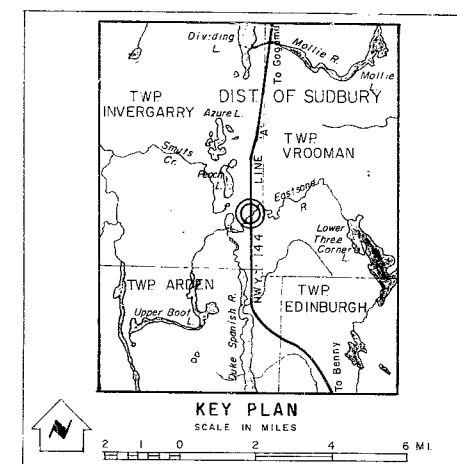


67-F-218

W.P. # 266-64

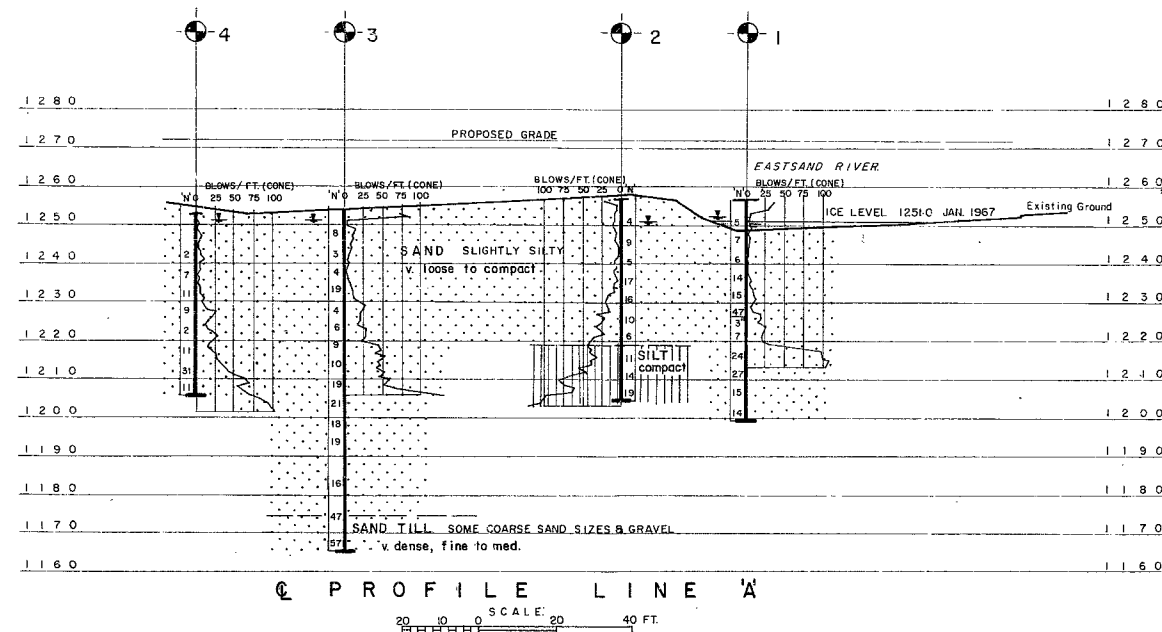
HWY. # 144

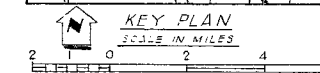
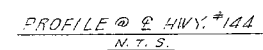
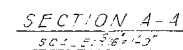
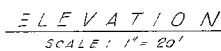
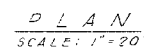
EAST SAND
RIVER



- 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.

[illegible][illegible]



| | | | |
|-----------|------|----|-------------|
| REVISIONS | | | |
| | | | |
| | | | |
| | | | |
| | DATE | BY | DESCRIPTION |

| | | | |
|---|--|--|--|
| DEPARTMENT OF HIGHWAYS ONTARIO BRIDGE DIVISION | | | |
| EAST SAND RIVER BRIDGE | | | |
| KING'S HIGHWAY No. <u>142 - V.F. 4</u> | | DIST. No. <u>14</u> | |
| 21ST OF JULY 1954 | | 22ND OF FEBRUARY | |
| TWP. <u>INVERGARRY</u> | | LOT <u>1255US 70</u> CON. <u>1255US 22ND</u> | |
| PRELIMINARY | | | |
| APPROVED | | SITE No. <u>16-243</u> W.P. No. <u>206-6</u> | |
| DESIGN <u>A.R.</u> CHECK <u>BRIDGE ENGINEER</u> | | CONTRACT No. | |
| DRAWING <u>L.S.</u> CHECK <u>A.R.</u> | | DRAWING No. | |
| DATE <u>11/16/57</u> | | <u>D-6180-P</u> | |

↓

MR. A. RUTKA, P.ENG.
DEPARTMENT OF HIGHWAYS OF ONTARIO
MATERIALS AND TESTING DIVISION
MACDONALD CARTIER FREEWAY AND KEELE STREET
DOWNSVIEW, ONTARIO

FOUNDATION CONDITIONS
PROPOSED BRIDGE SITE
EAST SAND RIVER
PROPOSED KING'S HIGHWAY 144, LINE "A"
W.P. NUMBER 266-64 *Sheet 14*

Project: J3414

February, 1967

William Trow Associates Limited

90 Milvan Drive
Weston, Ontario
749-1290

William Trow

Project: J3414

Soil Mechanics
Consultants
W. A. Trow
MSc. MEIC. P. Eng.
K. Peaker
PhD. MEIC. P. Eng.
D. H. Shields
PhD. MEIC. P. Eng.



Associates Ltd.

Mr. A. Rutka, P.Eng.,
Department of Highways of Ontario,
Materials and Testing Division,
MacDonald Cartier Freeway and Keele Street,
Downsview, Ontario.

February 13, 1967

Attention: Mr. A.G. Stermac, P.Eng.

Foundation Conditions
Proposed Bridge Site
East Sand River
Proposed King's Highway 144, Line "A"
W.P. Number 266-64

Dear Sirs:

In accordance with your recent authorization, we have completed our investigation of the soil conditions at the above noted site. The field work was carried out during the period of January 23rd, to February 1st, 1967.

A summary of our findings and recommendations follows.
These points are further expanded upon in the body of the report.

1) The subsoil at this site was found to consist of an extensive loose to compact, fine to medium grained sand deposit. The sand generally becomes silty below 35 feet depth and was found to contain occasional thin silt layers. At one borehole location silt was found below 37 feet depth. Although there is



a rock outcrop about 300 feet east of the proposed bridge location bedrock was not encountered in the deepest borehole which was taken to $88\frac{1}{2}$ feet.

2) Bearing piles of 10 inch tip diameter or equivalent driven to about El 1210 feet are recommended for support of the structure. The actual terminating level will vary from approximate El 1217 feet near Hole 1 to El 1205 feet near Cone 6. These should be designed as short columns with a working load of 25 tons. This loading is believed to be quite conservative.

3) Since the subsoil is granular no stability or settlement problems are expected with the 15 foot approach embankments provided all topsoil and organics are first removed.

4) The resistance to horizontal earth pressures and impact loads is indicated in the report.

PROJECT AND SITE DESCRIPTION

This bridge crossing over the east Sand River comprises a part of the construction of Highway 144 joining Benny and Timmins. The river channel at this site is to be diverted and widened to form a straight approach to the bridge. The proposed bridge is to be a three span structure consisting of

two 35 foot spans and a longer interior span of about 70 feet.

The land about the site undulates forming small hills causing the river to meander on its course downstream. At the time of our field investigation the depth of water was about 7 feet. Local inhabitants of the area indicate that the high water level during heavy spring runoff is at about El 1255 feet or about 4 feet above levels at the time of the field work. During this high water period the river overflows into a small channel on the south bank. The existing south bank then becomes a small island.

FIELD WORK AND SUBSOIL CONDITIONS

The field work consisted of 4 sampled wash borings and 7 associated dynamic cone penetration tests. The subsoil was found to consist of a very loose to compact fine to medium grained slightly silty sand. The sand became siltier with depth. Although one borehole was advanced to a depth of 88 $\frac{1}{2}$ feet bedrock was not encountered.

More detailed descriptions of the boreholes may be found on the attached Dwg. 1 to 7 inclusive. An interpreted subsoil stratigraphy is also shown on Dwg. 1.



FOUNDATIONS

As indicated in the preceding summary we recommend the use of timber piles to support the structure. Timber piles of 10 inch diameter tip driven to about El 1210 feet would have a conservative working load of 25 tons. Recommended piled foundation elevations where practical refusal is expected are shown on Table 1. Refusal should be taken as 8 blows per inch under a pile driving energy of 8700 ft/lbs. This estimate of capacity is based on the following computation:

$$Q = \frac{1}{F} A \gamma DN$$

where: Q is the working load in tons
A is the pile tip area in square feet
γ is the submerged unit weight of sand
= 65 pcf.
N is the appropriate bearing capacity factor estimated to be at least 130 for the compact to dense sand and silt around El 1210 feet
F is the required safety factor of 3

If the wood piles are not cut off and capped well below the permanent groundwater table level, (El 1251 feet) that part of the pile extending above this level should be appropriately treated or preserved. Some means of protecting the wood piles

against abrasion for a depth of about 4 feet below the proposed river channel bottom, i.e. to El 1244 feet, should be provided.

APPROACH EMBANKMENTS

In connection with the construction of approach embankments no problems associated with stability or settlement are expected. All topsoil and organic-stained sand should be removed where the fill is less than 4 feet thick before construction of the approaches. Rip-rap protection from ice and water action should be provided to the highest anticipated flood level.

EARTH PRESSURES

Closed abutments and wing walls must be designed to withstand the lateral earth pressure exerted by the retained soil. The lateral earth pressure, p , at any depth, h , below the surface can be estimated using the following expression:

$$p = 0.25 (\gamma h + q)$$

| | | |
|--------|----------|--|
| where: | 0.25 | is the appropriate earth pressure factor considered to be applicable for granular fill and slightly yielding walls |
| | γ | is the unit weight of the backfill |
| | = | 125 pcf above the water table and |
| | = | 65 pcf below the water table |
| | q | is an allowance for surcharge from traffic |



Horizontal forces on the structure can be taken by battered piles driven to about elevation 1210 feet and designed for a conservative working load of 25 tons.

We trust that the information contained in this brief report will enable you to proceed with the design of this project. If you should require further explanation or amplification of our comments please do not hesitate to contact this office.

Yours very truly,

OAJ/gh
Encls.

Dist: - Department of Highways (11)

O.A. Johnston, B.Sc.

William A. Trow, P.Eng.



TABLE I
ESTIMATED LEVELS AT WHICH PILES WILL
REACH PRACTICAL REFUSAL

| BOREHOLE | RECOMMENDED LEVEL OF PILED FOUNDATION |
|----------|---------------------------------------|
| 1 | 1217 feet |
| 2 | 1210 feet |
| 3 | 1209 feet |
| 4 | 1208 feet |
| 5 | 1209 feet |
| 6 | 1204 feet |
| 7 | 1217 feet |

LEGEND

BOREHOLE NO. 1
PROJECT Proposed Bridge Site
LOCATION East Sand River
HOLE LOCATION 12' Lt of Sta. 486 + 09
HOLE ELEVATION 1256.2 feet
DATUM D.H.O.

PENETRATION RESISTANCE

2" O.D. SPLIT TUBE —○—○—○—
2" I.D. SHELBY TUBE —x—x—x—x—
2" DIA. CONE ————

SHEAR STRENGTH

UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE ⊕
UNCONFINED COMPRESSION ⊗
VANE TEST AND SENSITIVITY (S) +

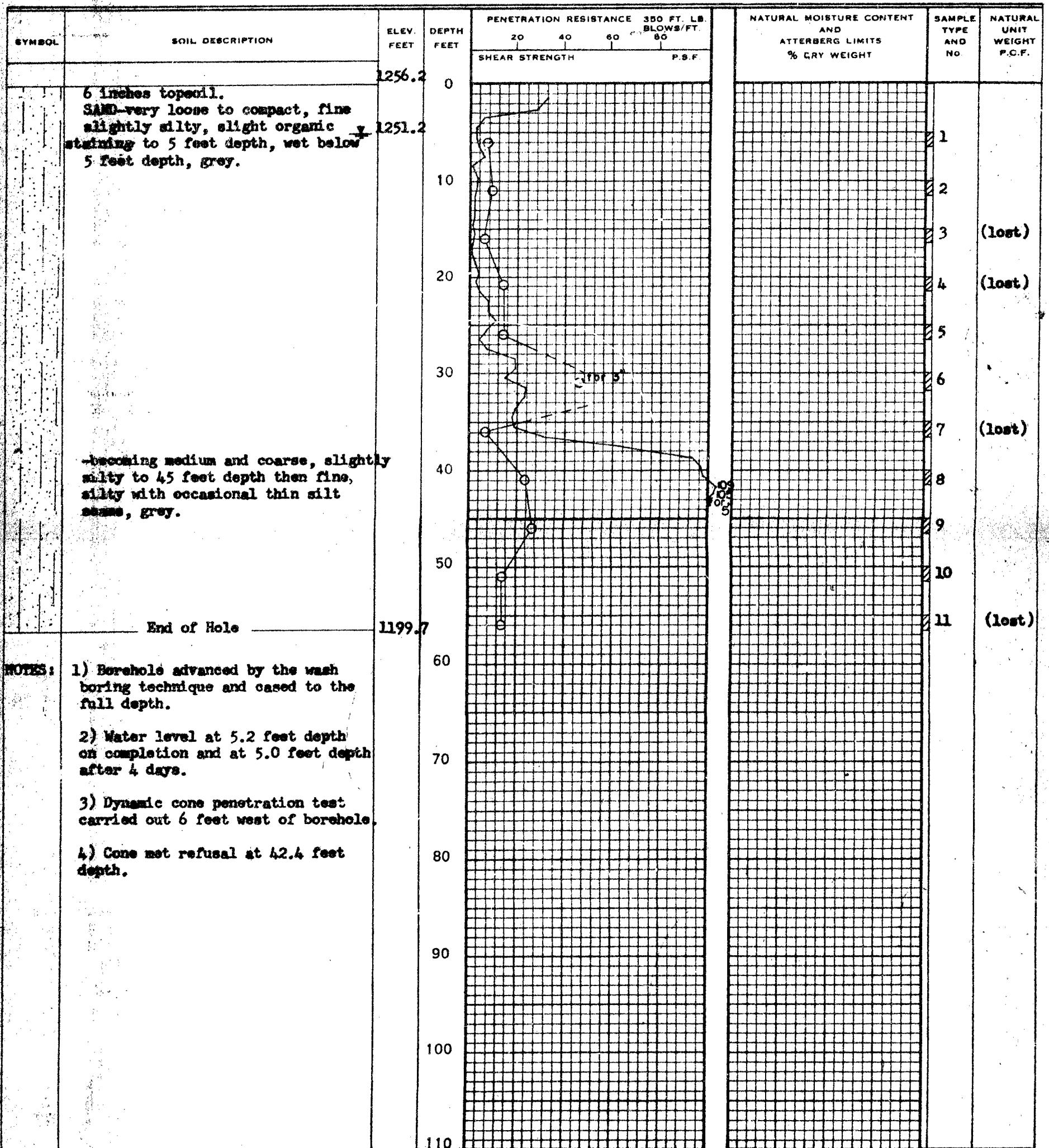
NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX X^{LI}

ATTERBERG LIMITS


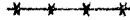

LIQUID LIMIT —○—
PLASTIC LIMIT ———

SAMPLE TYPE




2" O.D. SPLIT TUBE —■—
2" I.D. SHELBY TUBE —■—
3" O.D. SHELBY TUBE —■—



PENETRATION RESISTANCE

2" O.D. SPLIT TUBE 
 2" I.D. SHELBY TUBE 
 2" DIA. CONE 

SHEAR STRENGTH




UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE 
 UNCONFINED COMPRESSION 
 VANE TEST AND SENSITIVITY (S) 

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX 

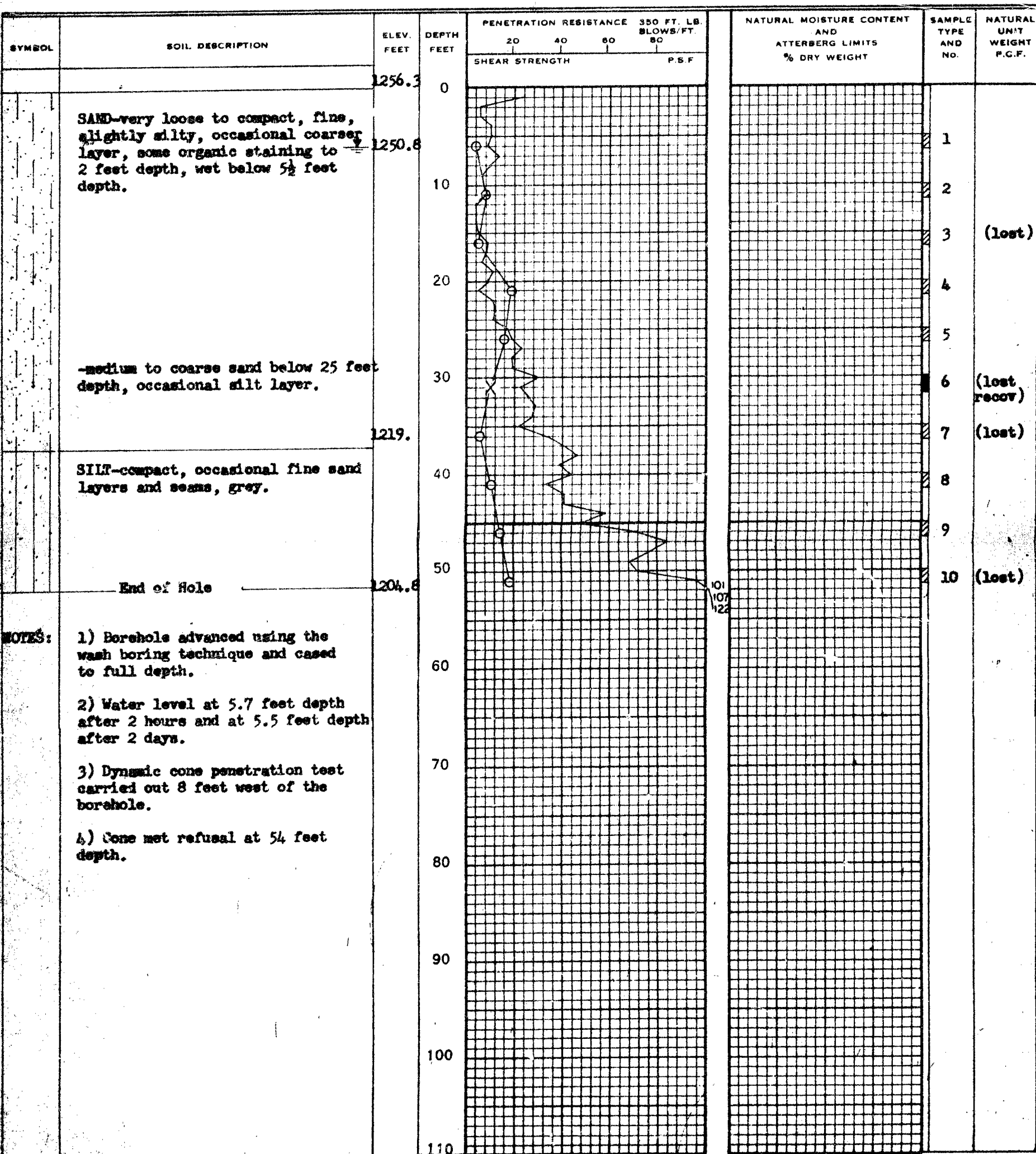
ATTERBERG LIMITS

LIQUID LIMIT 
 PLASTIC LIMIT 

SAMPLE TYPE

2" O.D. SPLIT TUBE 
 2" I.D. SHELBY TUBE 
 3" O.D. SHELBY TUBE 




BORHOLE NO. 2
 PROJECT Proposed Bridge Site
 LOCATION East Sand River
 HOLE LOCATION 17th Rt of Sta. 485 + 77
 HOLE ELEVATION 1256.3 feet
 DATUM _____



LEGEND

BOREHOLE NO. 3
PROJECT Proposed Bridge Site
LOCATION East Sand River
HOLE LOCATION 17th Lt of Sta. 485 + 05
HOLE ELEVATION 1253.9 feet
DATUM D.H.O

PENETRATION RESISTANCE

2" O.D. SPLIT TUBE 
2" I.D. SHELBY TUBE 
2" DIA. CONE 


SHEAR STRENGTH

UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE 
UNCONFINED COMPRESSION 
VANE TEST AND SENSITIVITY (S) 




NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

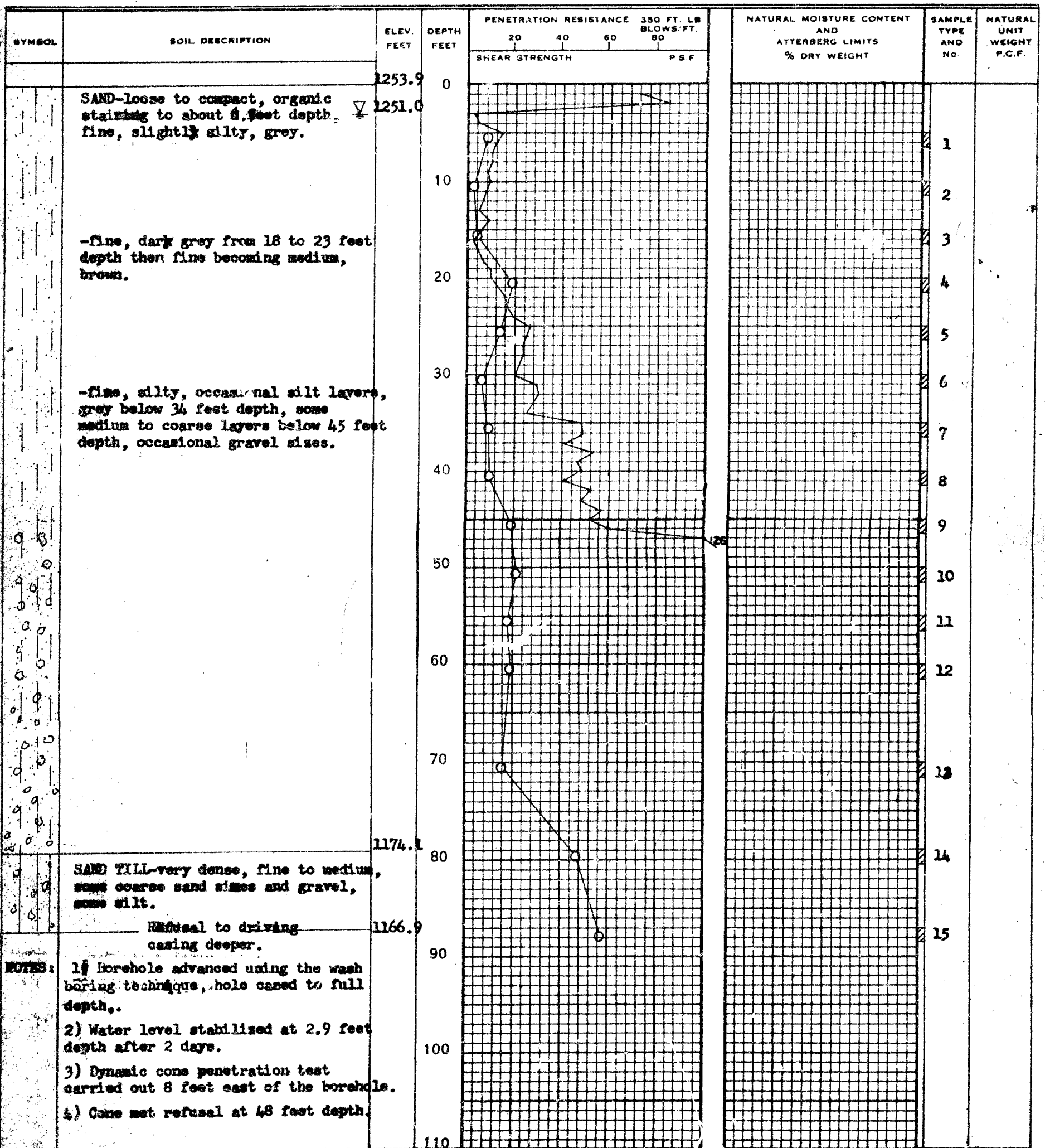
LI
X

ATTERBERG LIMITS

LIQUID LIMIT 
PLASTIC LIMIT 

SAMPLE TYPE


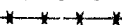




2" O.D. SPLIT TUBE 
2" I.D. SHELBY TUBE 
3" O.D. SHELBY TUBE 



LEGEND

BOREHOLE NO. 4
PROJECT Proposed Bridge Site
LOCATION East Sand River
HOLE LOCATION 17th Rt of Sta. 484 + 65
HOLE ELEVATION 1252.2 feet
DATUM D.H.O

PENETRATION RESISTANCE

2" O.D. SPLIT TUBE 
2" I.D. SHELBY TUBE 
2" DIA. CONE 
SHEAR STRENGTH
UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE 
UNCONFINED COMPRESSION 
VANE TEST AND SENSITIVITY (S_u) 

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX

LI
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ATTERBERG LIMITS




LIQUID LIMIT

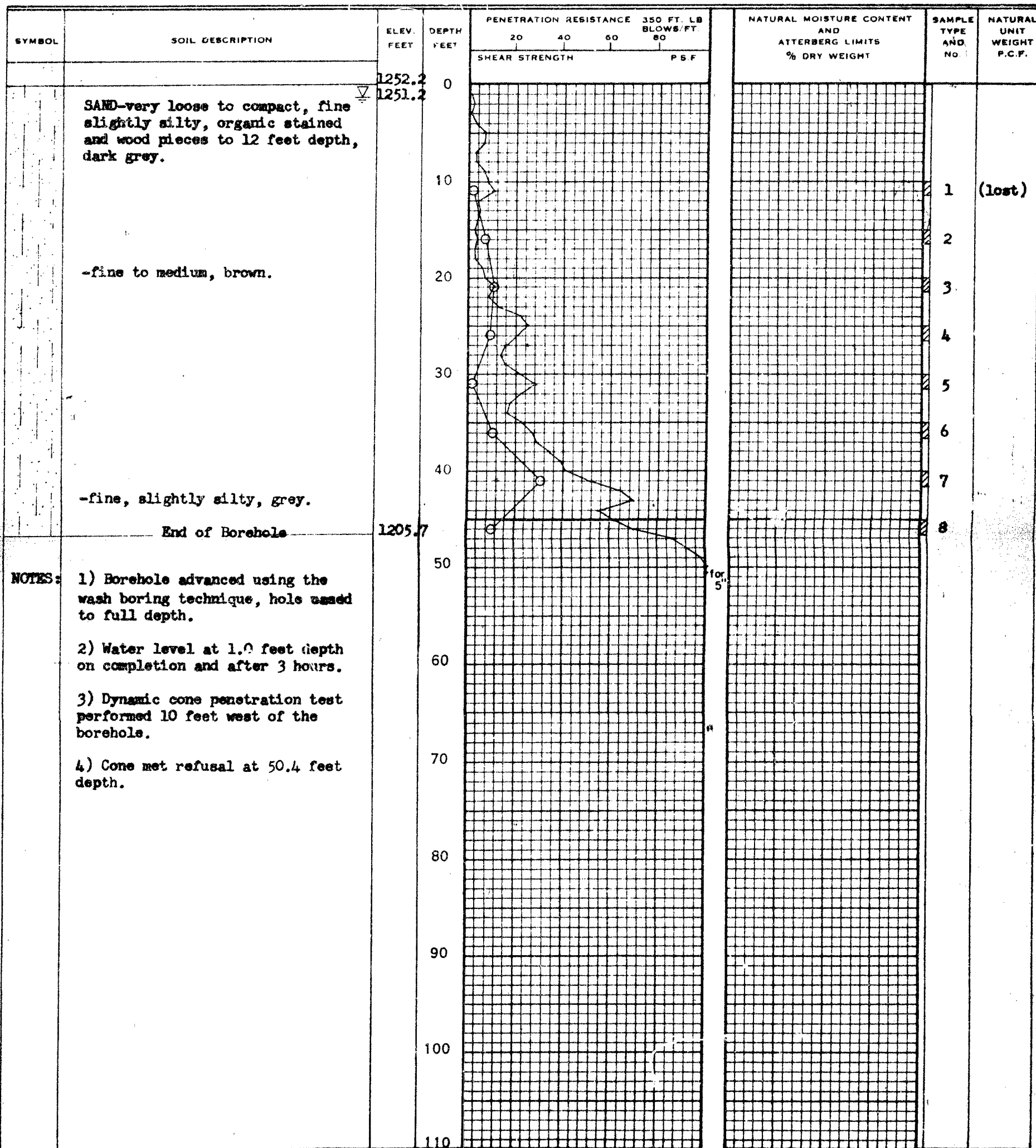
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PLASTIC LIMIT

—|

SAMPLE TYPE

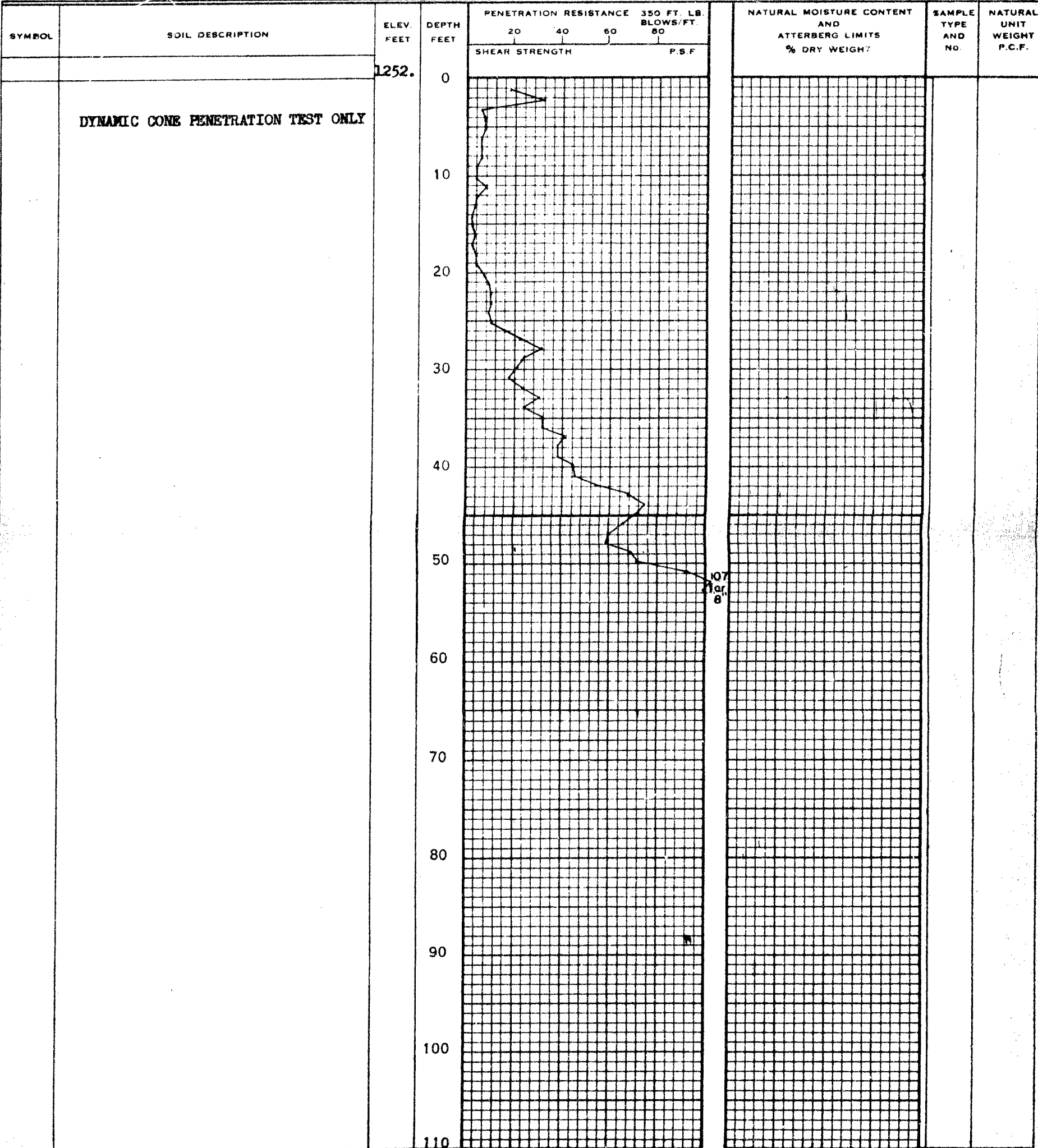
2" O.D. SPLIT TUBE 
2" I.D. SHELBY TUBE 
3" O.D. SHELBY TUBE 



BOREHOLE No. 5
PROJECT Proposed Bridge Site
LOCATION East Sand River
HOLE LOCATION 17th Lt of Sta. 484 + 65
HOLE ELEVATION 1252 feet
DATUM Ground level at cone location approx.
same as at Hole 4.

PENETRATION RESISTANCE
2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
2" DIA. CONE
SHEAR STRENGTH
UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE
UNCONFINED COMPRESSION
VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX
ATTERBERG LIMITS
LIQUID LIMIT
PLASTIC LIMIT
SAMPLE TYPE
2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
3" O.D. SHELBY TUBE

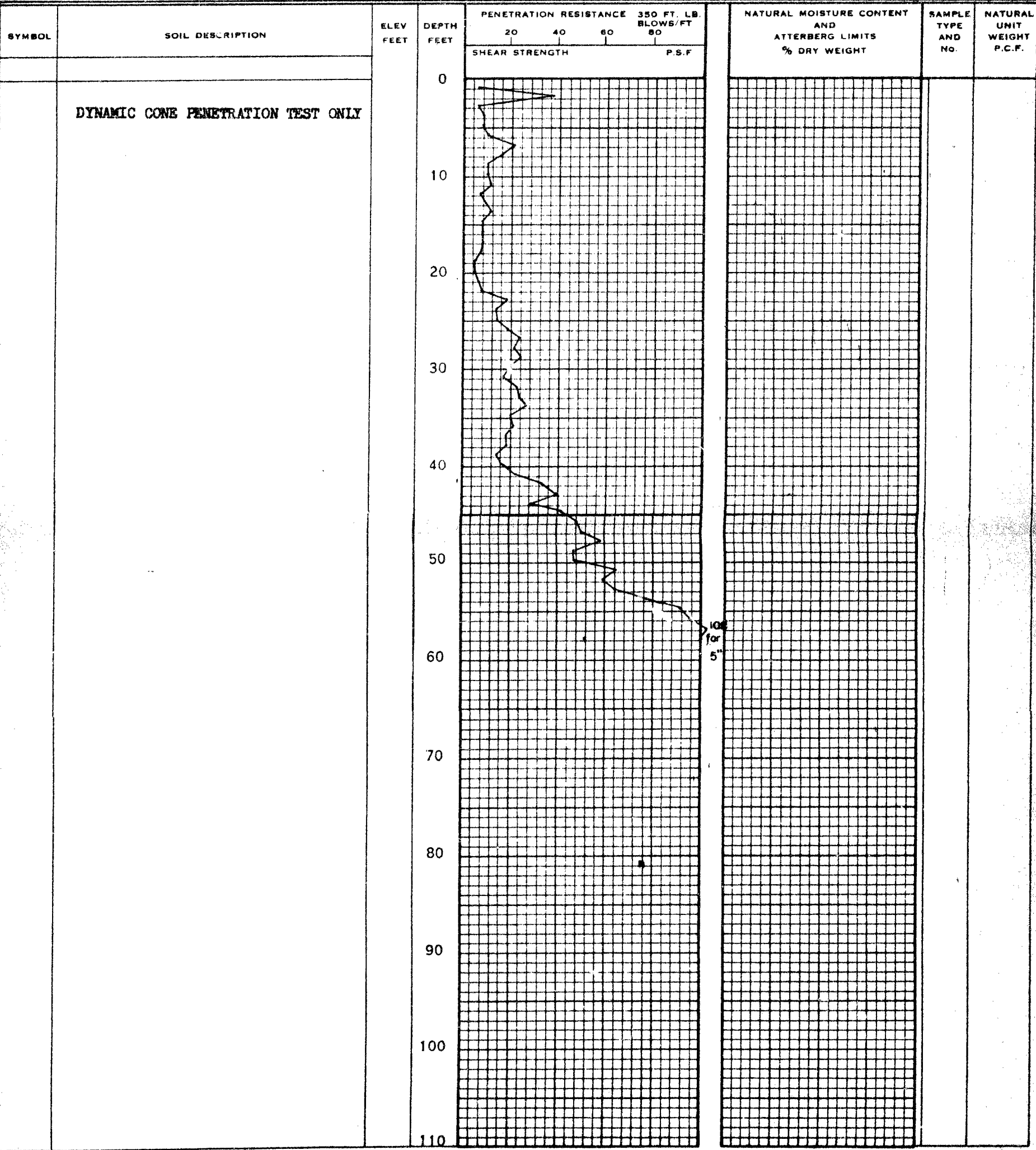


LEGEND

BOREHOLE NO. 6
PROJECT Proposed Bridge Site
LOCATION East Sand River
HOLE LOCATION 17' right of Sta. 485 + 05
HOLE ELEVATION 1253 feet.
DATUM Ground level at cone location approx.
same as at Hole 3

PENETRATION RESISTANCE
2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
2" DIA. CONE
SHEAR STRENGTH
UNDRAINED TRIAXIAL
AT OVERBURDEN PRESSURE
UNCONFINED COMPRESSION
VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE CONTENT
AND LIQUIDITY INDEX
ATTERBERG LIMITS
LIQUID LIMIT
PLASTIC LIMIT
SAMPLE TYPE
2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
3" O.D. SHELBY TUBE



WILLIAM TROW ASSOCIATES LTD.

SITE INVESTIGATIONS SOIL MECHANICS CONSULTATION

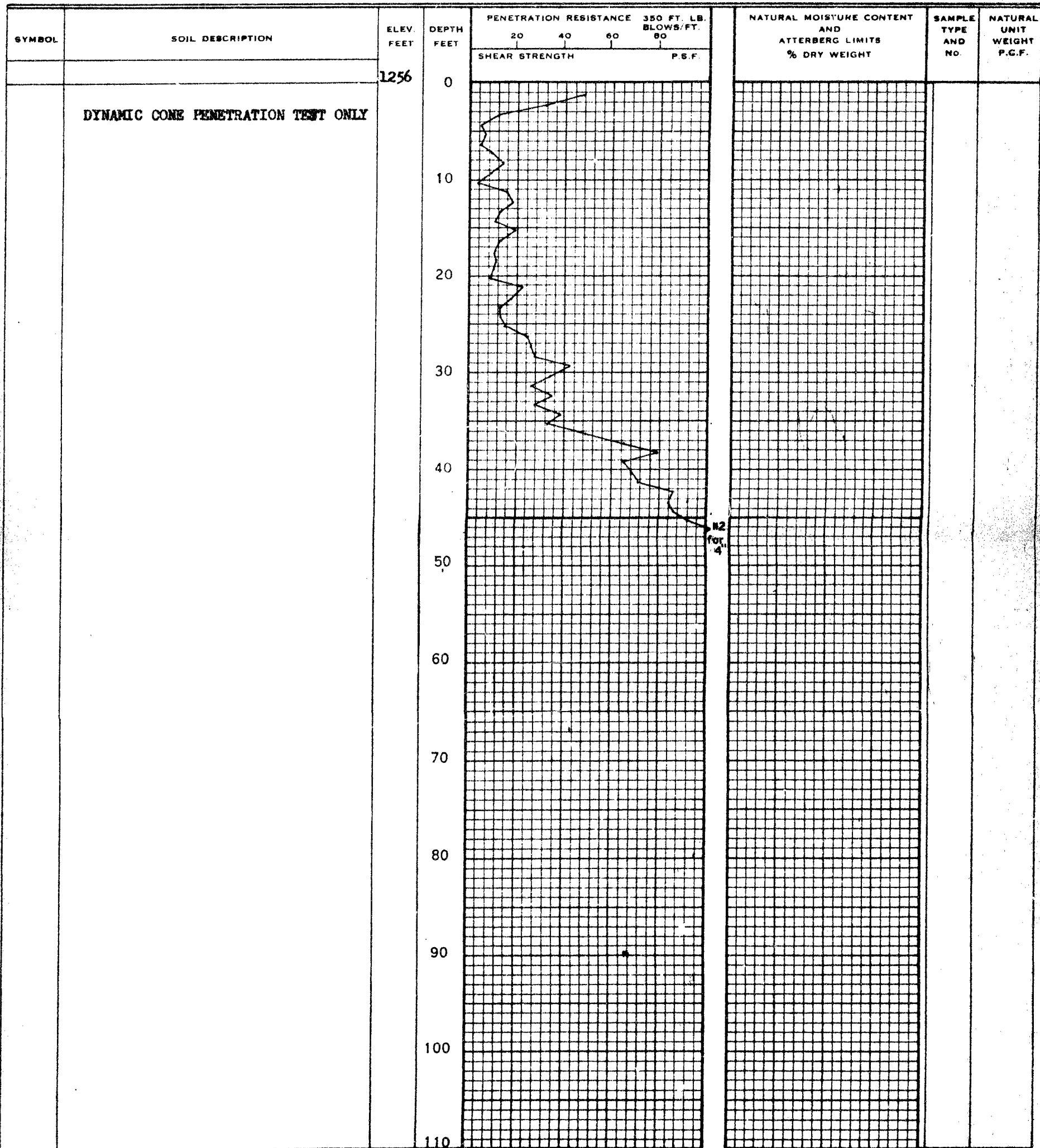
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PROJECT No. J3414

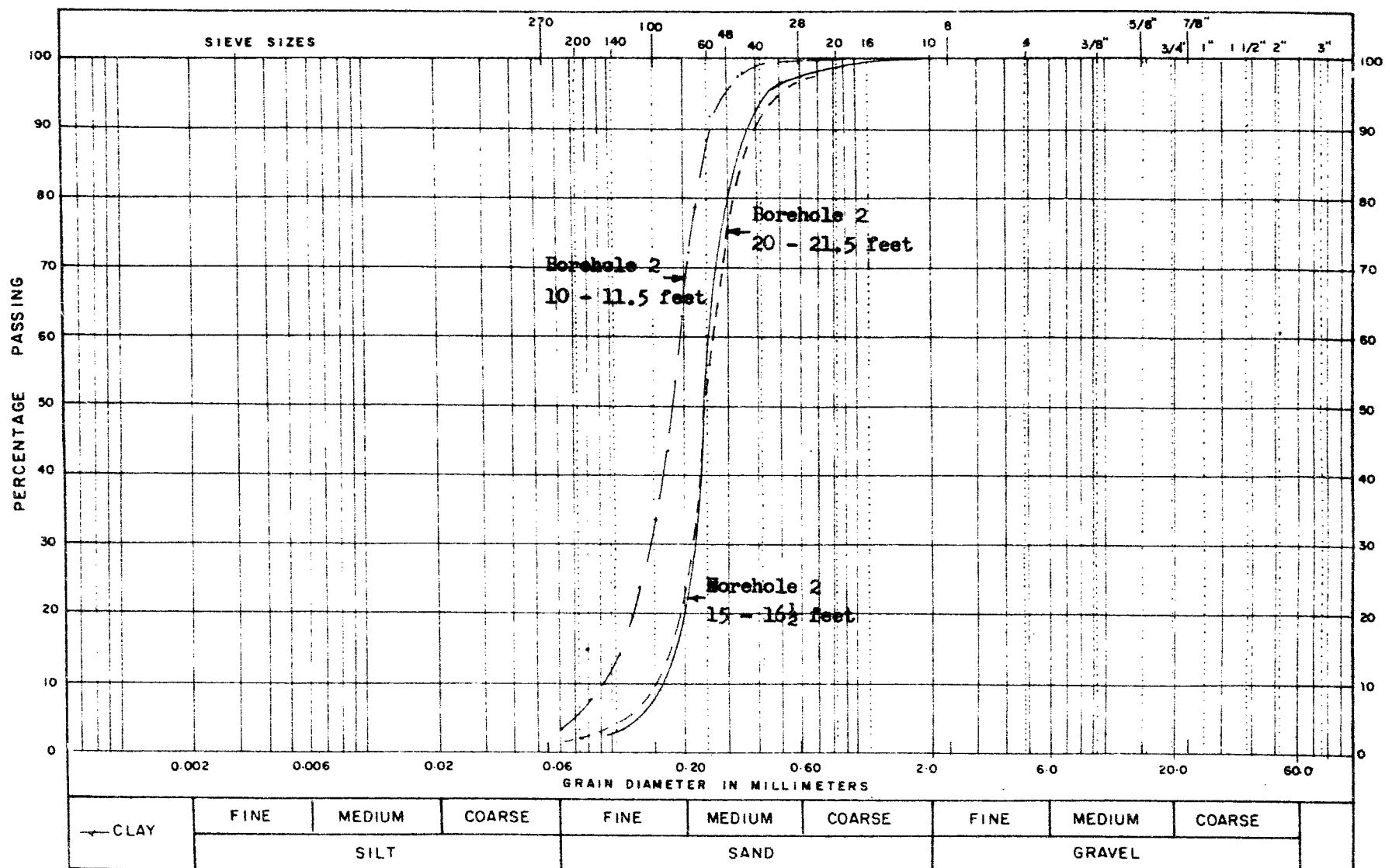
BOREHOLE No. 7
PROJECT Proposed Bridge Site
LOCATION East Sand River
HOLE LOCATION 17' left of Sta. 485 + 77
HOLE ELEVATION 1256 feet
DATUM Ground level at cone location approx.
same as at Hole 2

PENETRATION RESISTANCE
2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
2" DIA. CONE
SHEAR STRENGTH
UNDRAINED TRIAXIAL AT OVERBURDEN PRESSURE
UNCONFINED COMPRESSION
VANE TEST AND SENSITIVITY (S)

NATURAL MOISTURE CONTENT AND LIQUIDITY INDEX
ATTERBERG LIMITS
LIQUID LIMIT
PLASTIC LIMIT
SAMPLE TYPE
2" O.D. SPLIT TUBE
2" I.D. SHELBY TUBE
3" O.D. SHELBY TUBE



MECHANICAL ANALYSIS

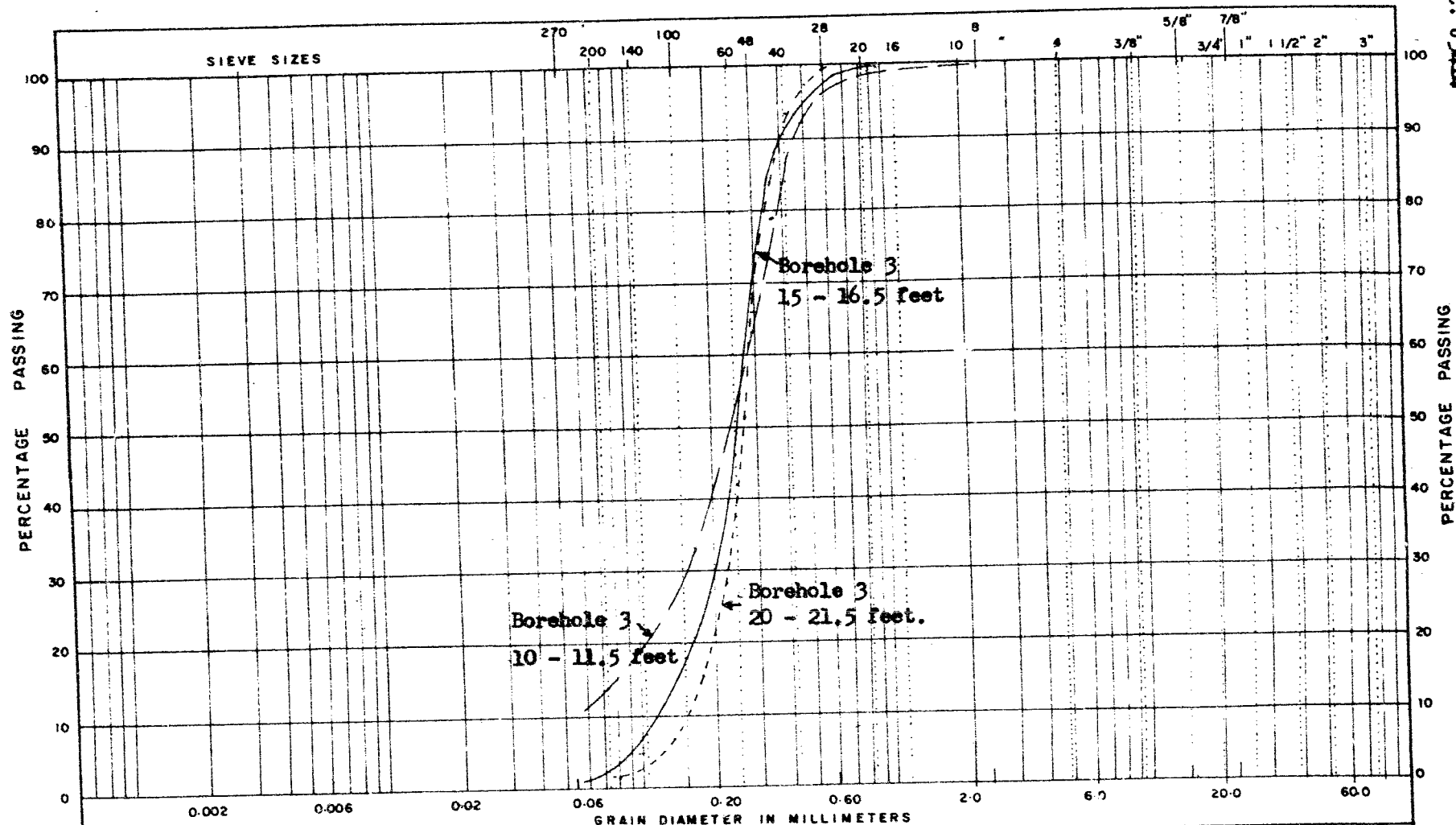


MODIFIED M.I.T. CLASSIFICATION

GRADING CURVES, PROPOSED EAST SAND RIVER CROSSING

WILLIAM TROW  ASSOCIATES LTD.

MECHANICAL ANALYSIS



MODIFIED M.I.T. CLASSIFICATION

GRADING CURVES, PROPOSED EAST SAND RIVER CROSSING

WILLIAM TROW  ASSOCIATES LTD.

Copy for the information of

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

Mr. J.B. Curtis,
Reg. Bridge Location Engineer,
North Bay Regional Office,
North Bay, Ontario

Bridge Division,
Downsview, Ontario

June 21, 1967

Eastsand River Bridge
W.P. 266-64, Site No. 46-243
Highway 144, District No. 14

Attached herewith are prints of the Preliminary Bridge
Plan Drawing D-6180-P1 for the above-mentioned structure.

The estimated cost of the proposed structure is \$66,000.
This cost includes tender, materials, engineering and sundry
construction.

Any comments or revisions you may have should be submitted
within three weeks.

CSG:rd

G.S. Grebski,
Bridge Design Engineer

Attach.

c.c. S. McGhie
A. Stermac
R. Forrest
E. Cross

7 Nov '67

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

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

June 28, 1967

-- Eastsand River Bridge --
W.P. 266-64 -- Site No. 46-243
Hwy. #144, District No. 14

Tasw/67

We have reviewed the Preliminary Bridge Plan
Dwg. D-6180-P1 and, in general, we have no comments.

We draw to your attention a slight error in
designating the slopes of the embankment sides. These are
shown as 1:2; we believe that these should read 2:1.

MD/MdeF

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

cc: Messrs. S. McCombie
J. B. Curtis
Foundations Files ✓
Gen. Files

Mr. D. E. Davis,
Bridge Engineer,
Bridge Division.

Foundation Section,
Materials & Testing Div.,
Room 197, Lab. Bldg.

Attention: Mr. E. McConis

February 16, 1967

FEB 16 1967

FOUNDATION INVESTIGATION REPORT FOR D.E.O.
By: William Trow Associates Limited --
Proposed Bridge Site, East Main River,
Proposed Ring's Highway 100, Line 'A',
A.P. 266-64 -- District #14 (New Windsor).

Attached, please find the report for the above mentioned site, prepared and submitted by the consultant, William A. Trow Associates Ltd.

We have reviewed the report and are in agreement with the consultant's findings and recommendations. However, we would suggest that timber piles be used, their allowable bearing capacity be limited to 20 tons, and that the driving be controlled in the field by the use of the Hilley formula.

Some problems with the groundwater may be encountered when excavations for piers are carried out. It is suggested that the groundwater be controlled by pumping from trenches dug around and deeper than the footing excavation.

Should you wish to discuss any aspects of the foundation recommendations now, or at the time of the preliminary bridge design, please feel free to contact this Office.

AGS/ade

attach.

cc: Messrs. E. E. Davis (2)

E. A. Ferguson

D. W. Farrow

H. H. H. H.

A. A. Osborne-white

J. B. Curtis

A. A. Saint

E. A. Singh

Foundations Files

Gen. Files

A. G. Stern

A. G. Stern

PRINCIPAL FOUNDATION ENGINEER

Bay. 401 & Leslie St.,
Scarborough, Ontario.

January 4, 1967

Materials and Testing Division

William A. Trow Associates Ltd.,
90 Milver Drive,
Weston, Ontario.

Attention: Mr. W. A. Trow

Re: Letter of Authority -- Foundation Investigations

- (1) Leslie E. Dr., Bay. 144, District #14;
W.P. 262-64, Bridge Site 44-244.
- ✓ (2) Eastmond E. Dr., Bay. 144, District #14;
W.P. 264-64, Bridge Site 44-244.

Dear Sir:

Please consider this your authority to carry out the necessary foundation investigations at the two above mentioned sites.

The plans and all other pertinent information regarding access to the sites and possible accommodation, were given to you on Wednesday, January 4, 1967.

There is a certain urgency regarding these jobs, and you are therefore requested to start the field work as soon as possible. Because of the weather conditions and other difficulties that might be encountered, it is impractical to specify a completion date. However, we would appreciate receiving your reports at the earliest possible time. Eleven (11) copies of each report will be required for our distribution.

You are also requested to advise Messrs. L. A. Saint, Regional Materials Engineer, 1301 Hammond Street, North Bay, Telephone No. 472-5760 (Area Code 705), and J. B. Curtis, Regional Bridge Location Engineer, 269 Main Street West (Libbitt Building), North Bay, Telephone No. 472-7300 (Area Code 705), of the date of commencement of field work, and maintain a liaison with them while in the area.

cont'd. /2 ...

William A. Trow Associates Ltd.
Attn: Mr. Wm. A. Trow

January 4, 1967

The field work should, at all times, be supervised by a qualified Soils Engineer. Any deviation from this agreement has to meet our prior approval.

Previous requirements as to preliminary borehole information and laboratory testing program, should be followed.

Since the drawings accompanying the foundation reports, showing the location of borings, the inferred subsoil conditions, etc., are to become contract drawings, you are required to prepare them in accordance with the A.S.C. Standards. To enable you to do this, we are supplying you with a sample drawing with all the necessary explanations, together with linen sheets for your drawings. You are also requested to provide us with Greenfield copies of the drawings.

Charges for the work performed will be in accordance with your Schedule of Rates, dated January 1, 1966, and invoices to be addressed to the attention of the undersigned.

We are attaching the following Purchase Orders:

K-08818 -- S.P. 267-64, Kollie R. Br., Bridge Site 46-244;

K-08819 -- S.P. 266-64, Kestond R. Br., " " 46-243,

covering the purchase of any new material required for this work, in order that you may use these as a basis for exemption from the Federal Tax for such purchases. The Exemption Certificate is printed thereon.

AGS/MGP
Attach.

Yours very truly,

A. Rutka

A. Rutka

MATERIALS & TESTING ENGINEER

cc: Messrs. G. McConbie
H. McArthur
D. A. Osborne-White
J. B. Curtis
E. R. Saint
H. Konings
Mrs. I. Steinberg
R. Gyzanski (2)
A. Crowley
Foundations Office
Gen. Files (2)