

#59-F-253-C

W.P. 919-59

HWY. #17

HARMONY RIVER



ONTARIO

DEPARTMENT OF HIGHWAYS

Memo to Mr. A. M. Toye, **Date** August 13, 1959.
Bridge Engineer. **Subject** Re: Harmony Creek Crossing,
From Materials & Research Section. Hwy. 17 (TCH) W.P. 919-59,
District #18.

Attention: Mr. S. McCombie.

The foundation report submitted by Dominion Soil Investigation, Ltd. accompanying this memo, has been reviewed by this Section. The following comments have resulted from our examination of the report:-

- (1) If a bridge structure is to be built at this location, large displacement type end-bearing piles are recommended. Timber or steel monotube type piles will meet practical refusal in the sand and gravel layer - elevations 568' to 550'. Pile capacities of 15 and 40 tons for wood and steel monotube piles, respectively, may be used. Steel 'H' piles should not be used at this site.

If construction below the water table, or in the river is required to place abutments or piers, steel sheet piles will be used. These sheet piles may be driven to approximately elevation 580' for a pile cap founded at elevation 591' or higher. Adequate bracing should be provided, since the soft clay will offer little resistance to inward movement for the embedded portions of the sheet piling.

No stability problems are anticipated for road embankments built to the proposed elevation 609.5 ± 2 at 2:1 side slopes.

- (2) An alternative to a bridge structure, is a flexible culvert. This culvert should be founded in the upper layer of sand and gravel at approximately elev. 598'. If the culvert is to be placed at a lower elevation, a minimum of one foot of sand and gravel should be placed between the culvert and the layer of soft reddish brown clay. A bearing capacity of 1500 p.s.f. may be used. Care should be taken that adequate compaction of suitable backfill material is carried out.

If further information is required regarding this foundation investigation, please contact the Foundation Section.

KP/MdeF

Encl.

cc: Messrs. A. M. Toye
H. A. Tregaskes
D. G. Ramsay
H. McArthur
D. P. Collins

E. R. Saint
Foundation Office
Gen. Files.

L. G. Soderman,
PRINCIPAL SOILS & FDNS. ENGR.
per:

K. Peaker
K. Peaker,
Fdn. Field Supervising Engr.

BA 925

Department of Highways of Ontario
Materials and Research Section
Downsview Avenue - Toronto, Ontario

REPORT ON
FOUNDATION INVESTIGATION
HARMONY CREEK BRIDGE CROSSING
ON HIGHWAY NO. 17 T.C.H.
HARMONY BEACH
WP 919-59 BW 270

Submitted by:
Dominion Soil Investigation Ltd.
88 Eglinton Avenue East,
Toronto 12, Ontario
July 30, 1959.

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ENGINEERING DATA SHEETS

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| Subsurface Sections | Encl. No. 2 |
| Borehole Logs | Encl. Nos. 3-6 incl. |

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TORONTO 12, ONTARIO

FOUNDATION INVESTIGATION
HARMONY RIVER CROSSING
HWY NO. 17 T.C.H. AT
HARMONY BEACH
WP 919-59 BW 270

1. INTRODUCTION:

A foundation investigation was requested by the Materials and Research Section of D.H.O. for the Harmony River and Highway No. 17 crossing at Harmony Beach. Four boreholes were requested to determine the foundation conditions for a proposed new bridge on Line "E" about 75 ft due west of the existing roadway.

This report presents the results of field investigation, the results of laboratory soil tests on selected samples and provides recommendations on foundations for the proposed structure.

2. SUMMARY OF CONCLUSIONS:

The subsoil below several feet of sand and gravel and is a soft reddish-brown clay. This stratum is 30 to 45 ft thick. A dense granular soil underlies the clay.

Artesian pressure was encountered. Water level rose to elev. 605.2 which is a pressure equivalent to a water head of about 43 ft. River water level was 601.5 during the investigation.

Pile foundations are recommended for a bridge. The piles should be driven into the granular strata below the clay. An alternative to a bridge is a culvert(s) bedded within the sand lining the river bed. A flexible type structure is advisable.

Construction of a new embankment to elev. 609.5⁺ is considered safe based on the performance of the existing approaches.

3. LOCATION AND DESCRIPTION OF SITE:

The site is located about 30 miles north of Sault Ste. Marie along Provincial highway No. 17 (T.C.H.) at Harmony Beach. Highway surveys plans show the land location to be Section 13 in the Township of Haviland, District of Algoma.

Revised line "E" follows the existing highway route

with a slight departure towards the Bay in the vicinity of the site. Hardwood River (sometimes called Jones Creek) flows into Bachawana Bay which is about 300 ft west. A sand bar formation has developed at the mouth of the river. Light growth of evergreens and shrubs line the river banks. The channel is clean, sand lined, and straight as a result of some recent dredging operations. Water level on July 20 was 601.5. On July 17, 1959 the water level was about 0.4 ft lower. Winds blowing inland from the Bay affect the water level.

North of the site the terrain is flat. To the south the land rises 40 ft at a gradual slope. This area is heavily wooded with small shrubs and trees.

The existing timber trestle bridge has an 8 x 50 ft waterway opening. The centre piers are reinforced with a rock filled crib.

4. DRILLING PROGRAMME:

Drilling was started at borehole 1 on July 17, 1959. A timber crib was built within the water about 10 ft from the bank. Cone penetration test was made at this borehole. All borings were carried to the dense underlying granular soil. Field work was completed on July 20, 1959.

Insitu vane shear tests were made as well as samples recovered at intervals of about 10 ft. The number of samples from within the clay stratum was reduced when it was obvious that the formation is the same throughout.

The samples will be stored for a period of 3 months for future reference. Two tube samples have been cut and sealed for further testing if necessary.

Location of boreholes is shown in Plan on Enclosure No. 1 at the back of the report.

5. SOIL DESCRIPTION:

From the ground surface to a depth of about 3 ft, the soil is a loose to medium dense sand with some gravel. This is followed by a medium dense coarse gravel, sand and silt to the clay stratum. In borehole 1 the granular soil extended to elev. 592.6 and to elev. 596.0 at borehole 2. On the south bank clay was reached at elev. 599.5.

At the north bank the soft reddish-brown clay contained some fine to coarse sand. This was not apparent on the south bank. Vane shear strengths increase with depth from 350-425 psf at elev. 594 to 960 psf at elev. 557 in borehole 2. The rate of increase appears to be almost linear. Water contents are lower (52 and 66.2) near the top and remain about the same to

the bottom with the average value being about 75%. This is a highly plastic clay having a sensitivity of 5 to 6. Thickness of the clay is 30 to 45 ft.

A medium dense to dense well-graded coarse sand and fine gravel followed the clay. It slopes north-west to Bachawana Bay. The upper portion of it is very porous and water bearing. Some of the gravel sizes were up to $1\frac{1}{2}$ ".

A detailed description of the soil in each borehole is given on the borehole logs at the back of the report. Field and laboratory test results are also enclosed. Subsurface sections of the north and south banks are drawn on Enclosure No. 2.

6. ARTESIAN PRESSURE CONDITIONS:

Artesian water pressure conditions were encountered in the dense granular strata underlying the clay. With the exception of borehole 2 where the strata was not entirely opened, the water flowed from the casing above ground surface level. In boreholes 3 and 4 the water rose to elev. 605.2. In the former borehole this was maintained for 36 hours. In borehole 1 the water rose in the casing standpipe to elev. 603.2.

All the boreholes were backfilled and grouted to prevent flow. It was not found necessary to leave lengths of casing within the holes.

7. LABORATORY SOIL TESTS:

Laboratory tests revealed that the clay stratum is highly plastic and very wet. Consistency tests show that the water content is higher than the liquid limit giving a liquidity index range of 1.15 to 1.32. Natural moisture contents range from 52.0% and 66.2% at elev. 595-596 to as high as 84.8% at elev. 584. The unit weights are around 99 pcf.

Unconfined compression tests were made on undisturbed samples. These are shown on the borehole logs. The cohesion is generally less than half of the insitu vane shear values. With sensitivities of 5-6 there is bound to be remoulding of the samples due to extrusion and in the sampling operation Shelby tube samples were pushed by hand into the clay.

The ratio of the vane shear strengths to the effective overburden pressure is roughly 0.8-0.9 at the top of the clay stratum and reduces to about 0.5 at the bottom. Based on the liquid limits there is a suggestion that the clay (especially near the surface) has higher strengths than a normally loaded clay. Also from the liquid limits the compression index is estimated to be about 0.6 for settlement analysis.

An undisturbed specimen of samples 3 in borehole 2 from elevation 579 is available for tests if required.

8. FOUNDATION CONDITIONS:

Erosion on the downstream side of the existing bridge near the north bank is believed to be the reason for the depth of granular material and the mixture of sand sizes in the upper portion of the clay. Most of the flow was concentrated near the north bank. The stream bed drops off sharply (by 2.6 ft) at about 12 ft from the bank.

The clay soil is not capable of sustaining loads from foundations without excessive settlement. A pile foundation is recommended to support a bridge structure. The footings may be established at or below elev. 591.0 which is between 4.0 and 6.0 ft below the stream bed.

Piles driven into the dense granular strata under the clay offer good bearing. Length of piles will vary with the contour of the strata.

Granular soil, mostly coarse sand, lines the bottom of the channel. Concrete or corrugated iron culverts may be placed within the granular soil which is believed to provide good bedding for such structures.

Construction of pier foundations within the river will require a cofferdam with sheet piles driven into the clay. The sand at the river bed is loose and porous.

Although ~~an~~ stability analysis was not made, the proposed roadway elevation 609.5[±] is not expected to cause failure. This is based on the performance of the existing embankment which although 1.5 ft lower than the proposed, does not show signs of instability.

9. CONCLUSIONS:

The borings revealed that the subsoil consists of several feet of medium dense sand followed by gravel, coarse sand and silt to a soft clay stratum. A dense sand and gravel strata underlies the clay. It dips to the north-west in the direction of Bachawana Bay.

Artesian water pressure was encountered below the clay stratum. The highest recorded rise in an open standpipe was to elev. 605.2 in boreholes 3 and 4.

River water level was 601.5 during the investigation. There was some fluctuation due to a change in water level of Bachawana Bay.

Laboratory soil tests and field tests indicate that

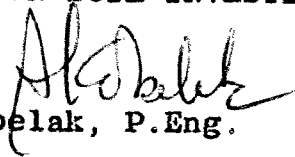
the clay is not capable of sustaining low foundation loads. Settlement would be high and not uniform due to the difference in the thickness of clay. Pile foundations for a bridge are recommended. Piles should be driven into the dense granular strata.

Good bedding for a culvert(s) is available at the site within the river bed. This is a suggested alternative type of structure which blends itself to the soil conditions.

On the basis of the performance of the approaches to the existing bridge it is considered safe to construct the new embankment to elev. 609.5± as proposed.



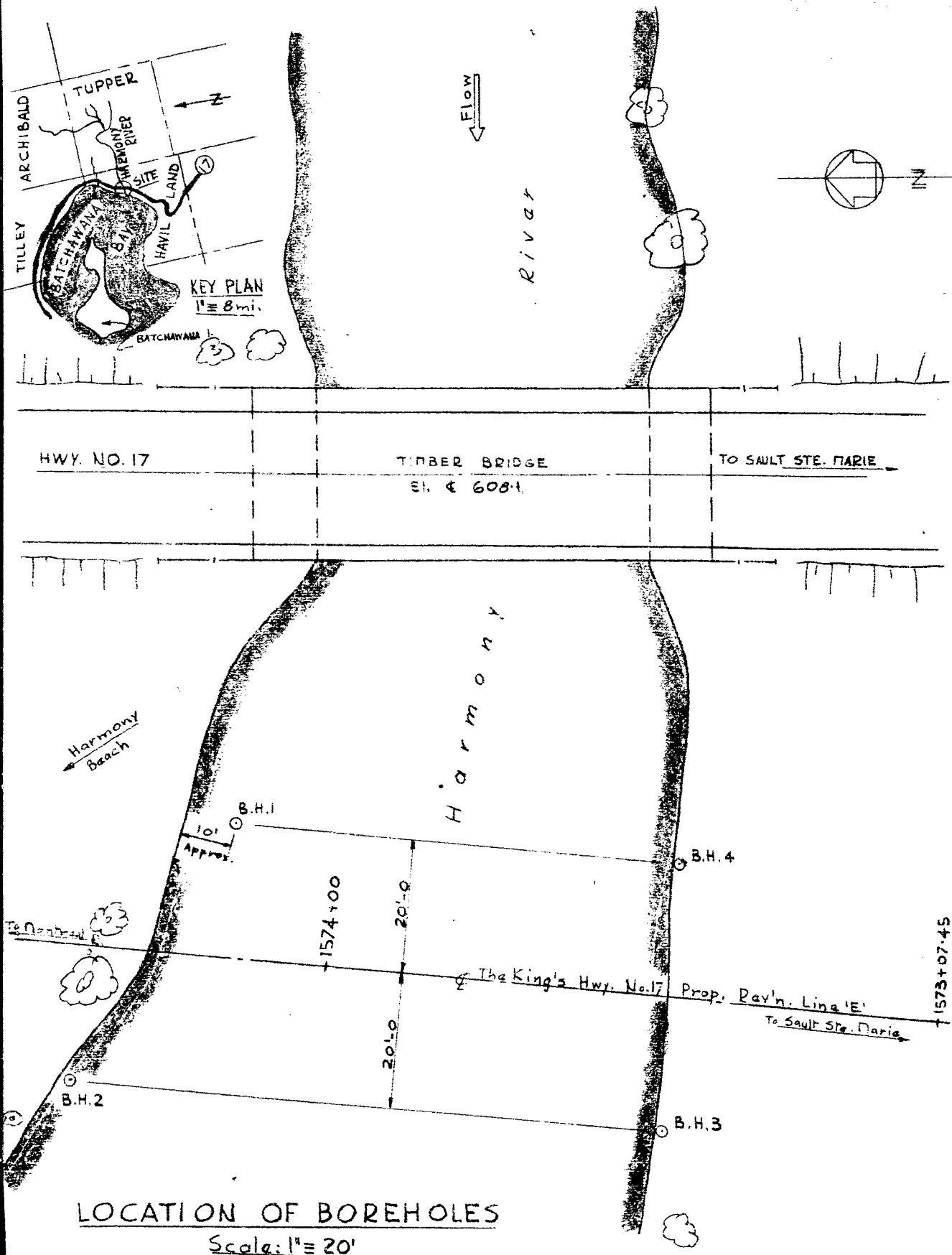
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A. Kobelak, P.Eng.

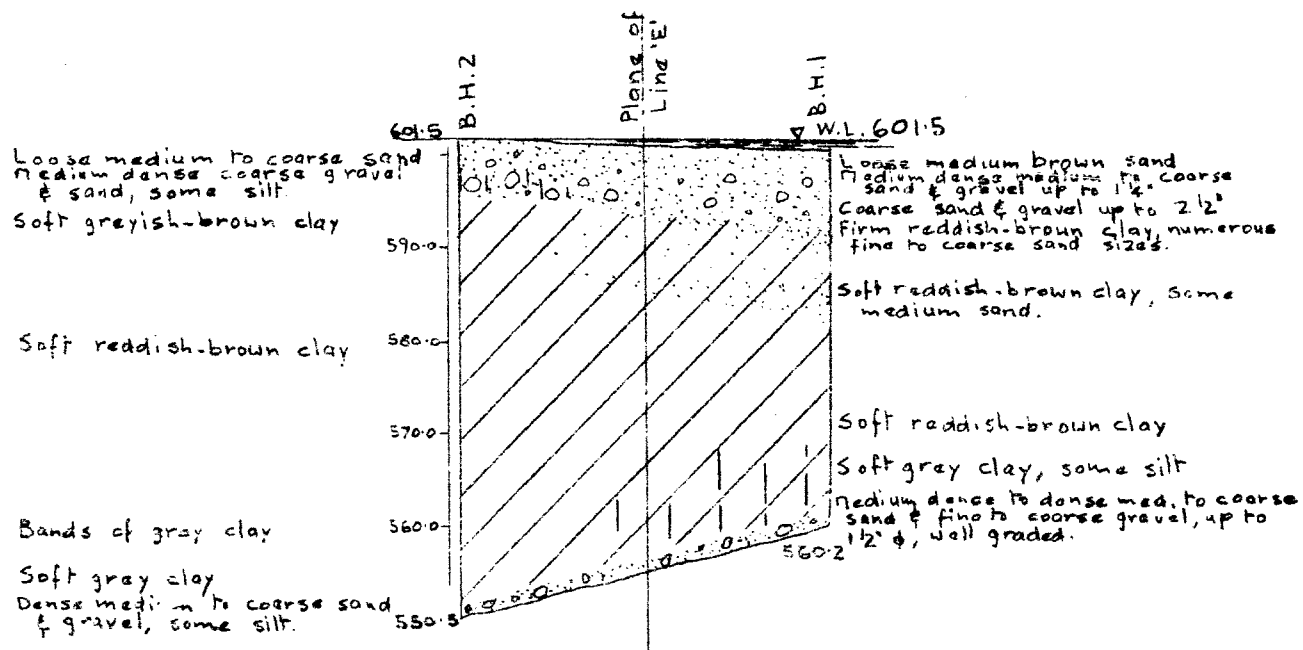
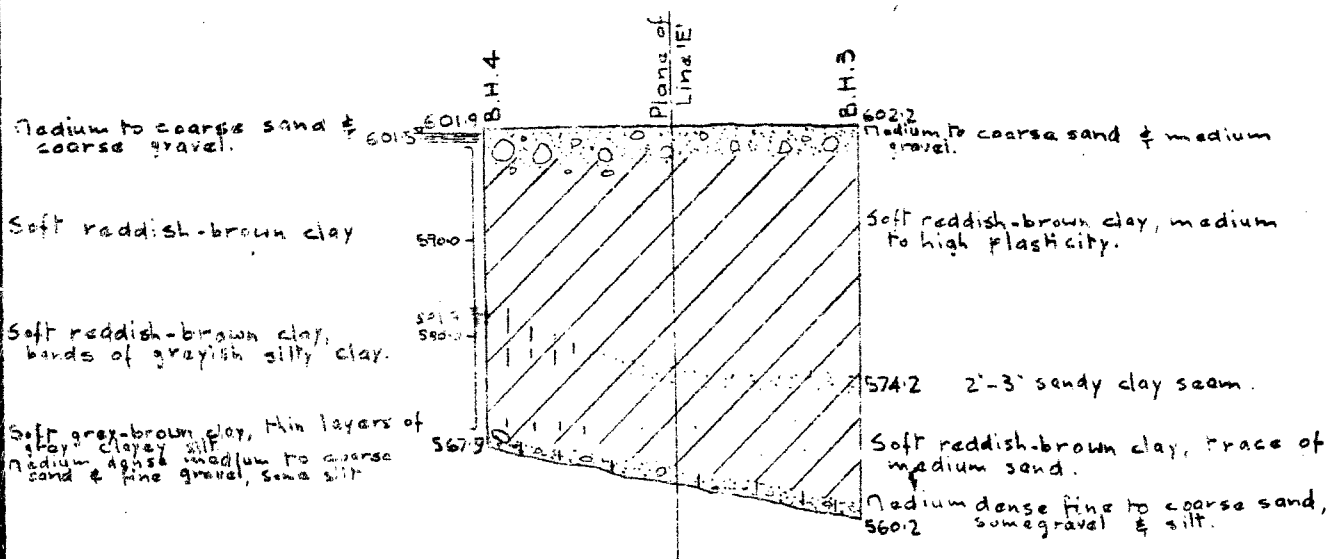
ENGINEERING DATA SHEETS

Location of Boreholes Encl. No. 1
Subsurface Sections Encl. No. 2
Borehole Logs Encl. Nos. 3-6 incl.

Prep. By G.R.



Prep. By G.R.

SUBSURFACE SECTION NORTHWARDScale: 1" = 20'SUBSURFACE SECTION SOUTHWARDScale: 1" = 20'

Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 1

Date: 30-7-59.

Dominion Soil Investigation Ltd.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 1

Date: 30-7-59.

Project: Harmony River Bridge
Location: Hwy. 17 T.C.H. BW 270
Hole Location: Sta. 1574+12, 21' Rt.
(N.E. corner)
Hole Elevation and Datum: 601.5
Field Supervisor: A.K. Prep.: G.R.
Driller: C.S. Checked:

LEGEND

Shear Strength (C)

Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P) 1 1/2

2" Split tube

2" Dia. Cone

Casing

Sampling Method

2" Dia. split tube

2" Shelby tube

LEGEND

Consistency

Natural moisture and

Liquidity Index (LI)

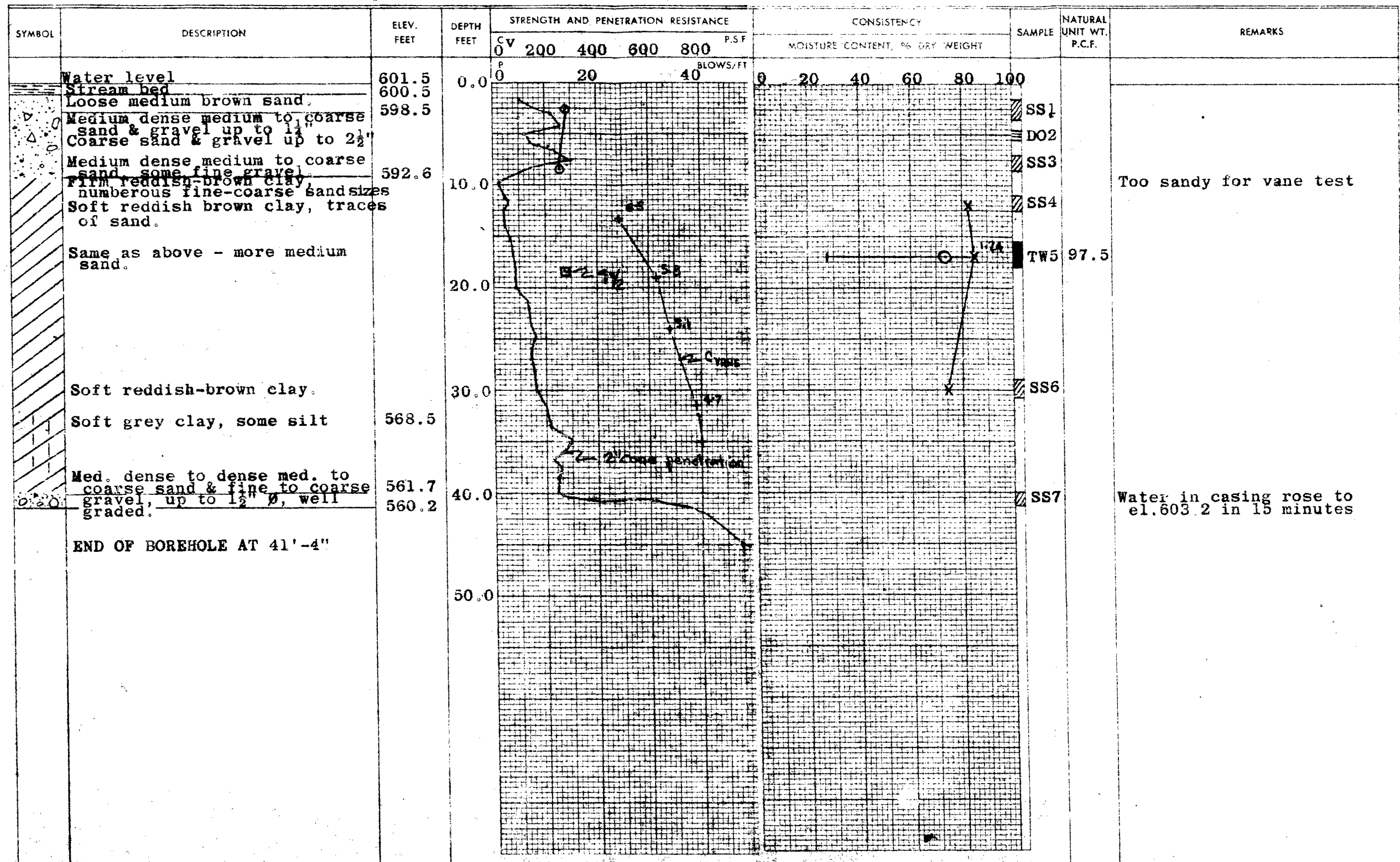
Liquor limit

Plastic limit

Sampling Method

2" Dia. split tube

2" Shelby tube



Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 2

Date: 29-7-59.

Dominion Soil Investigation Ltd.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 2

Date: 29-7-59.

Project: Harmony River Bridge
Location: Hwy. 17 T.C.H. BW 270
Hole Location: Sta. 1574+36, 20' left
(N.W. corner)
Hole Elevation and Datum: 602.0
Field Supervisor: A.K. Prep.: G.R.
Driller: C.S. Checked:

LEGEND

Shear Strength (C)

Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕
+s
⊕

9 1/2

⊕

Sampling Method

2" Dia. split tube

2" Shelby tube

LEGEND

Consistency

Natural moisture and

Liquidity Index (LI)

Liquid limit

Plastic limit

—x—o

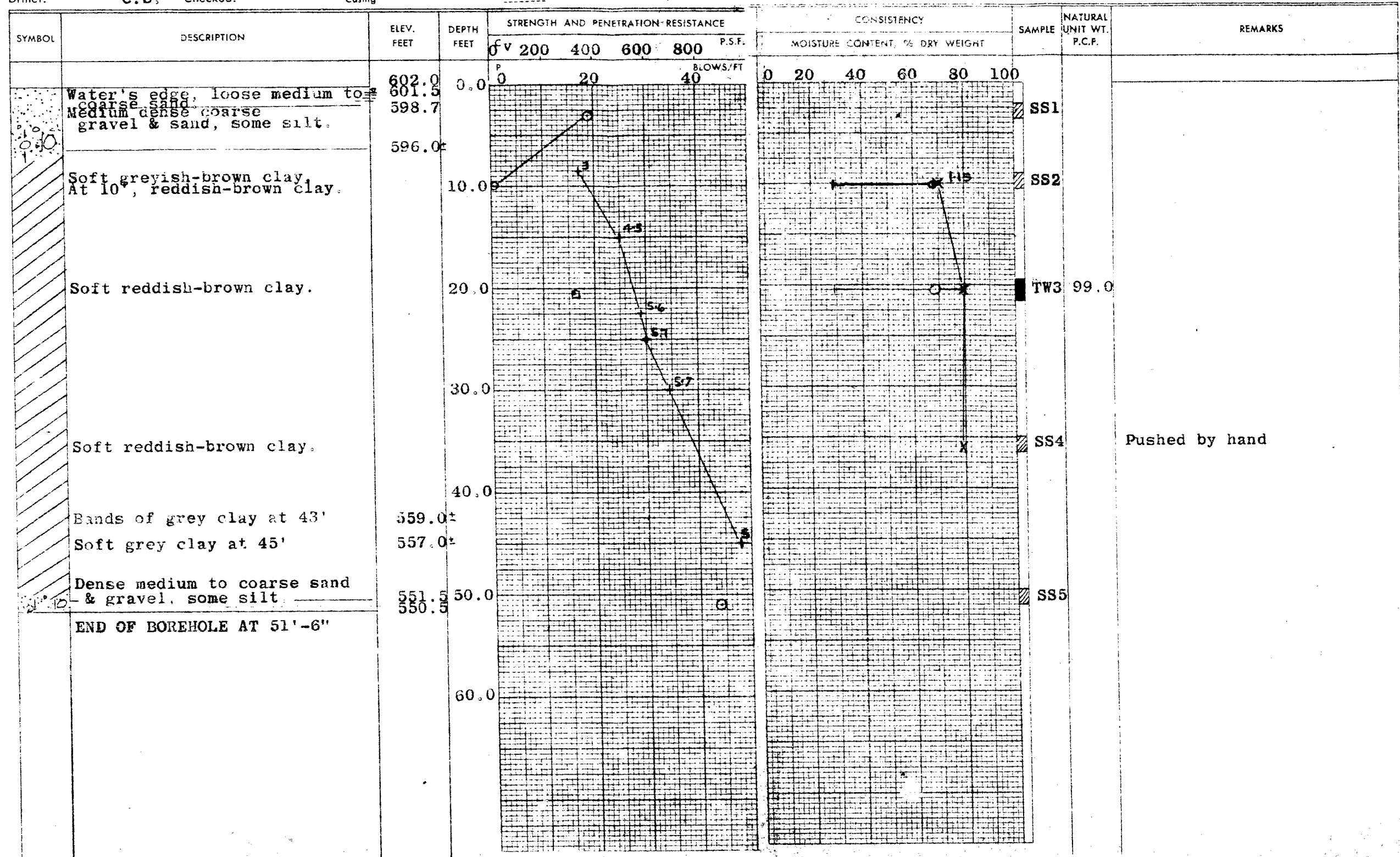
x LI

—o—

Sampling Method

2" Dia. split tube

2" Shelby tube



Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 3

Date: 29-7-59

Project: **Harmony River Bridge**
Location: **Hwy. 17 T.C.H. BW 270**
Hole Location: **S.W. corner**
Hole Elevation and Datum: **602.2**
Field Supervisor: **A.K.** Prep.: **G.R.**
Driller: **C.S.** Checked: **A.K.**

LEGEND

Shear Strength (C)

Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube
2" Dia. Cone
Casing

Sampling Method
2" Dia. split tube
2" Shelby tube



LEGEND

Consistency

Natural moisture and
Liquidity Index (LI)
Liquid limit
Plastic limit

Sampling Method

2" Shelby tube

| SYMBOL | DESCRIPTION | ELEV. FEET | DEPTH FEET | STRENGTH AND PENETRATION RESISTANCE | | CONSISTENCY | | | | | SAMPLE | NATURAL UNIT WT. P.C.F. | REMARKS |
|---|---|-----------------|---------------|-------------------------------------|--------|--------------------------------|----|----|----|----|--------|-------------------------------|---------|
| | | | | C | P.S.F. | MOISTURE CONTENT, % DRY WEIGHT | | | | | | | |
| | | | | BLOWS/FT. | | 0 | 20 | 40 | 60 | 80 | | | |
|  | Ground (beach) at water's edge | 602.2 | 0.0 | 0 | 20 | 40 | 0 | 20 | 40 | 60 | 80 | | |
| | Med. to coarse sand & medium gravel. | 601.5 | | | | | | | | | | | |
| | Soft reddish-brown clay. | 599.4± | | | | | | | | | | | |
| | Soft reddish-brown clay, medium to high plasticity. | | 10.0 | | | | | | | | | | |
| | | | 20.0 | | | | | | | | | | |
|  | 2"-3" sandy clay seam @ 28' | 574.2± | 30.0 | | | | | | | | | | |
| | Soft reddish-brown clay, trace of medium sand. | | | | | | | | | | | | |
| | | | 40.0 | | | | | | | | | | |
| | Medium dense fine to coarse sand, some gravel and silt. | 562.1± 560.2 | | | | | | | | | | | |
| | | | 50.0 | | | | | | | | | | |
| | END OF BOREHOLE AT 42'-0" | | | | | | | | | | | | |

99.0 Specimen of sample stored in sealed jar.

SS2

SS3

SS4

Water rose in casing to el. 605.2 in 36 hrs.

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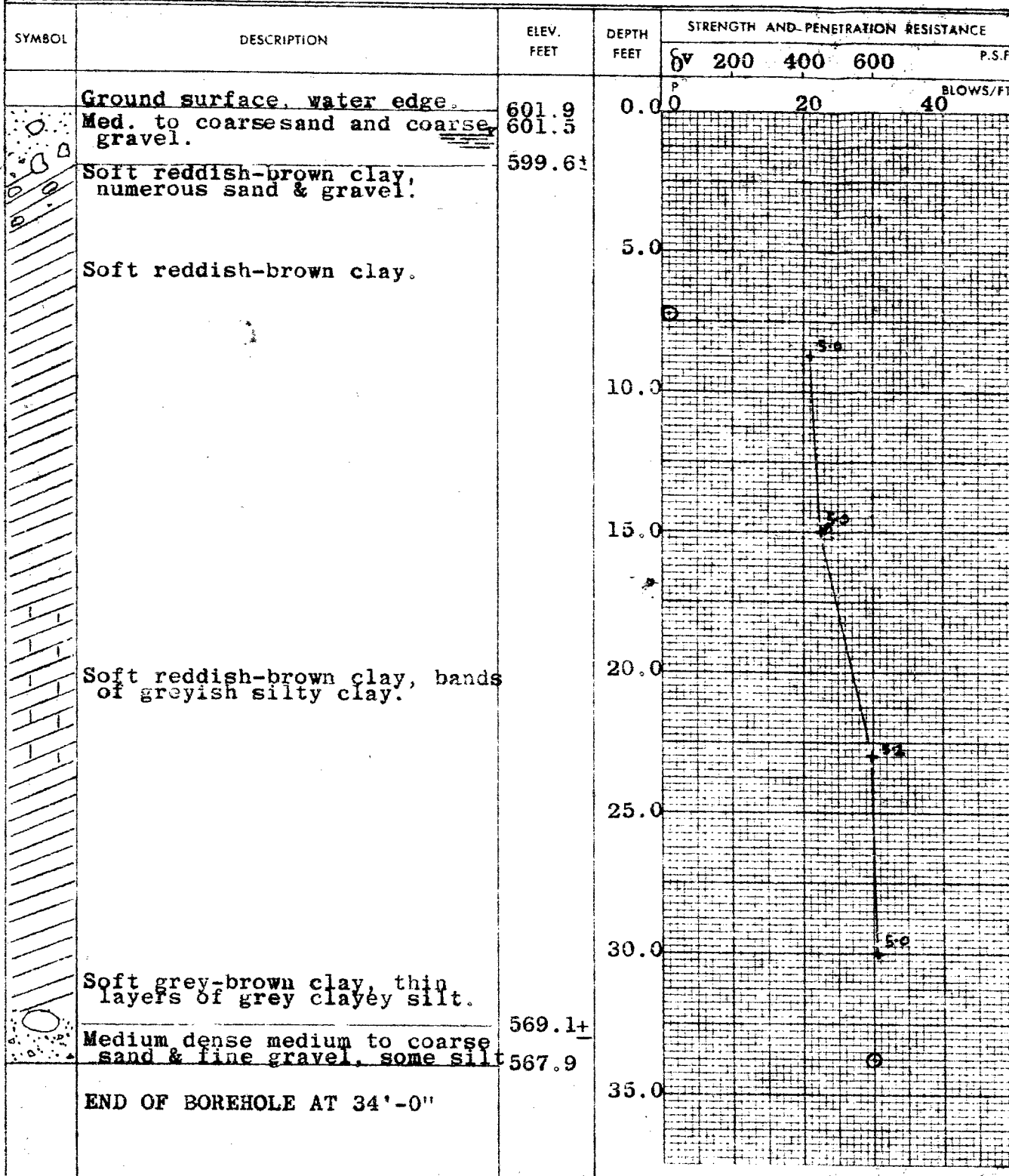
Engineering Data Sheet for Borehole: 4

Project: Harmony River Bridge
Location: Hwy. 17 T.C.H. BW 270
Hole Location: Sta. 1573+50 20' Rt.
Hole Elevation and Datum: 601.9
Field Supervisor: A.K. Prep.: G.R.
Driller: C.S. Checked: A.K.

LEGEND
Shear Strength (C)
Uncut compression
Vane test and sensitivity (S)
Penetration Resistance (P)
2" Split tube
2" Dia. Cone
Casing

Date: 29-7-59

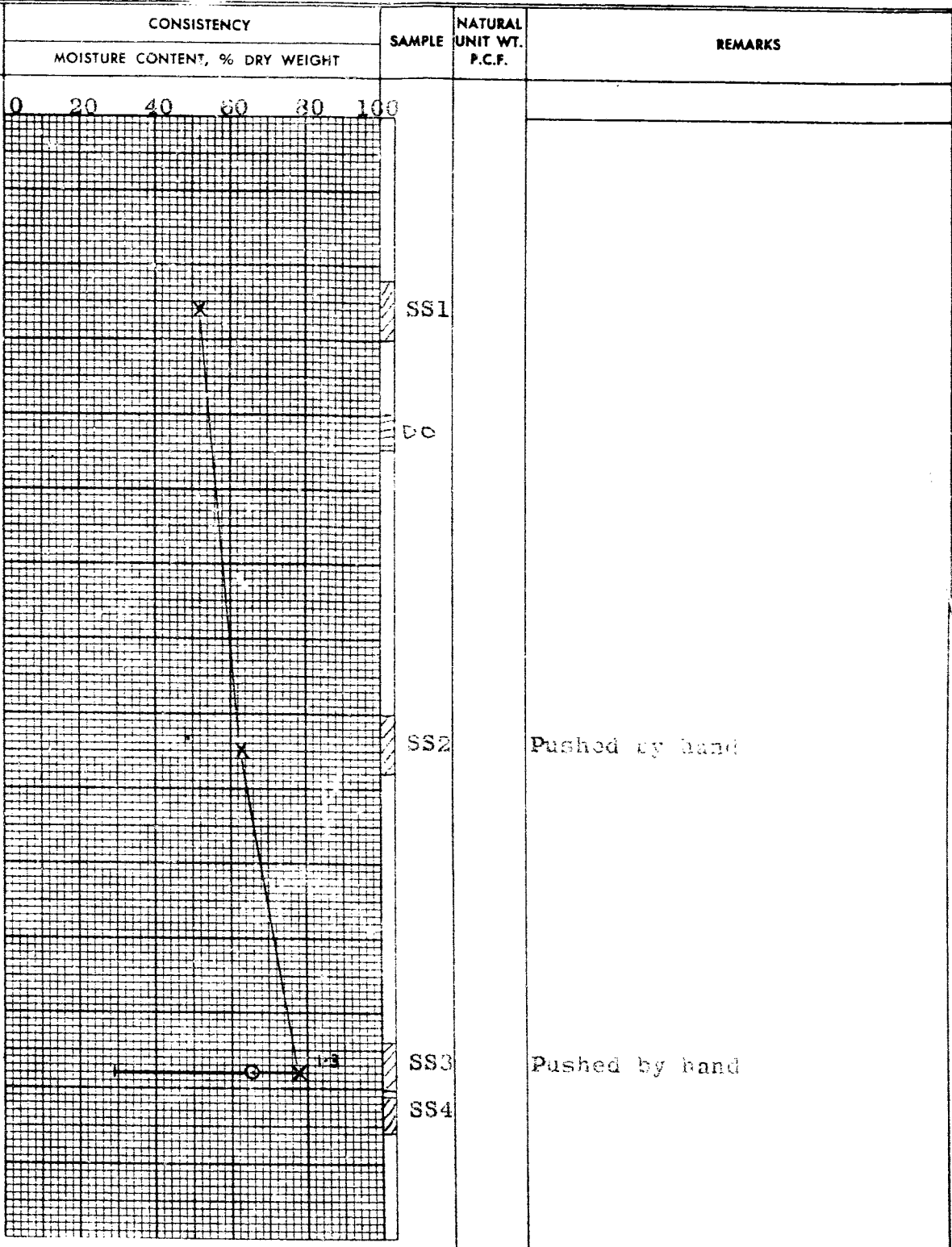
Sampling Method
2" Dia. split tube
2" Shelby tube



Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole: 4

LEGEND
Consistency
Natural moisture and Liquidity Index (LI)
Liquid limit
Plastic limit
Sampling Method
2" Dia. split tube
2" Shelby tube



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FOUNDATION INVESTIGATION
HARMONY RIVER CROSSING
HWY. NO. 17 T.C.H.AT
HARMONY BEACH
WP 919-59 BW 270

1. INTRODUCTION:

A foundation investigation was requested by the Materials and Research Section of D.H.O. for the Harmony River and Highway No. 17 crossing at Harmony Beach. Four boreholes were requested to determine the foundation conditions for a proposed new bridge on Line "E" about 75 ft due west of the existing roadway.

This report presents the results of field investigation, the results of laboratory soil tests on selected samples and provides recommendations on foundations for the proposed structure.

2. SUMMARY OF CONCLUSIONS:

The subsoil below several feet of sand and gravel and is a soft reddish-brown clay. This stratum is 30 to 45 ft thick. A dense granular soil underlies the clay.

Artesian pressure was encountered. Water level rose to elev. 605.2 which is a pressure equivalent to a water head of about 43 ft. River water level was 601.5 during the investigation.

Pile foundations are recommended for a bridge. The piles should be driven into the granular strata below the clay. An alternative to a bridge is a culvert(s) bedded within the sand lining the river bed. A flexible type structure is advisable.

Construction of a new embankment to elev. 609.51 is considered safe based on the performance of the existing approaches.

3. LOCATION AND DESCRIPTION OF SITE:

The site is located about 30 miles north of Sault Ste. Marie along Provincial Highway No. 17 (T.C.H.) at Harmony Beach. Highway surveys plans shows the land location to be Section 13 in the Township of Haviland, District of Algoma.

Revised line "E" follows the existing highway route

with a slight departure towards the Bay in the vicinity of the site. Hardwood River (sometimes called Jones Creek) flows into Bachawana Bay which is about 300 ft west. A sand bar formation has developed at the mouth of the river. Light growth of evergreens and shrubs line the river banks. The channel is clean, sand lined, and straight as a result of some recent dredging operations. Water level on July 20 was 601.5. On July 17, 1959 the water level was about 0.4 ft lower. Winds blowing inland from the Bay affect the water level.

North of the site the terrain is flat. To the south the land rises 40 ft at a gradual slope. This area is heavily wooded with small shrubs and trees.

The existing timber trestle bridge has an 8 x 50 ft waterway opening. The centre piers are reinforced with a rock filled crib.

4. DRILLING PROGRAMME:

Drilling was started at borehole 1 on July 17, 1959. A timber crib was built within the water about 10 ft from the bank. Cone penetration test was made at this borehole. All borings were carried to the dense underlying granular soil. Field work was completed on July 20, 1959.

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The samples will be stored for a period of 3 months for future reference. Two tube samples have been cut and sealed for further testing if necessary.

Location of boreholes is shown in Plan on Enclosure No. 1 at the back of the report.

5. SOIL DESCRIPTION:

From the ground surface to a depth of about 3 ft, the soil is a loose to medium dense sand with some gravel. This is followed by a medium dense coarse gravel, sand and silt to the clay stratum. In borehole 1 the granular soil extended to elev. 592.6 and to elev. 596.0 at borehole 2. On the south bank clay was reached at elev. 599.5.

At the north bank the soft reddish-brown clay contained some fine to coarse sand. This was not apparent on the south bank. Vane shear strengths increase with depth from 350-425 psf at elev. 594 to 960 psf at elev. 557 in borehole 2. The rate of increase appears to be almost linear. Water contents are lower (52 and 66.2) near the top and remain about the same to

the bottom with the average value being about 75%. This is a highly plastic clay having a sensitivity of 5 to 6. Thickness of the clay is 30 to 45 ft.

A medium dense to dense well-graded coarse sand and fine gravel followed the clay. It slopes north-west to Bachawana Bay. The upper portion of it is very porous and water bearing. Some of the gravel sizes were up to $1\frac{1}{2}$ ".

A detailed description of the soil in each borehole is given on the borehole logs at the back of the report. Field and laboratory test results are also enclosed. Subsurface sections of the north and south banks are drawn on Enclosure No. 2.

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Construction of pier foundations within the river will require a cofferdam with sheet piles driven into the clay. The sand at the river bed is loose and porous.

Although our stability analysis was not made, the proposed roadway elevation 609.5¹ is not expected to cause failure. This is based on the performance of the existing embankment which although 1.5 ft lower than the proposed, does not show signs of instability.

9. CONCLUSIONS:

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River water level was 601.5 during the investigation. There was some fluctuation due to a change in water level of Bachawana Bay.

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DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

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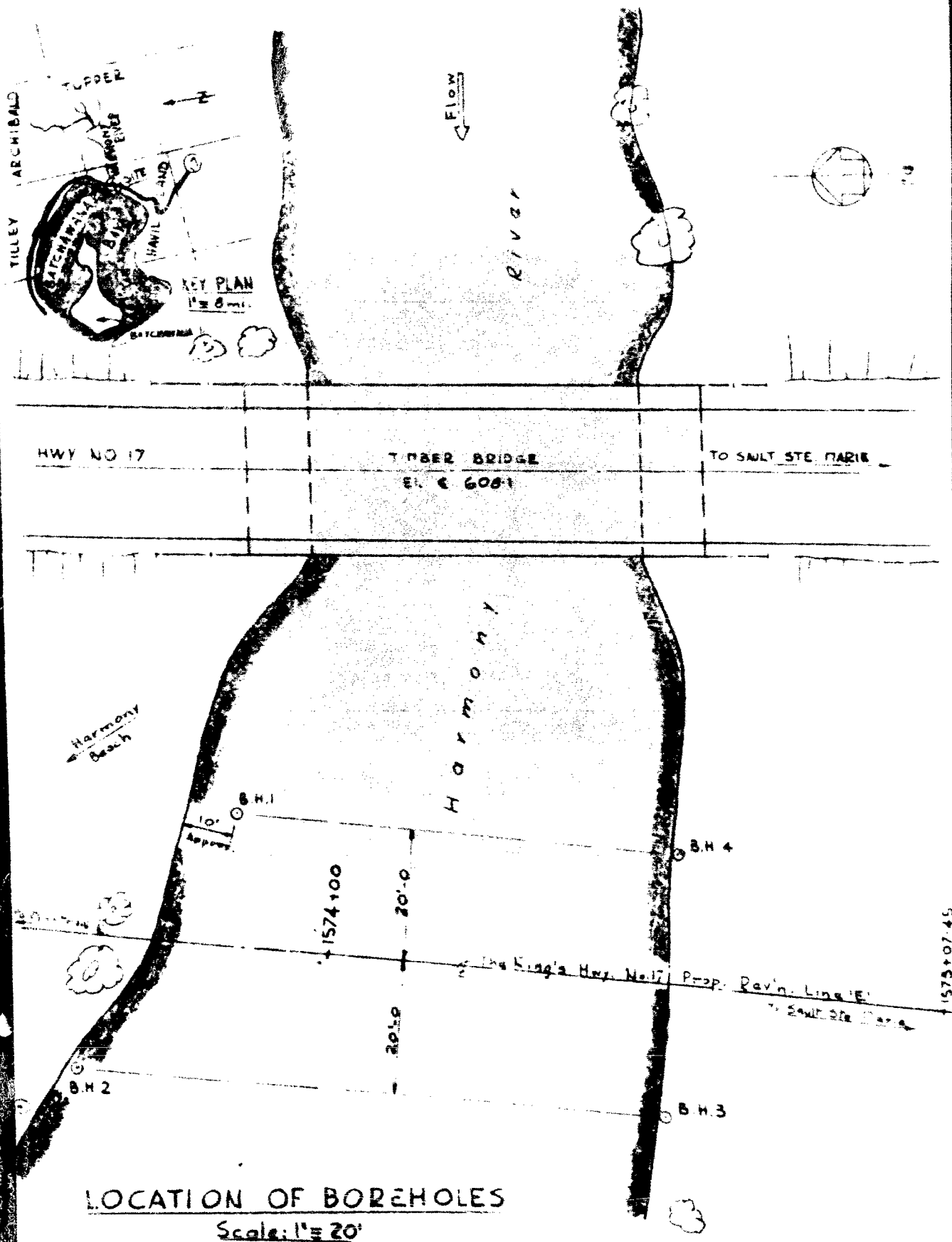
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L. D. Gaudet
for A. Kobelak, P.Eng.

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Borehole Logs Encl. Nos. 3 - 6 incl.

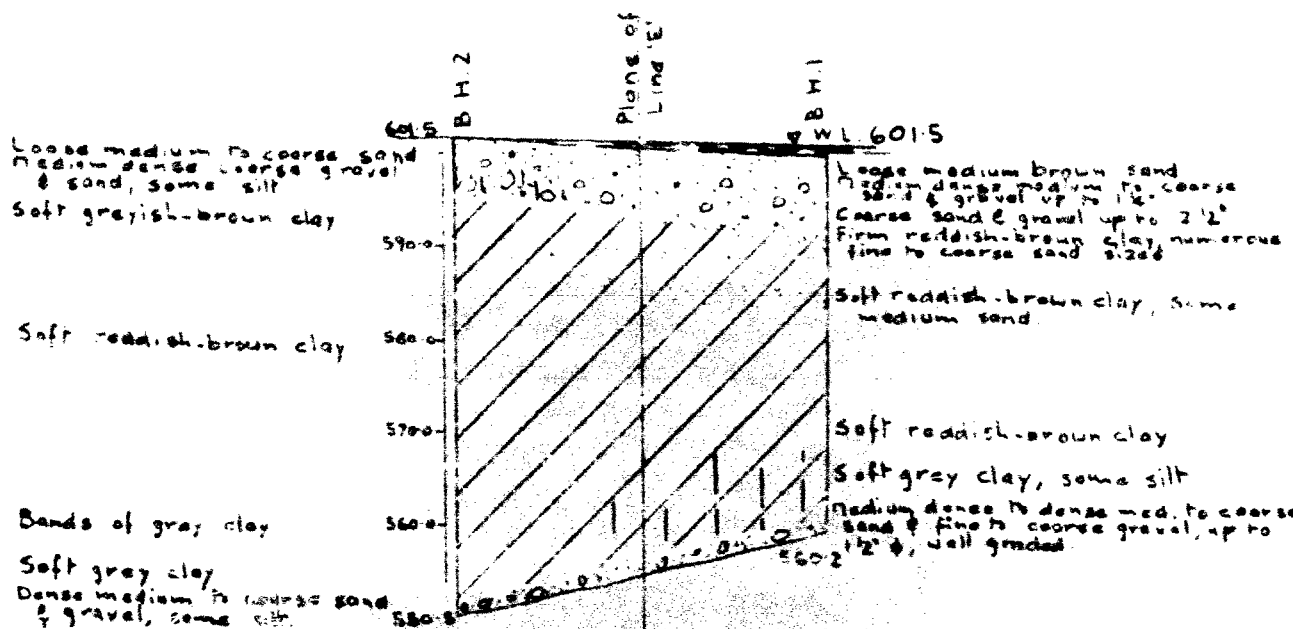
~~EXISTS~~ IN NEGATIVE DUE TO
~~REPRODUCTION~~ OF ORIGINAL DOCUMENT



LOCATION OF BOREHOLES

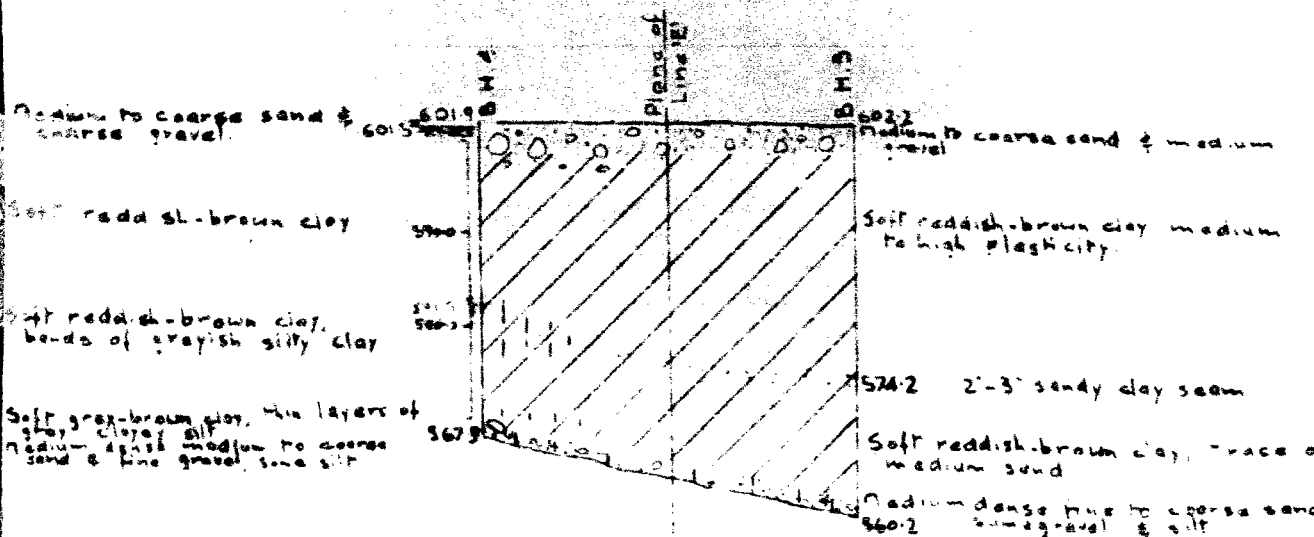
Scale: 1" = 20'

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT



SUBSURFACE SECTION NORTHWARD

Scale: 1" = 20'



SUBSURFACE SECTION SOUTHWARD

Scale: 1" = 20'

DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT

Dominion Soil Investigation Ltd.

Engineering Data Sheet for Sample 1

Project: Harmony River Bridge
 Location: Hwy. 17 T.C.M. SW 270
 Hole Number: 812 1574.12 21' Rt.
 Hole Elevation and Datum: 881.5
 Field Supervisor: A.K. Prop. G.R.
 Driller: C.S. Church

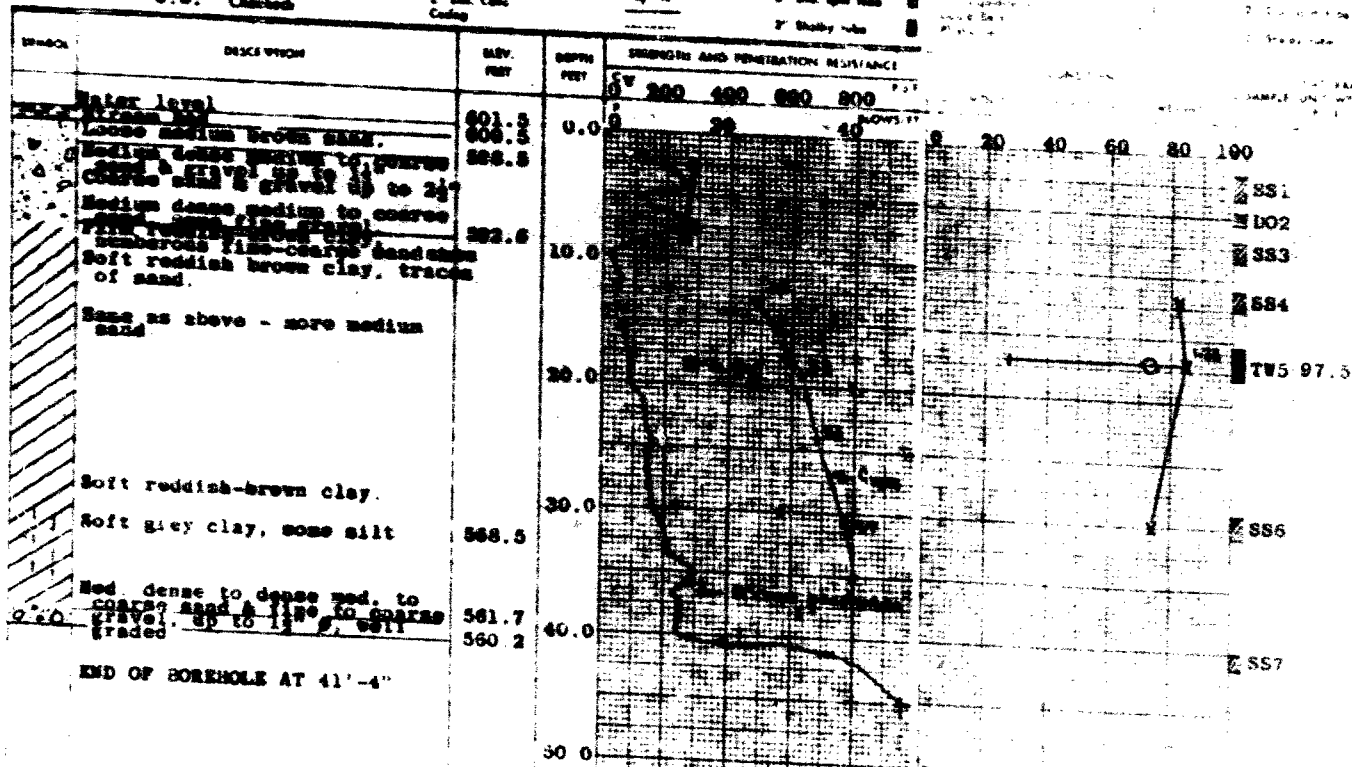
SSSR
 Blow Strength (C)
 Unconfined compression
 Fine test and sensitivity (S)
 Penetration Resistance (P) 9/4
 2" Split tube
 2" Dia. Cone
 Coding

Date: 30-7-59

Dominion Soil Investigation Ltd.

Investigation Engineering Division
 Engineering Data Sheet for Borehole

30-7-59



DEFECTS IN NEGATIVE LOG OF
 CONDITION OF ORIGINAL LOG

Dominion Soil Investigation Ltd.

Engineering Data Sheet for Borehole 2

Project: Harmony River Bridge
 Location: Hwy. 17 T.C. d. SW 270
 Hole location: Sta. 1574+36, 20' left
 Hole Elevation and Datum: 602.0
 Field Supervisor: A.K. Prep. G.R.
 Driller: C.S. Checked:

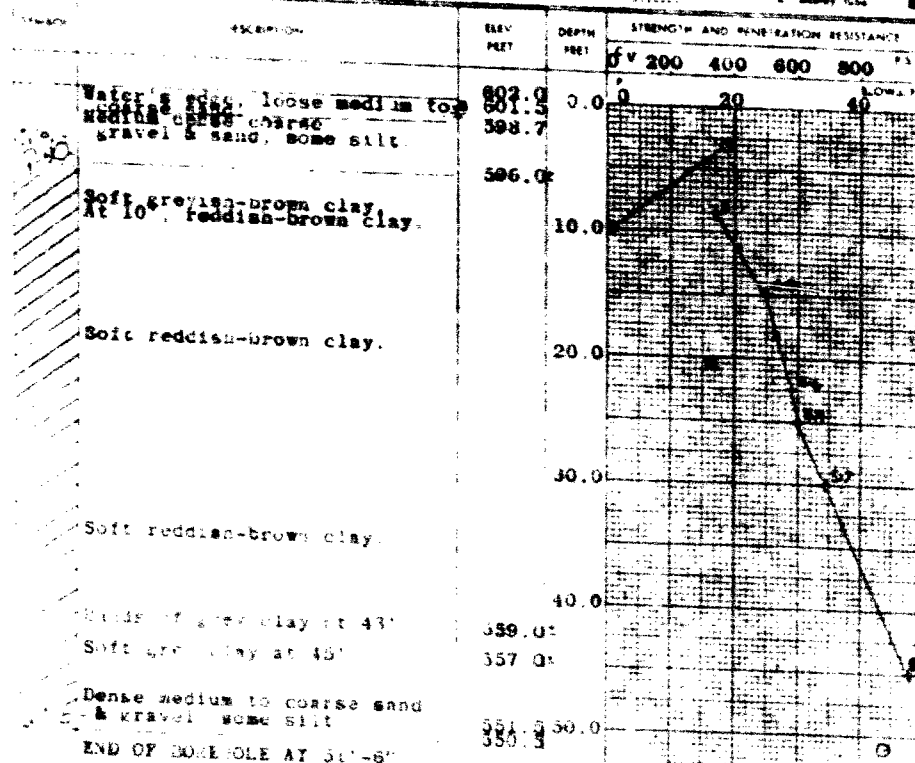
MBHP
 Shear Strength (C)
 unconfined compression
 Vane test and sensitivity S:
 Penetration Equipment (P)
 2" Split tube
 2" Dia. Cone
 Casing

Date: 29-7-59.

Sampling Method

2" Dia. split tube

2 Shelby tube



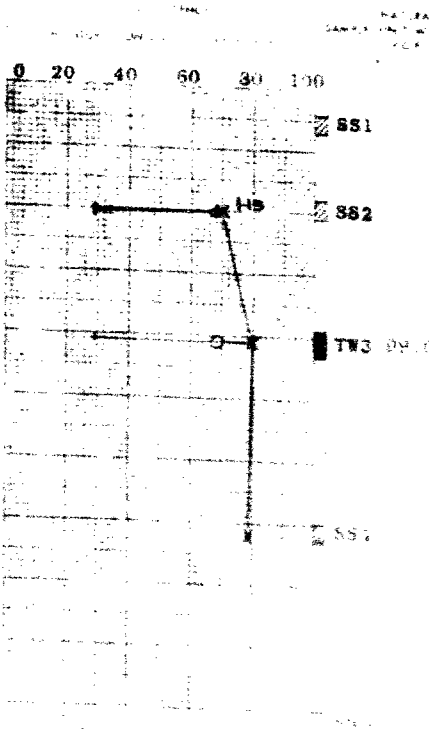
Dominion Soil Investigation Ltd.

Foundation Engineering Division

Engineering Data Sheet for Borehole 2

Enclosure No. 4

Project: Harmony River Bridge
 Location: Hwy. 17 T.C. d. SW 270
 Hole location: Sta. 1574+36, 20' left
 Hole Elevation and Datum: 602.0
 Field Supervisor: A.K. Prep. G.R.
 Driller: C.S. Checked:



DEFECTS IN NEGATIVE LINE
 IN SECTION OF RETAINED SHEET

Domination Soil Investigation Ltd.

Engineering Data Sheet for Borehole 3

Project: Harmony River Bridge
 Location: Hwy. 17 T.C.H. SW 270
 Hole Location: S.W. corner
 Hole Elevation and Depth: 602.2
 Field Supervisor: A.E. Prep: G.R.
 Driller: C.S. Checked: A.K.

TESTS

Shore Strength (C)

Unconfined compression
 Vane test and laboratory

Penetration Resistance (P)

2" Split tube
 2" Dil. split tube
 Curing

Date: 29-7-53

Sampling Method

2" Dil. split tube

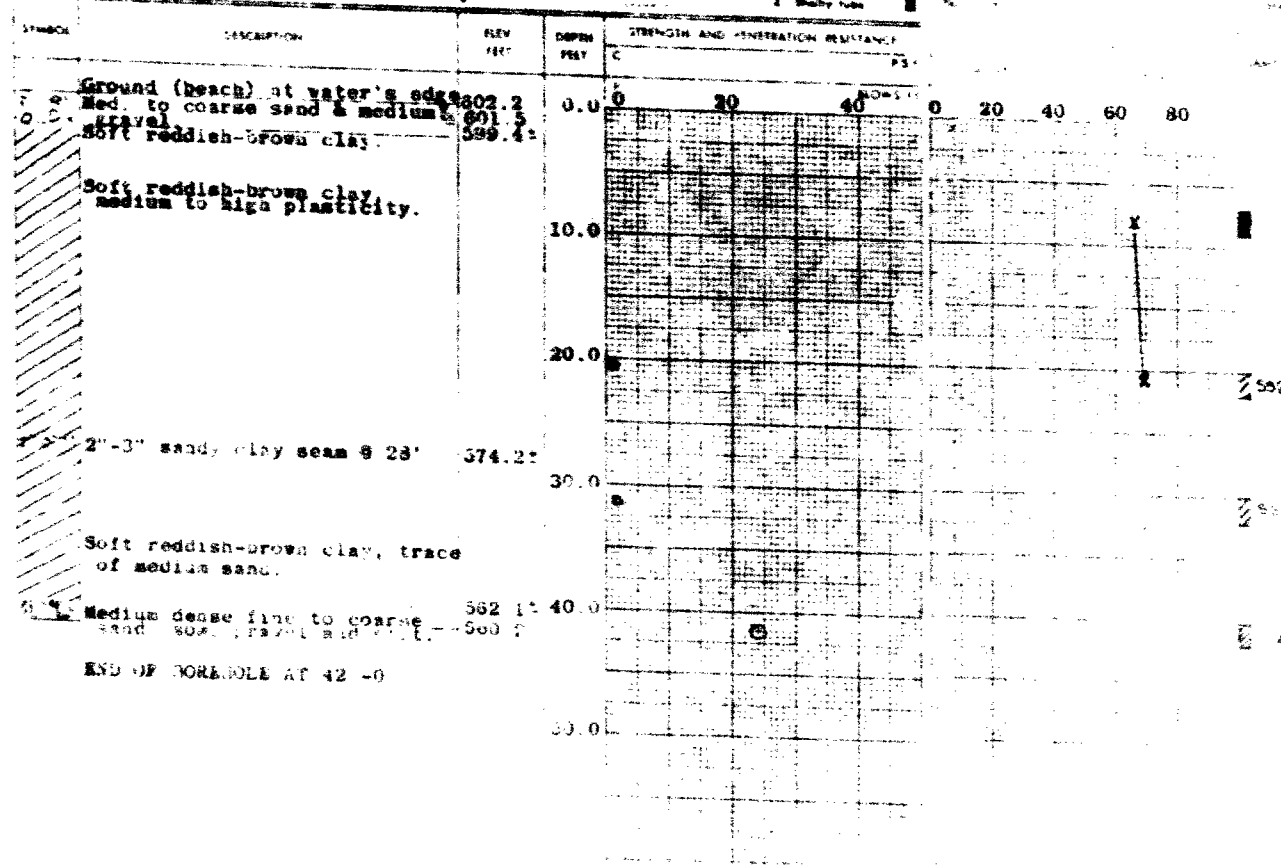
2" Shallow tube

Domination Soil Investigation Ltd.

Foundation Engineering Division

Engineering Data Sheet for Borehole 3

Date: 29-7-53



DEFECTS IN NEGATIVE DUE TO
 CONDITION OF ORIGINAL DOCUMENT

Seminole Soil Investigation Ltd.

Engineering Data Sheet for Barabole: 44

Abstract

Share the Love

Manufactured components
have not met standards

Demographic Description (%)

2" Spill Valve
2" Dis. Conn
Casing

Date: 29-7-59

43100

2000

structural moisture and
liquidity index (ii)
Liquid Ratio
Stable Ratio

Scoring method

2. On the other hand, the

1998, 1999, 2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017, 2018, 2019, 2020, 2021, 2022, 2023, 2024, 2025, 2026, 2027, 2028, 2029, 2030, 2031, 2032, 2033, 2034, 2035, 2036, 2037, 2038, 2039, 2040, 2041, 2042, 2043, 2044, 2045, 2046, 2047, 2048, 2049, 2050, 2051, 2052, 2053, 2054, 2055, 2056, 2057, 2058, 2059, 2060, 2061, 2062, 2063, 2064, 2065, 2066, 2067, 2068, 2069, 2070, 2071, 2072, 2073, 2074, 2075, 2076, 2077, 2078, 2079, 2080, 2081, 2082, 2083, 2084, 2085, 2086, 2087, 2088, 2089, 2090, 2091, 2092, 2093, 2094, 2095, 2096, 2097, 2098, 2099, 2100, 2101, 2102, 2103, 2104, 2105, 2106, 2107, 2108, 2109, 2110, 2111, 2112, 2113, 2114, 2115, 2116, 2117, 2118, 2119, 2120, 2121, 2122, 2123, 2124, 2125, 2126, 2127, 2128, 2129, 2130, 2131, 2132, 2133, 2134, 2135, 2136, 2137, 2138, 2139, 2140, 2141, 2142, 2143, 2144, 2145, 2146, 2147, 2148, 2149, 2150, 2151, 2152, 2153, 2154, 2155, 2156, 2157, 2158, 2159, 2160, 2161, 2162, 2163, 2164, 2165, 2166, 2167, 2168, 2169, 2170, 2171, 2172, 2173, 2174, 2175, 2176, 2177, 2178, 2179, 2180, 2181, 2182, 2183, 2184, 2185, 2186, 2187, 2188, 2189, 2190, 2191, 2192, 2193, 2194, 2195, 2196, 2197, 2198, 2199, 2200, 2201, 2202, 2203, 2204, 2205, 2206, 2207, 2208, 2209, 2210, 2211, 2212, 2213, 2214, 2215, 2216, 2217, 2218, 2219, 2220, 2221, 2222, 2223, 2224, 2225, 2226, 2227, 2228, 2229, 2230, 2231, 2232, 2233, 2234, 2235, 2236, 2237, 2238, 2239, 2240, 2241, 2242, 2243, 2244, 2245, 2246, 2247, 2248, 2249, 2250, 2251, 2252, 2253, 2254, 2255, 2256, 2257, 2258, 2259, 2260, 2261, 2262, 2263, 2264, 2265, 2266, 2267, 2268, 2269, 2270, 2271, 2272, 2273, 2274, 2275, 2276, 2277, 2278, 2279, 2280, 2281, 2282, 2283, 2284, 2285, 2286, 2287, 2288, 2289, 2290, 2291, 2292, 2293, 2294, 2295, 2296, 2297, 2298, 2299, 2300, 2301, 2302, 2303, 2304, 2305, 2306, 2307, 2308, 2309, 2310, 2311, 2312, 2313, 2314, 2315, 2316, 2317, 2318, 2319, 2320, 2321, 2322, 2323, 2324, 2325, 2326, 2327, 2328, 2329, 2330, 2331, 2332, 2333, 2334, 2335, 2336, 2337, 2338, 2339, 2340, 2341, 2342, 2343, 2344, 2345, 2346, 2347, 2348, 2349, 2350, 2351, 2352, 2353, 2354, 2355, 2356, 2357, 2358, 2359, 2360, 2361, 2362, 2363, 2364, 2365, 2366, 2367, 2368, 2369, 2370, 2371, 2372, 2373, 2374, 2375, 2376, 2377, 2378, 2379, 2380, 2381, 2382, 2383, 2384, 2385, 2386, 2387, 2388, 2389, 2390, 2391, 2392, 2393, 2394, 2395, 2396, 2397, 2398, 2399, 2400, 2401, 2402, 2403, 2404, 2405, 2406, 2407, 2408, 2409, 2410, 2411, 2412, 2413, 2414, 2415, 2416, 2417, 2418, 2419, 2420, 2421, 2422, 2423, 2424, 2425, 2426, 2427, 2428, 2429, 2430, 2431, 2432, 2433, 2434, 2435, 2436, 2437, 2438, 2439, 2440, 2441, 2442, 2443, 2444, 2445, 2446, 2447, 2448, 2449, 2450, 2451, 2452, 2453, 2454, 2455, 2456, 2457, 2458, 2459, 2460, 2461, 2462, 2463, 2464, 2465, 2466, 2467, 2468, 2469, 2470, 2471, 2472, 2473, 2474, 2475, 2476, 2477, 2478, 2479, 2480, 2481, 2482, 2483, 2484, 2485, 2486, 2487, 2488, 2489, 2490, 2491, 2492, 2493, 2494, 2495, 2496, 2497, 2498, 2499, 2500, 2501, 2502, 2503, 2504, 2505, 2506, 2507, 2508, 2509, 2510, 2511, 2512, 2513, 2514, 2515, 2516, 2517, 2518, 2519, 2520, 2521, 2522, 2523, 2524, 2525, 2526, 2527, 2528, 2529, 2530, 2531, 2532, 2533, 2534, 2535, 2536, 2537, 2538, 2539, 2540, 2541, 2542, 2543, 2544, 2545, 2546, 2547, 2548, 2549, 2550, 2551, 2552, 2553, 2554, 2555, 2556, 2557, 2558, 2559, 2560, 2561, 2562, 2563, 2564, 2565, 2566, 2567, 2568, 2569, 2570, 2571, 2572, 2573, 2574, 2575, 2576, 2577, 2578, 2579, 2580, 2581, 2582, 2583, 2584, 2585, 2586, 2587, 2588, 2589, 2590, 2591, 2592, 2593, 2594, 2595, 2596, 2597, 2598, 2599, 2600, 2601, 2602, 2603, 2604, 2605, 2606, 2607, 2608, 2609, 2610, 2611, 2612, 2613, 2614, 2615, 2616, 2617, 2618, 2619, 2620, 2621, 2622, 2623, 2624, 2625, 2626, 2627, 2628, 2629, 2630, 2631, 2632, 2633, 2634, 2635, 2636, 2637, 2638, 2639, 2640, 2641, 2642, 2643, 2644, 2645, 2646, 2647, 2648, 2649, 2650, 2651, 2652, 2653, 2654, 2655, 2656, 2657, 2658, 2659, 2660, 2661, 2662, 2663, 2664, 2665, 2666, 2667, 2668, 2669, 2670, 2671, 2672, 2673, 2674, 2675, 2676, 2677, 2678, 2679, 26

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DEFECTS IN NEGATIVE DUE TO
CONDITION OF ORIGINAL DOCUMENT