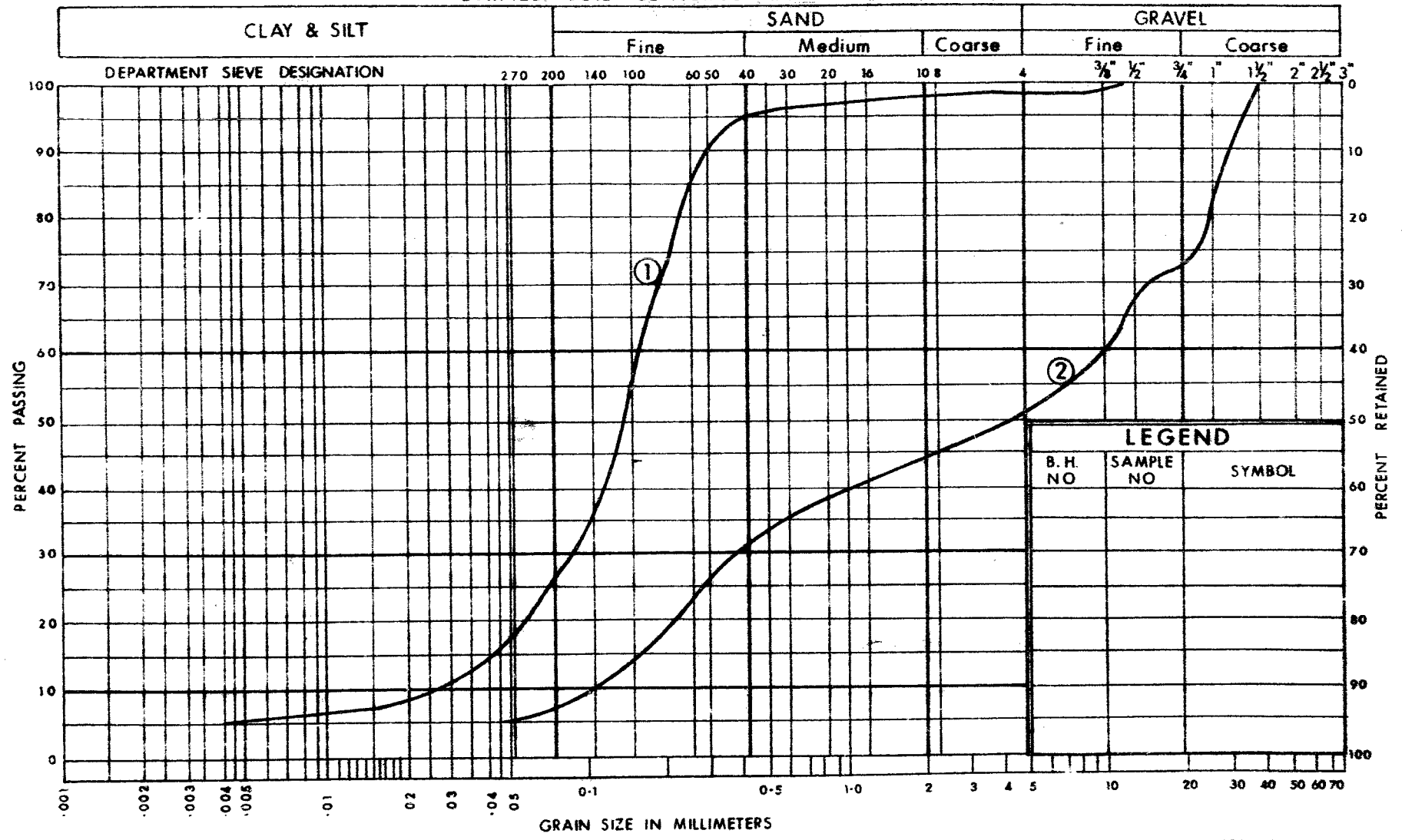
BOREHOLE TYPE Drive BX Casing &amp; Wash

CHECKED BY *AK*Art. Head  
Gr. Sn. Si. Cl.Artesian  
Water  
Pressure  
El. 1112.0

0 53 39

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

UNIFIED SOIL CLASSIFICATION SYSTEM



LEGEND		
B. H. NO	SAMPLE NO	SYMBOL

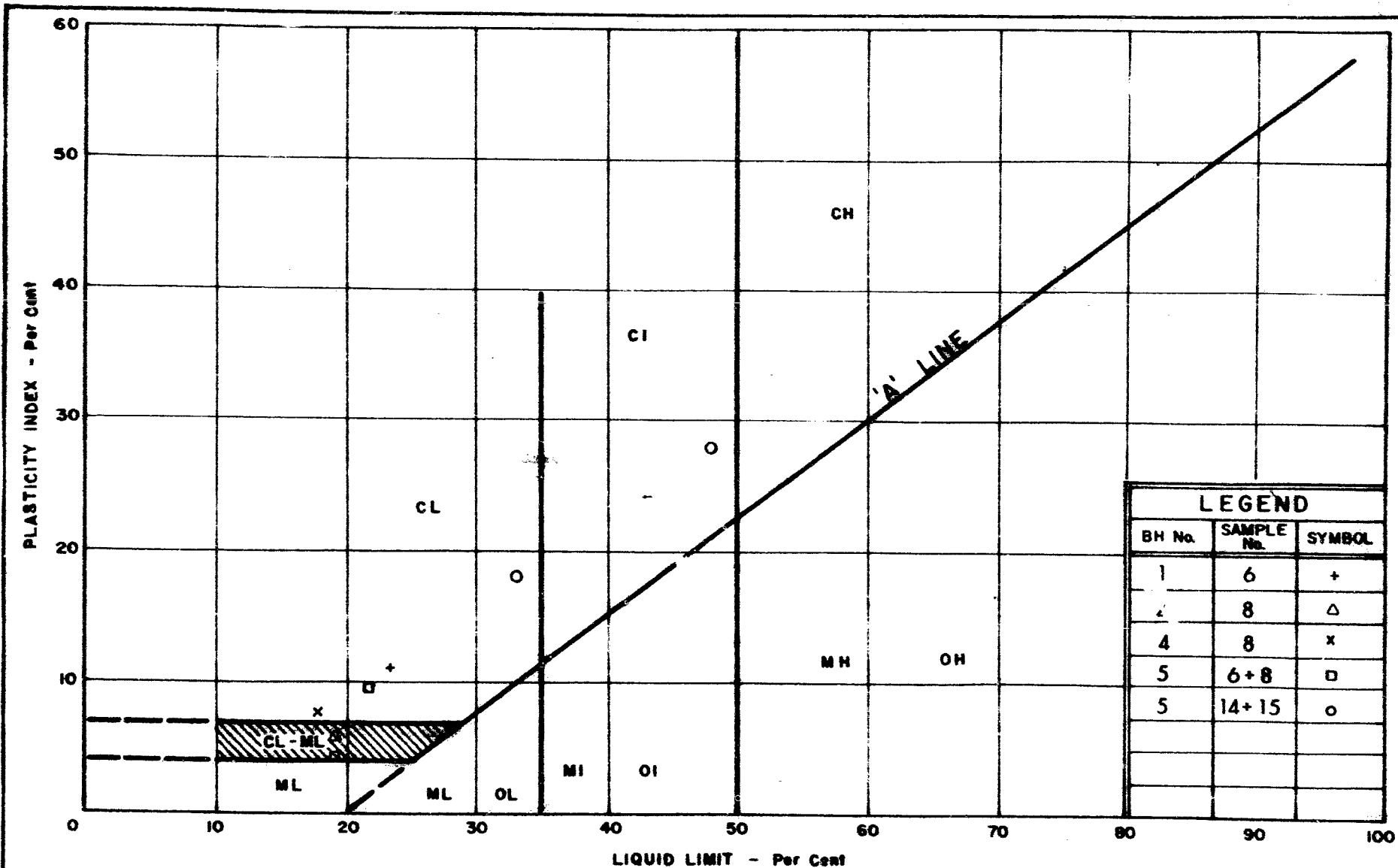


DEPARTMENT OF HIGHWAYS  
MATERIALS and  
TESTING  
DIVISION

GRAIN SIZE DISTRIBUTION

- ① SILTY SAND WITH TRACES OF GRAVEL
- ② WELL GRADED SAND AND GRAVEL

W.P. No. 475 - 64 - 01  
JOB No. 68 - F - 68



DEPARTMENT OF HIGHWAYS  
**MATERIALS and  
TESTING  
DIVISION**

## PLASTICITY CHART

DEFECTS IN NEGATIVE DUE TO  
CONDITION OF ORIGINAL DOCUMENT

WP. No. 475 - 64 - 01

JOB No. 68 - F - 68



## 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

SS	SPLIT SPOON	TW	THINWALL OPEN
WS	WASHED SAMPLE	TP	THINWALL PISTON
SB	SCRAPER BUCKET SAMPLE	OS	OESTERBERG SAMPLE
AS	AUGER SAMPLE	FS	FOIL SAMPLE
CS	CHUNK SAMPLE	RC	ROCK CORE
ST	SLOTTED TUBE SAMPLE		
	PH	SAMPLE ADVANCED HYDRAULICALLY	
	PM	SAMPLE ADVANCED MANUALLY	

### SOIL TESTS

QU	UNCONFINED COMPRESSION	LV	LABORATORY VANE
Q	UNDRAINED TRIAXIAL	FV	FIELD VANE
QCU	CONSOLIDATED UNDRAINED TRIAXIAL	C	CONSOLIDATION
Qd	DRAINED TRIAXIAL	S	SENSITIVITY

## ABBREVIATIONS USED IN THIS REPORT

### SOIL PROPERTIES

$\gamma$	UNIT WEIGHT OF SOIL (BULK DENSITY)
$\gamma_s$	UNIT WEIGHT OF SOLID PARTICLES
$\gamma_w$	UNIT WEIGHT OF WATER
$\gamma_d$	UNIT DRY WEIGHT OF SOIL (DRY DENSITY)
$\gamma'$	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 <sub>r</sub>	DEGREE OF SATURATION
w <sub>L</sub>	LIQUID LIMIT
w <sub>p</sub>	PLASTIC LIMIT
I <sub>p</sub>	PLASTICITY INDEX
s	SHRINKAGE LIMIT
I <sub>L</sub>	LIQUIDITY INDEX = $\frac{w - w_p}{I_p}$
I <sub>c</sub>	CONSISTENCY INDEX = $\frac{w_L - w}{I_p}$
e <sub>max</sub>	VOID RATIO IN LOOSEST STATE
e <sub>min</sub>	VOID RATIO IN DENSEST STATE
D <sub>r</sub>	DENSITY INDEX = $\frac{e_{max} - e}{e_{max} - e_{min}}$
	RELATIVE DENSITY D <sub>r</sub> 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 <sub>v</sub>	COEFFICIENT OF VOLUME CHANGE = $\frac{-\Delta e}{(1+e)\Delta\sigma}$
c <sub>v</sub>	COEFFICIENT OF CONSOLIDATION
C <sub>c</sub>	COMPRESSION INDEX = $\frac{\Delta e}{\Delta \log_{10} \sigma}$
T <sub>v</sub>	TIME FACTOR = $\frac{c_v t}{d^2}$ (d DRAINAGE PATH)
U	DEGREE OF CONSOLIDATION
T <sub>1</sub>	SHEAR STRENGTH
c	EFFECTIVE COHESION INTERCEPT
φ	EFFECTIVE ANGLE OF SHEARING RESISTANCE OR FRICTION
c <sub>u</sub>	APPARENT COHESION
φ <sub>u</sub>	APPARENT ANGLE OF SHEARING RESISTANCE OR FRICTION
μ	COEFFICIENT OF FRICTION
S <sub>t</sub>	SENSITIVITY

### GENERAL

π	≈ 3.1416
e	BASE OF NATURAL LOGARITHMS 2.7183
log <sub>e</sub> a OR ln a	NATURAL LOGARITHM OF a
log <sub>10</sub> 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
σ̄	NORMAL EFFECTIVE STRESS (σ̄ 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 <sub>0</sub>	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 <sub>s</sub>	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

*alg*

Mr. C. S. Grebski,  
Bridge Design Engineer,  
Bridge Office,  
Admin. Bldg.

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

May 26, 1969

The Proposed Crossing at Alder Creek  
And Hwys. 7 and 5 (Westbound Lanes)  
Township of Wilmot - County of Waterloo  
N.J. 63-8-63 -- N.P. 475-64-01

We have reviewed the final bridge drawing No.  
D-6609-1, for the aforementioned crossing and submit the  
following comment:

The surficial cover across the site is a 1.5 to  
4 feet thick layer of soft organic clay-silt. This cover  
should be sub-excavated within the plan limits of the  
approach fills and the excavation so formed, filled  
with a granular type of material.

MLD/MLP

*M. Devata*

M. Devata,  
SUPERVISING FOUNDATION ENGR.  
For:  
A. G. Stermac,  
PRINCIPAL FOUNDATION ENGR.

cc: Messrs. S. McCombie  
A. P. Watt  
J. Roy

Foundations Files  
Gen. Files

MEMORANDUM

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

FROM: C.S. Grebski,  
Bridge Office

ATTENTION:

DATE: May 14, 1969

OUR FILE REF.

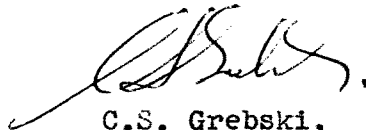
IN REPLY TO

SUBJECT: Alder Creek Structure (W.B. Lanes)  
1.6 Mi. East of Cty. Rd. #6  
W.P. 475-64-01, Site 33-217  
Hwys. 7N & 8N, District No. 3

68-F-68

Attached herewith we are submitting a copy of the  
final bridge drawing for this structure.

Kindly give us your comments at your earliest  
convenience.



C.S. Grebski,  
Bridge Design Engineer

CSG:rd

Attach.

c.c. Foundation Section

Received  
May 26/69  
RTP