

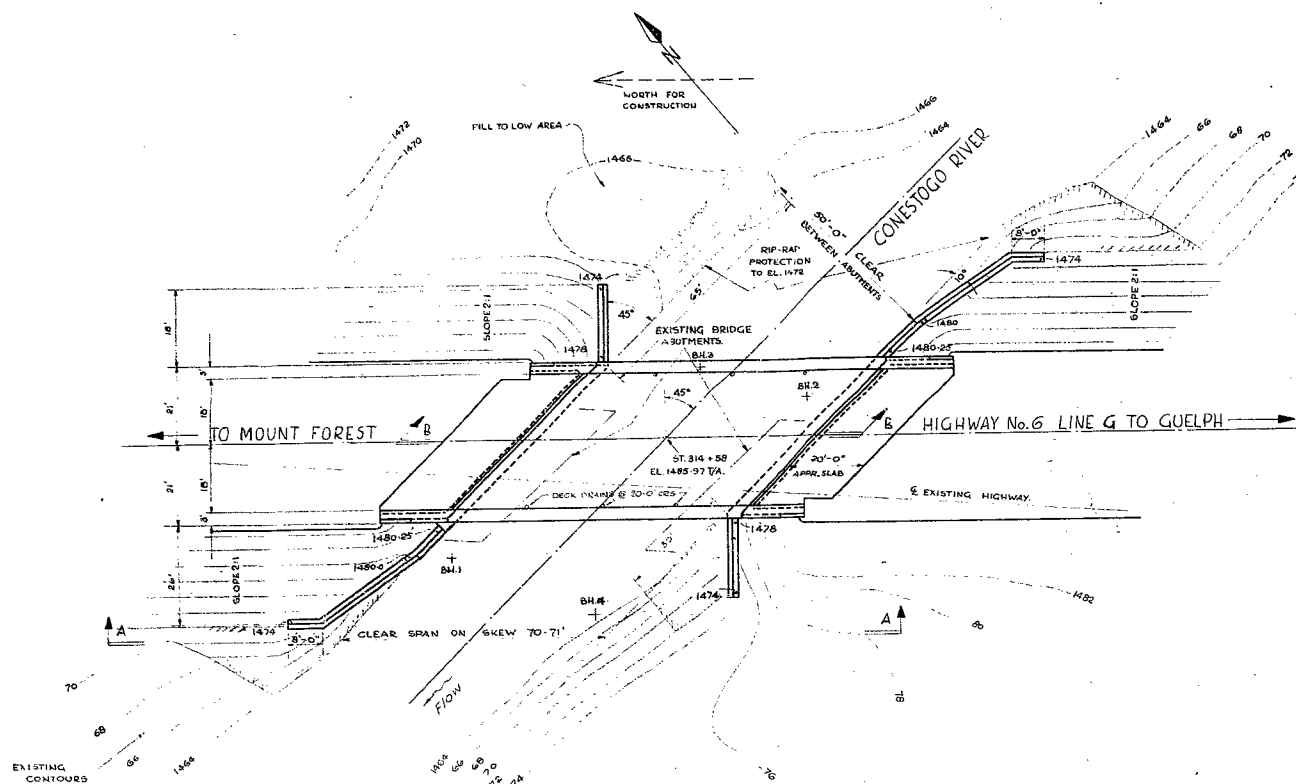
59-F-211C

W.P. #152-59

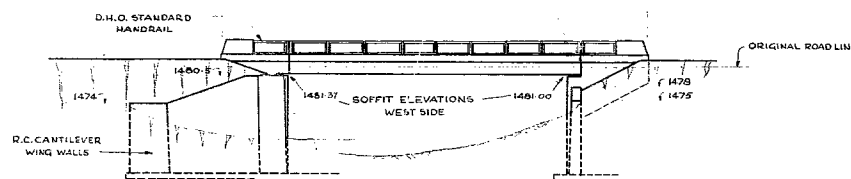
Hwy #6

CONESTOGA R.

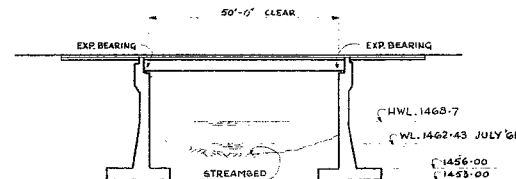
V. OF ARTHUR



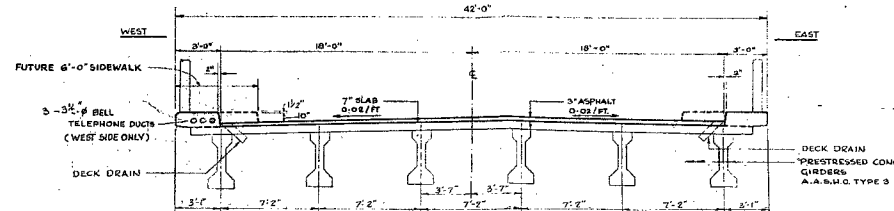
PLAN
SCALE 1"=20'-0"



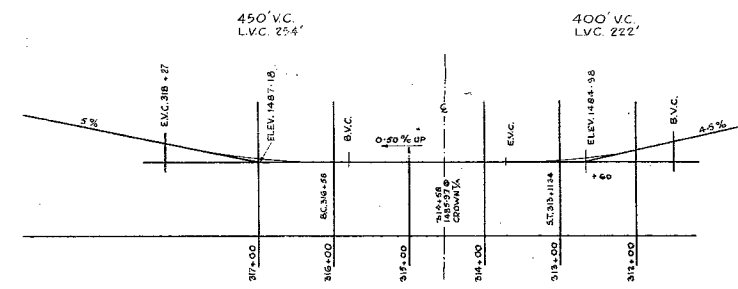
ELEVATION A-A
SCALE 1"=20'-0"



SECTION B-B
SCALE 1"=20'-0"

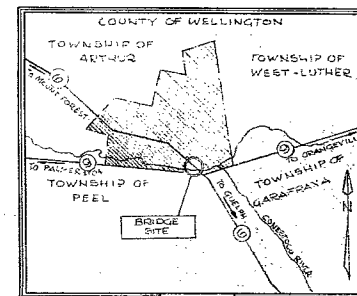


TYPICAL DECK SECTION
SCALE 3/4"=1'-0"



FINISHED PAVEMENT PROFILE
HWY. 6 LINE G
SCALE 1"=10'-0" VERT.
1"=100'-0" HORIZ.

NOTE: Profile grade is 0.38 below finished grade.



KEY PLAN
Scale 1"=1.00 mile

GENERAL NOTES

NOTE TO DISTRICT ENGINEERS
Concrete work on the structure must not be commenced until monuments to fix control points have been erected and checked by the District Engineer.

NOTE TO CONTRACTOR
Structure to be built in accordance with the latest Form No. 9 and the Special Provisions, extra copies of which may be obtained from the District Engineer.

CONCRETE DETAILS
Concrete to Footings, Abutments & Wing Walls, Deck Slab, Diaphragms, Sidewalks & Curbs to have a minimum compressive strength of 3000 p.s.i. at 28 days. Concrete to Prestressed Beams to have a minimum compressive strength of 4000 p.s.i. at 28 days and a minimum compressive strength of 4000 p.s.i. at transfer of prestress. Approved admixtures supplied by the Contractor will be added to all concrete as specified by the Engineer. Maximum aggregate size in footings and abutments below beam seating 1 1/2" in all other work 3/4".

REINFORCING STEEL
Clear cover in Footings and Abutments to be 2" except where noted otherwise.
Clear cover in Deck Slab, Diaphragms, Sidewalks & Curbs to be 1".
Clear cover in Prestressed Beams to be 1".

CONSTRUCTION NOTES
All exposed edges to be chamfered 1/2" except as noted.
All Construction Joints must be approved by the Bridge Engineer.
No concrete shall be placed above bridge seat elevations until concrete in deck slabs has been placed.
The General Contractor shall be responsible for finishing the bridge seat dead level to the specified elevations with a tolerance of plus or minus 1/8". If they are cast too high, they shall be bush hammered down by the General Contractor. If they are cast too low, the General Contractor shall provide full bearing shims to bring them up to the correct elevations. The use of grout is prohibited.
The General Contractor shall be responsible for ensuring that the final deck elevations conform to the elevations shown.

Drawing reviewed; footings in compliance with foundation report recommendations. No comments after March 13, 1962.

W.P. 152-59

GIBB, UNDERWOOD & McLELLAN CONSULTING ENGINEERS		C.U.M. DWG. No. 108-1	
DEPARTMENT OF HIGHWAYS, ONTARIO BRIDGE OFFICE - TORONTO			
CONESTOGO RIVER BRIDGE AT ARTHUR			
THE KING'S HIGHWAY No. 6		DIST. No. 5	
CO. WELLINGTON		LOT	
TWP. ARTHUR		CON.	
APPROVED			
BRIDGE ENGINEER		DESIGN ENGINEER	
DATE MARCH 1962		H 20-S16	
DRAWING NUMBER		DRAWING NUMBER	
D 4459 A		D 4459 A	

REVISIONS	DATE	BY	DESCRIPTION

Conestogo

TE 173

PRELIMINARY STRUCTURE SITE REPORT

HWY. #6 W.P. 152-59 STATION _____ DISTRICT #3

PLAN NO. _____ PROFILE NO. _____ SITE PLAN NO. _____

Purpose of Structure: River Crossing ☒ R.R.X ☐
Grade Separation ☐ Other _____

Is Structure located on D.H.O. right-of-way? _____ If not, who owns property and was permission obtained to carry out necessary exploration work _____

Conestogo River Bridge in Arthur.

Describe Soil Conditions at Site. This is to be determined chiefly from a visual observation and possibly a limited amount of hand exploration and should include the general geological formation, anticipated soil conditions, bedrock if visible, etc.

Steel Bridge - abutments recently repaired angle skew ~ 25° abutments in poor shape river cut into during spring large boulders (3 feet) to protect from erosion probable till or gravel & spread footings. Telephone & hydro.

Is Structure Site readily accessible with Core Drill or Power Auger?

Core drill can get down to bottom of 20' fill at low water otherwise no rock fill - no stability prob. or align

Would preliminary borings by Power Auger be advantageous?

No

Is water available at the site? Yes If not, where is closest source?

Should Approach Fills be investigated for stability?

probably not.

REMARKS: Bridge 300 yds downstream useful for diversion possible revision to avoid downstream Arthur opening est approx 50 feet.

DATE July 23/53

ENGINEER AP



ONTARIO

DEPARTMENT OF HIGHWAYS

Bridge Division.

Memo to	Mr. A. G. Stermac, Principal Foundation Eng., Room 107, Lab. Bldg.	Date	April 9, 1962.
From	F. DeVisser	Subject	W.P. 152-59 Conestoga River Br. at Arthur - Hwy. #6 District #5

Attached you will find one print of Preliminary Plan D4459 - A for the subject structure. If you have any comments, would you please let us know.

FDeV/ea

F. DeVisser,
Bridge Location Engineer.

Mr. A. M. Toye,
Bridge Engineer.
Materials & Research Section.

September 8, 1959.

Re: Conestoga River Bridge,
Arthur, Ont.
Hwy. #6 - Dist. #3 - W.P. 152-59.

Attention: Mr. S. McCombie.

The foundation report prepared by Hacey MacCallum and Associates in connection with the above site, and accompanying this memo, has been reviewed by the Foundation Section. Our review of this report has led to the following conclusions:-

1. Spread footings should be used to support the proposed structure. These footings may be founded at approx. elevation $1454 \pm$ depending on the depth of cover required for scour protection. An allowable bearing pressure of $\frac{4 \text{ tons}}{\text{sq. ft.}}$ should be used. This value of bearing capacity is lower than that stated by the Consultants, since building codes, and disturbance during construction has been considered. If a higher value of bearing capacity is desired, the Foundation Section should be contacted.
2. Steel sheet piles used to keep water out of foundation excavations, if used, should be driven a minimum of 5 feet below the foundation level. Difficulty in driving the sheet piles through the dense sandy till is to be expected. No "piping" at the bottom of excavations to elev. 1454 will occur.
3. The "free ground water" referred to by the Consultant on Page 3, Conclusion (2), is water under artesian head. The actual ground water level is not indicated but may be assumed at river level - elevation 1461 .

If any questions arise from your review of this report, please contact the Foundation Section.

KP/MSF
Encl.

cc. Messrs. A. M. Toye
H. A. Flegasker
D. C. Hamway
A. Gater

L. G. Coderman,
PRINCIPAL SOILS & FOUNDATIONS ENGR.
per:

(K. Leaker,
FOUNDATION FIELD SUPERVISING ENGR.)

L. D. Barrett
J. Roy
Foundation Section.
Gen. Files.

FIELD COMPACTION REPORT

MEMO TO: Mr. H. GILBERT DIST. 5 ATTENTION: Mr. A. D. McADIFFE DATE June 22/64
 HWY NO. 639 RE: CONTRACT 63-135 LOCATION ARTHUR.

FIELD TESTS AND OBSERVATIONS MADE TODAY SHOW AS FOLLOWS

FIELD NO.	STATION	DISTANCE FROM CENTRE LINE	DEPTH BELOW PROFILE GRADE	FIELD WET DENSITY (lb./cu.ft.)	FIELD MOISTURE CONTENT	FIELD DRY DENSITY (lb./cu.ft.)	% COMPACTION	LOCATION OF TEST			PROG.	FINAL
								STRUCT. BACKFILL	CULVERT BACKFILL	GRADE		
<u>64-04</u> <u>2004</u>	<u>315+50</u>	<u>12 LT</u>	<u>0</u>	<u>153.0</u>	<u>3%</u>	<u>146.4</u>	<u>100%+</u>			✓		✓
	<u>317+00</u>	<u>10 R.</u>	<u>0</u>	<u>154.7</u>	<u>3%</u>	<u>150.1</u>	<u>100%+</u>			✓		✓
	<u>307+00</u>	<u>10 LT</u>	<u>0</u>	<u>165.0</u>	<u>5%</u>	<u>156.7</u>	<u>100%+</u>			✓		✓
	<u>303+00</u>	<u>13 RT</u>	<u>0</u>	<u>163.4</u>	<u>5%</u>	<u>155.2</u>	<u>100%+</u>			✓		✓
	<u>309+00</u>	<u>4</u>	<u>0</u>	<u>161.0</u>	<u>5%</u>	<u>152.9</u>	<u>100%+</u>			✓		✓
	<u>366+00</u>	<u>10 RT</u>	<u>0</u>	<u>164.5</u>	<u>5%</u>	<u>156.3</u>	<u>100%+</u>			✓		✓
	<u>312+00</u>	<u>2 RT</u>	<u>0</u>	<u>156.3</u>	<u>5%</u>	<u>148.5</u>	<u>100%+</u>			✓		✓
	<u>364+00</u>	<u>5 LT</u>	<u>0</u>	<u>155.8</u>	<u>5%</u>	<u>148.0</u>	<u>100%+</u>			✓		✓
	<u>311+00</u>	<u>12 LT</u>	<u>0</u>	<u>150.3</u>	<u>3%</u>	<u>145.8</u>	<u>100%</u>			✓		✓
	<u>365+00</u>	<u>11 LT</u>	<u>0</u>	<u>153.5</u>	<u>3%</u>	<u>149.0</u>	<u>100%+</u>			✓		✓

(a) TYPE OF MATERIAL GRAN. "A" SOURCE KIDNIE PIT

(b) COMPACTION REQUIREMENT ON THIS CONTRACT 100 %

(c) LABORATORY DATA: OPTIMUM MOISTURE 5.6 %

MAXIMUM DRY DENSITY 146.8

MAXIMUM WET DENSITY 155.0

(d) APPROXIMATE RATE OF HAUL 200 ^{TONS} ~~tons~~ per hour compacted

(e) CONDITION OF MATERIAL: AT OR NEAR OPTIMUM ☒, BELOW ☒, ABOVE ☐

(f) COMPACTION UNITS USED: SHEEPSFOOT WOBBLEWHEEL OTHERS

LARGE ☐

LARGE ☐

SMALL ☐

SMALL ☒

(g) FILL CONSTRUCTION OPERATION: GOOD ☐, FAIR ☐, BAD ☐

(h) RECOMMENDED MEASURES FOR COMPACTION IMPROVEMENT _____

Signed Arnold W. Arnold

FIELD COMPACTION REPORT

MEMO TO: Mr. H. GILBERT DIST. 5 ATTENTION: Mr. A. D. McALICE DATE JUNE 9/64
DISTRICT ENGINEER
 HWY. NO. 6 RE: CONTRACT 63-135 LOCATION ARTHUR

FIELD TESTS AND OBSERVATIONS MADE TODAY SHOW AS FOLLOWS

FIELD NO.	STATION	DISTANCE FROM CENTRE LINE	DEPTH BELOW PROFILE GRADE	FIELD WET DENSITY (lb./cu.ft)	FIELD MOISTURE CONTENT	FIELD DRY DENSITY (lb./cu.ft)	% COMPACTION	LOCATION OF TEST			PROG	FINAL
								STRUCT. BACKFILL	CULVERT BACKFILL	GRADE		
64-DH 2003	286150	12 RT	0	164.7	4%	158.3	100%+			✓		✓
	288150	15 LT	0	168.0	4%	161.3	100%+			✓		✓
	291100	10 LT	0	164.5	4%	157.9	100%+			✓		✓
	293125	5 LT	0	157.5	4%	151.2	100%+			✓		✓
	295150	15 RT	0	160.7	4%	154.3	100%+			✓		✓
	298100	20 LT	0	164.1	4%	157.5	100%+			✓		✓
	300150	10 RT	0	165.1	4%	158.5	100%+			✓		✓

- (a) TYPE OF MATERIAL GRAN. A SOURCE KIDNIE PIT
- (b) COMPACTION REQUIREMENT ON THIS CONTRACT 100 %
- (c) LABORATORY DATA: OPTIMUM MOISTURE 5.6
 MAXIMUM DRY DENSITY 146.8
 MAXIMUM WET DENSITY 155.0
- (d) APPROXIMATE RATE OF HAUL 250 TONS ~~per~~ per hour compacted
- (e) CONDITION OF MATERIAL: AT OR NEAR OPTIMUM ☒, BELOW ☐, ABOVE ☐
- (f) COMPACTION UNITS USED: SHEEPSFOOT WOBBLEWHEEL OTHERS
 LARGE ☐ LARGE ☐
 SMALL ☐ SMALL ☒
- (g) FILL CONSTRUCTION OPERATION: GOOD ☐, FAIR ☐, BAD ☐
- (h) RECOMMENDED MEASURES FOR COMPACTION IMPROVEMENT _____

Signed Arnold W. Smith

DEPARTMENT OF HIGHWAYS - ONTARIO

FIELD COMPACTION REPORT

MEMO TO: Mr. H. GILBERT DIST. 5 ATTENTION: Mr. A. M'ALLIFFE DATE JUN 2/64
DISTRICT ENGINEER
HWY. NO. 689 RE: CONTRACT 63-135 LOCATION ARTHUR

FIELD TESTS AND OBSERVATIONS MADE TODAY SHOW AS FOLLOWS

[illegible]

(a) TYPE OF MATERIAL GRAV. "B" SOURCE KIONIE PIT

(b) COMPACTION REQUIREMENT ON THIS CONTRACT 100 %

(c) LABORATORY DATA: OPTIMUM MOISTURE 6.5

MAXIMUM DRY DENSITY 1.44 G

MAXIMUM WET DENSITY 154.0

(d) APPROXIMATE RATE OF HAUL 200 cu yd. per hour compacted

(e) CONDITION OF MATERIAL: AT OR NEAR OPTIMUM ☒, BELOW ☐, ABOVE ☐

(f) COMPACTION UNITS USED.	SHEEPSFOOT	WOBBLEWHEEL	OTHERS
1. Subgrade	100	100	100
2. Subbase	100	100	100
3. Base	100	100	100
4. Surface	100	100	100
5. Total	400	400	400

LARGE ☐

LARGE ☐

SMALL ☐SMALL ☒

(g) FILL CONSTRUCTION OPERATION: GOOD ☒, FAIR ☐, BAD ☐

(b) RECOMMENDED MEASURES FOR COMPACTION IMPROVEMENT _____

Signed Arthur Haster
Arnold M. Smith

FIELD COMPACTION REPORT

MEMO TO: Mr. H. GILBERT DIST. 5 ATTENTION: Mr. A D M. AULIFFE DATE MAY 25/64
DISTRICT ENGINEER
HWY. NO. 6 RE: CONTRACT 63-125 LOCATION ARTHUR

FIELD TESTS AND OBSERVATIONS MADE TODAY SHOW AS FOLLOWS

[illegible]

(a) TYPE OF MATERIAL GRAIN B SOURCE KIDNIE PIT

(b) COMPACTION REQUIREMENT ON THIS CONTRACT 100 % *Sample results 64 DH 2002*

(c) LABORATORY DATA: OPTIMUM MOISTURE 6.5 FW 5.0
MAXIMUM DRY DENSITY 144.6 FDD 149.1
MAXIMUM WET DENSITY 154.0 FW 156.6

(d) APPROXIMATE RATE OF HAUL 200 cu. yd per hour compacted

(e) CONDITION OF MATERIAL: AT OR NEAR OPTIMUM ☒, BELOW ☐, ABOVE ☐

(f) COMPACTION UNITS USED: SHEEPSFOOT WOBBLEWHEEL OTHERS

LARGE ☐ LARGE ☐ _____

SMALL ☐ SMALL ☒ _____

(g) FILL CONSTRUCTION OPERATION: GOOD ☒, FAIR ☐, BAD ☐

(h) RECOMMENDED MEASURES FOR COMPACTION IMPROVEMENT

Signed Angela W. Brown

FIELD COMPACTION REPORT

MEMO TO: Mr. H. GILBERT DIST. S ATTENTION: Mr. A. D. McAULIFFE DATE MAY 21 / 64
DISTRICT ENGINEER
HWY. NO. 6 RE: CONTRACT 63-135 LOCATION ARTHUR BRIDGE

FIELD TESTS AND OBSERVATIONS MADE TODAY SHOW AS FOLLOWS

[illegible]

(g) TYPE OF MATERIAL EARTH FILLS SOURCE SUBX 706-290

(b) COMPACTION REQUIREMENT ON THIS CONTRACT _____% *94.6 646A2022*

(c) LABORATORY DATA: OPTIMUM MOISTURE 10.6 %
MAXIMUM DRY DENSITY 1.2 g/cc
MAXIMUM WET DENSITY 1.91 g/cc

(d) APPROXIMATE RATE OF HAUL _____ cu. yd per hour compacted

(e) CONDITION OF MATERIAL: AT OR NEAR OPTIMUM ☐ , BELOW ☐ , ABOVE ☐

(f) COMPACTION UNITS USED:

<u>SHEEPSFOOT</u>	<u>WOBBLEWHEEL</u>	<u>OTHERS</u>
LARGE <input type="checkbox"/>	LARGE <input type="checkbox"/>	<u>SELF PROPELLED</u>
SMALL <input type="checkbox"/>	SMALL <input type="checkbox"/>	<u>SHEEPS FOOT</u>

(g) FILL CONSTRUCTION OPERATION: GOOD ☐ , FAIR ☐ , BAD ☐

(b) RECOMMENDED MEASURES FOR COMPACTION IMPROVEMENT _____

FLUENTE TEST TO SAMPLE "C4DH 2 (A. SMITH)

Signed

HWY. NO.

[illegible]

Signed

[Signature]

FIELD COMPACTION REPORT

MEMO TO: Mr. H. GILBERT DIST. 5 ATTENTION: Mr. ADM CAULIFFE DATE MAY 19/64
DISTRICT ENGINEER
HWY. NO. 6 RE: CONTRACT 63-135 LOCATION ARTHUR BRIDGE

HWY. NO. 6 RE: CONTRACT 63-135 LOCATION ARTHUR BRIDGE

FIELD TESTS AND OBSERVATIONS MADE TODAY SHOW AS FOLLOWS

[illegible]

(a) TYPE OF MATERIAL GRAN P. SOURCE WIDNIE P.

(b) COMPACTION REQUIREMENT ON THIS CONTRACT 100 %

(c) LABORATORY DATA: OPTIMUM MOISTURE 16

MAXIMUM DRY DENSITY 1.76 g

MAXIMUM WET DENSITY 1.52.5

(d) APPROXIMATE RATE OF HAUL 2.500 yd. per hour compacted

(e) CONDITION OF MATERIAL: AT OR NEAR OPTIMUM ☒, BELOW ☐, ABOVE ☐

(f) COMPACTION UNITS USED: SHEEPSFOOT WOBBLWHEEL OTHERS

LARGE ☐

LARGE ☐

O T H E R S

SMALL ☐SMALL ☐

Wobble & TACTOR

1970

(g) FILL CONSTRUCTION OPERATION: GOOD ☒, FAIR ☐, BAD ☐

(h) RECOMMENDED MEASURES FOR COMPACTION IMPROVEMENT

CORRECTION FOR PLUS = 4 158 ADD

Signed

FIELD COMPACTION REPORT

MEMO TO: Mr. H. GILBERT DIST. 5 ATTENTION: Mr. ADMCAULIFFE DATE MAY 12
DISTRICT ENGINEER
HWY. NO. 6 RE: CONTRACT 63-135 LOCATION ARTHUR DRIDDLE

FIELD TESTS AND OBSERVATIONS MADE TODAY SHOW AS FOLLOWS

[illegible]

(d) TYPE OF MATERIAL GRAN B SOURCE KIDNIE PIT

(b) COMPACTION REQUIREMENT ON THIS CONTRACT 100 %

(c) LABORATORY DATA: OPTIMUM MOISTURE 6.2

MAXIMUM DRY DENSITY 144.6

MAXIMUM WET DENSITY 1.54.0

(d) APPROXIMATE RATE OF HAUL 2.00 cu. yd per hour compacted

(e) CONDITION OF MATERIAL: AT OR NEAR OPTIMUM ☒ , BELOW ☐ , ABOVE ☐

(f) COMPACTION UNITS USED:	<u>SHEEPSFOOT</u>	<u>WOBBLEWHEEL</u>	<u>OTHERS</u>
LARGE <input type="checkbox"/>	LARGE <input type="checkbox"/>	SELF PROPELLED	
SMALL <input type="checkbox"/>	SMALL <input type="checkbox"/>	SHEEP FOOT.	

(g) FILL CONSTRUCTION OPERATION: GOOD ☒, FAIR ☐, BAD ☐

(h) RECOMMENDED MEASURES FOR COMPACTION IMPROVEMENT _____

Signed

FIELD COMPACTION REPORT

MEMO TO: Mr. M. GILBERT DIST. S ATTENTION: Mr. AJ McVIGHER DATE MAY 11/64
DISTRICT ENGINEER
HWY. NO. 6 RE: CONTRACT 63-135 LOCATION ARTHUR BRIDGE

FIELD TESTS AND OBSERVATIONS MADE TODAY SHOW AS FOLLOWS

[illegible]

Way: (STONE 2.5%)

(a) TYPE OF MATERIAL EARTH FILLS SOURCE CNT Sub-X 309450

(b) COMPACTION REQUIREMENT ON THIS CONTRACT 75 %

(c) LABORATORY DATA: OPTIMUM MOISTURE 12.4

MAXIMUM DRY DENSITY 1.18

MAXIMUM WET DENSITY 1.22 1.74

(d) APPROXIMATE RATE OF HAUL 150 cu yd. per hour compacted

(e) CONDITION OF MATERIAL AT OR NEAR OPTIMUM ☐ , BELOW ☐ , ABOVE ☐

(f) COMPACTION UNITS USED:

<u>SHEEPSFOOT</u>	<u>WOMBLEWHEEL</u>	<u>OTHERS</u>
LARGE <input type="checkbox"/>	LARGE <input type="checkbox"/>	<u>SELF PATTLED</u>
SMALL <input type="checkbox"/>	SMALL <input type="checkbox"/>	<u>SHEEP FOOT</u>

(g) FILL CONSTRUCTION OPERATION: GOOD ☒, FAIR ☐, BAD ☐

(h) RECOMMENDED MEASURES FOR COMPACTION IMPROVEMENT _____

RELATE TO "EMPLE" (DH 1 1964) A. SMITH

A. T. MATHIAS MDN 136

Signed

22-63-135

RACEY, MacCALLUM AND ASSOCIATES LIMITED

A COMPANY OWNED, DIRECTED AND OPERATED BY

Consulting Engineers
AND ASSOCIATED STAFF

MONTREAL



VANCOUVER

TORONTO

DONALD C. MACCALLUM, B.ENG., M.E.I.C., P.ENG.

H. JOHN RACEY, B.SC., M.E.I.C., P.ENG.

A. ERIC RANKINE, B.SC., M.E.I.C., A.M.I.ELEC.E., P.ENG.

TORONTO DIVISION
27 CARLTON STREET

OUR REFERENCE NO. S-500/T-1846

Toronto 2, Ontario,
31st August, 1959.

59-F-211C

The Department of Highways,
Foundation Section,
Materials and Research Branch,
Parliament Buildings,
TORONTO 2, Ontario.

Attention: Mr. L. Soderman

RE: FOUNDATION INVESTIGATION FOR
BRIDGE W.P. 152-59, HIGHWAY #6, DISTRICT #3
VILLAGE OF ARTHUR, ONTARIO

Dear Sirs,

The enclosed report presents the results of our soil investigation at the above location.

We hope the report is satisfactory to you; if you have any questions about it, please do not hesitate to get in touch with us.

Thank you for this opportunity of being of service to you.

Yours very truly,

RACEY, MacCALLUM AND ASSOCIATES LIMITED

J. J. Schoustra, P.Eng.,
Divisional Soils Engineer

JJS/PW

Enclosure

The Department of Highways of Ontario
Foundation Section
Toronto, Ontario

FOUNDATION INVESTIGATION
FOR
BRIDGE W.P. 152-59, HIGHWAY #6, DISTRICT #3
VILLAGE OF ARTHUR
ONTARIO

Ref: S-500/T-1846
-Report

Racey, MacCallum and Associates Limited

31 August, 1959

REFERENCE NO. S-500/T-1846
-REPORT-

Toronto 2, Ontario,
25th August, 1959.

FOUNDATION INVESTIGATION FOR
BRIDGE W.P. 152-59, HIGHWAY #6, DISTRICT #3
VILLAGE OF ARTHUR, ONTARIO

INTRODUCTION AND FIELD WORK:

An investigation into the sub-soil conditions was carried out at the above bridge site from the 28th July to 12th August, 1959 inclusive. Four boreholes were put down in positions, as indicated on Enclosure No. 1. Borings were conducted by means of a standard diamond drill adapted for soil testing. BX casing was run to the bottom of all holes and AX core bits and barrels used as necessary. Samples were recovered by means of a 2" diameter split-spoon sampler, driven into the soil by means of a 140 lb. hammer falling freely through a height of 30 inches. No penetration tests were conducted because of the bouldery nature of the soil.

The ground surface elevation of all four boreholes was obtained and referred to the B.M. Elevation 1503.40 geodetic, located by a cut-cross in the concrete gas isle of the Canadian Oil Companies Limited on Highway No. 9.

Accessibility to the site was extremely bad and much time was spent whilst landing equipment onto the river banks and moving from one borehole to another across the river-bed. This caused much delay although some time was saved by using a tow-truck with a mobile crane to move the equipment from Borehole No. 3 to Borehole No. 4. Local precipitation had caused the river level to rise by a foot or so, thus precluding movement of the rig across the river-bed.

GEOLOGY OF THE SITE:

A preliminary look at the geology of the area would indicate that the area is on a gently undulating till plain. It is an area of ground moraines which is broken up by several small moraines. According to Chapman & Putnam in their "Physiography of Southern Ontario", this area is on the margin of the Dundalk and Stratford Till Plains as well as the Guelph Drumlin Field. The Courtage River, which drains this area, is quite deeply entrenched in the till plains. The area apparently has more rain and snow than most of Southern Ontario and around March and April the average flow is around 1500 c.f.s. dwindling to as little as 4 to 5 c.f.s. in dry summers. Local information obtained in connection with digging for wells does not indicate any rock until 150 to 175 feet below the surface.

REFERENCE NO. S-500/T-1846

-REPORT-

Cont'd

25th August, 1959.

SUB-SOIL CONDITIONS:

The borehole profiles and all pertinent data are plotted on Engineering Data Sheets and included as Enclosures Nos. 2, 3, 4 and 5. Boreholes Nos. 1 and 2, which are diagonally opposite, were driven to 50 feet depth in an attempt to find if any variation occurred in the general nature of the sub-soil. Boreholes Nos. 3 and 4 were consequently only driven to 20 feet depth. The records show a good correlation of profile from all four locations.

The sub-soil indicates a top fill layer 4 to 6 feet deep of stone, coarse gravel and sand overlying a light grey to light brown hard sandy till. The till is interbedded with numerous boulders and stones. These were encountered in all the four boreholes irrespective of the depth of the borehole. The sand layer encountered in Borehole No. 1 at a depth of 42 feet is not observed in any of the other boreholes and is most probably an isolated lense.

The nature of the sampling prevented any measurement of ground water, but water was observed to come up from both Boreholes Nos. 1 and 2 when boring had reached a depth of 25 feet or thereabouts (Elevation 1435.90). The water in Borehole No. 2 came up with a greater force than in Borehole No. 1 where it was a mere trickle. The static head of the water coming out of Borehole No. 2 was approximately 2 feet above the water-level of the river. The holes were plugged with "Bentonite" and sand on withdrawal of the casing. No water was observed in Boreholes Nos. 3 and 4.

FOUNDATIONS:

The penetration strength obtained from the split-spoon sampler indicates fairly good agreement amongst the four boreholes once the sandy till is reached after penetrating through the top fill. This top fill is probably there as a result of the spill from the embankments of the approachway to the existing bridge. The penetration records obtained from the split-spoon sampler are probably on the high side due to the presence of stones and boulders in the till. This has been taken into account in determining allowable bearing pressures for the area. Spread footings would seem to be advisable because of the excellent bearing properties of the sandy till. Piles could be considered, but it is doubtful if it would be economical because of the bouldery nature of the sub-soil.

Since the soil is generally uniform, an allowable bearing pressure at Elevation 1454 feet (7 ft. below present water level), 16,000 lbs. per sq. ft. would seem advisable at all the four boreholes. Whether this depth of footings is sufficient with respect to scour cannot be decided without flood height and velocity records. This is recommended on the basis of a one-inch maximum total and 3/4" maximum differential settlement. No appreciable ground water problem in the excavation need be encountered, the till being relatively impervious

REFERENCE NO. S-500/T-1846

-REPORT-

Cont'd

25th August, 1959.

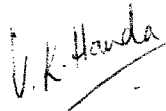
FOUNDATIONS Cont'd

and compact. Some protection against side seepage may be of use, but bottom seepage will not present a serious problem.

CONCLUSION:

The following conclusions would seem warranted from the investigation:-

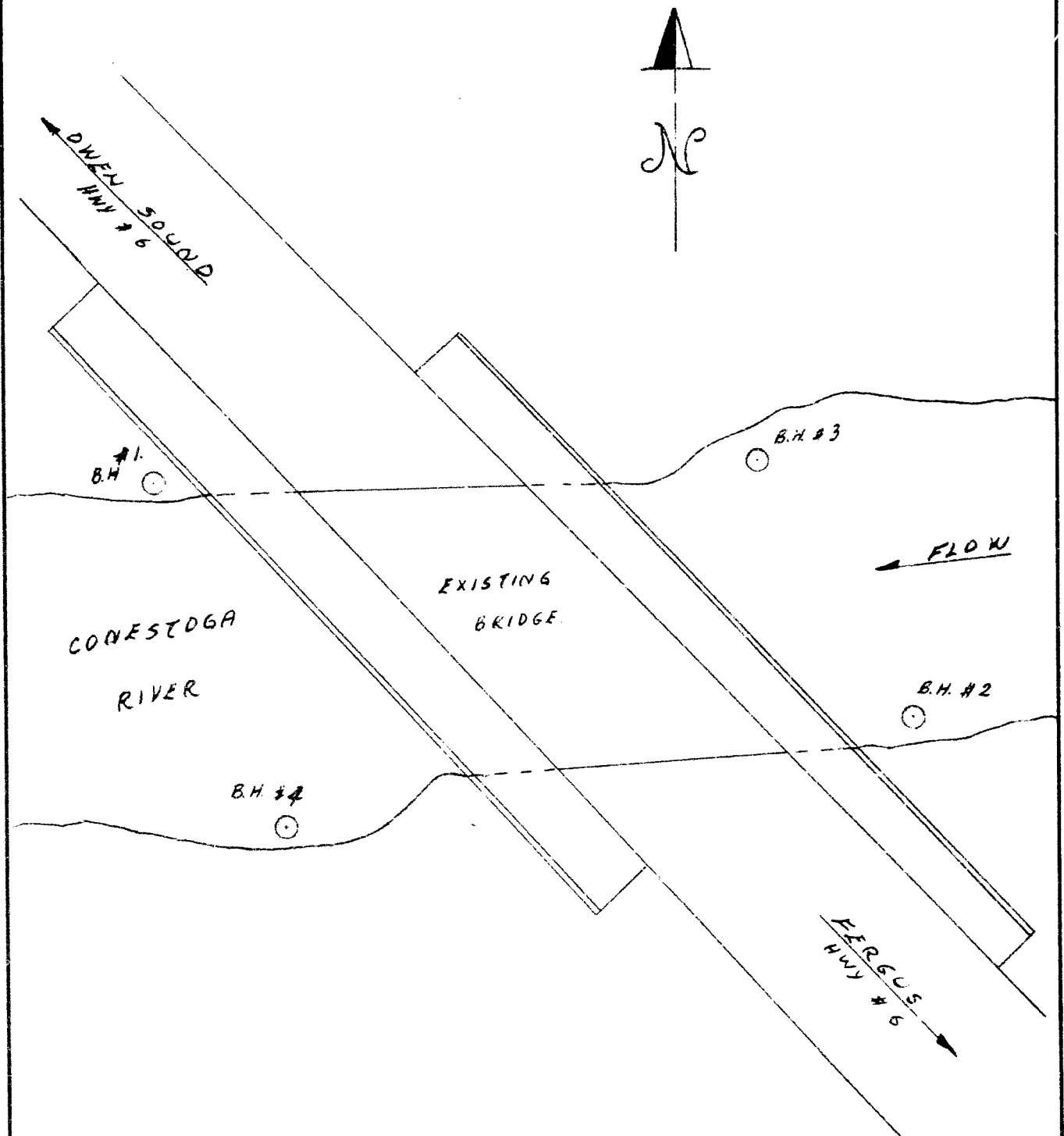
- (1) The sub-soil is essentially very dense, quite uniform, and consists of a light grey, light brown sandy till, interspersed with stones and boulders.
- (2) Free ground water was encountered at a depth of approximately 25 feet below the river surface.
- (3) Spread footings would seem advisable because of the excellent bearing properties of the sub-soil. A bearing pressure of 16,000 lbs./sq. ft. is suggested.
- (4) Piles would seem inadvisable because of the bouldery nature of the soil.



V. K. Handa, P.Eng.,
Project Engineer

VKH/PW

Prep. By VKH



SCALE 1" = 16'

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 1

Project: Bridge Foundation Investigation

Location: Hwy. #6, Arthur, Ontario

Hole Location: N.W. corner of bridge

Hole Elevation and Datum: 1461.90 (geodetic)

Field Supervisor: V.K.H. Prep.: V.K.H.

Driller:

Checked:

Date: 17 Aug., 1959

LEGEND

Shear Strength (C)

Unconfined compression

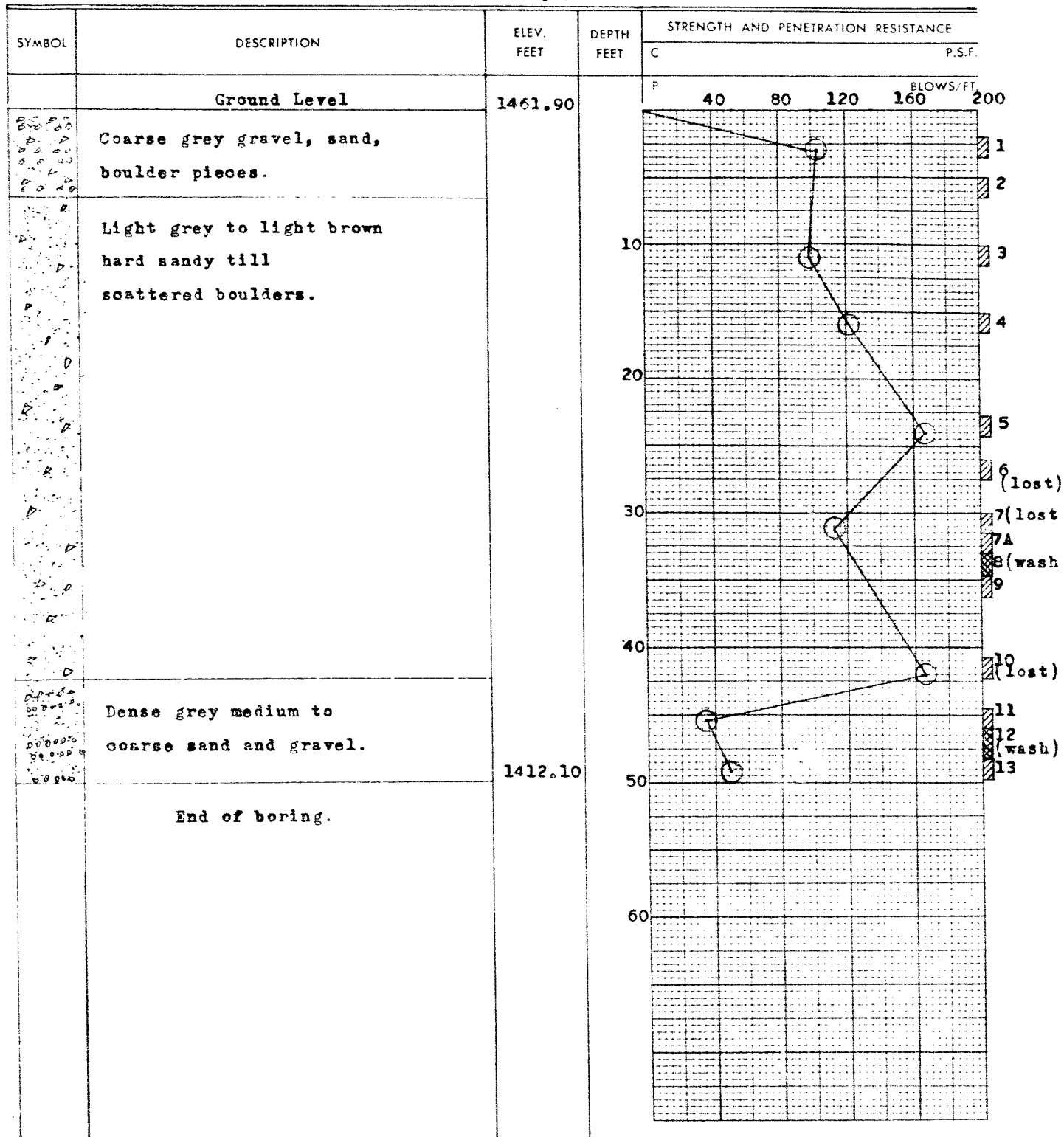
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕
+S

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: **2**Project: **Bridge Foundation Investigation**Location: **Hwy. #6 Arthur, Ontario.**Hole Location: **S.E. Corner of Bridge**Hole Elevation and Datum: **1460.90 (geodetic)**Field Supervisor: **V.K.H.** Prep.: **V.K.H.**

Driller:

Checked:

Date: **17 Aug., 1959****LEGEND**

Shear Strength (C)

Unconfined compression

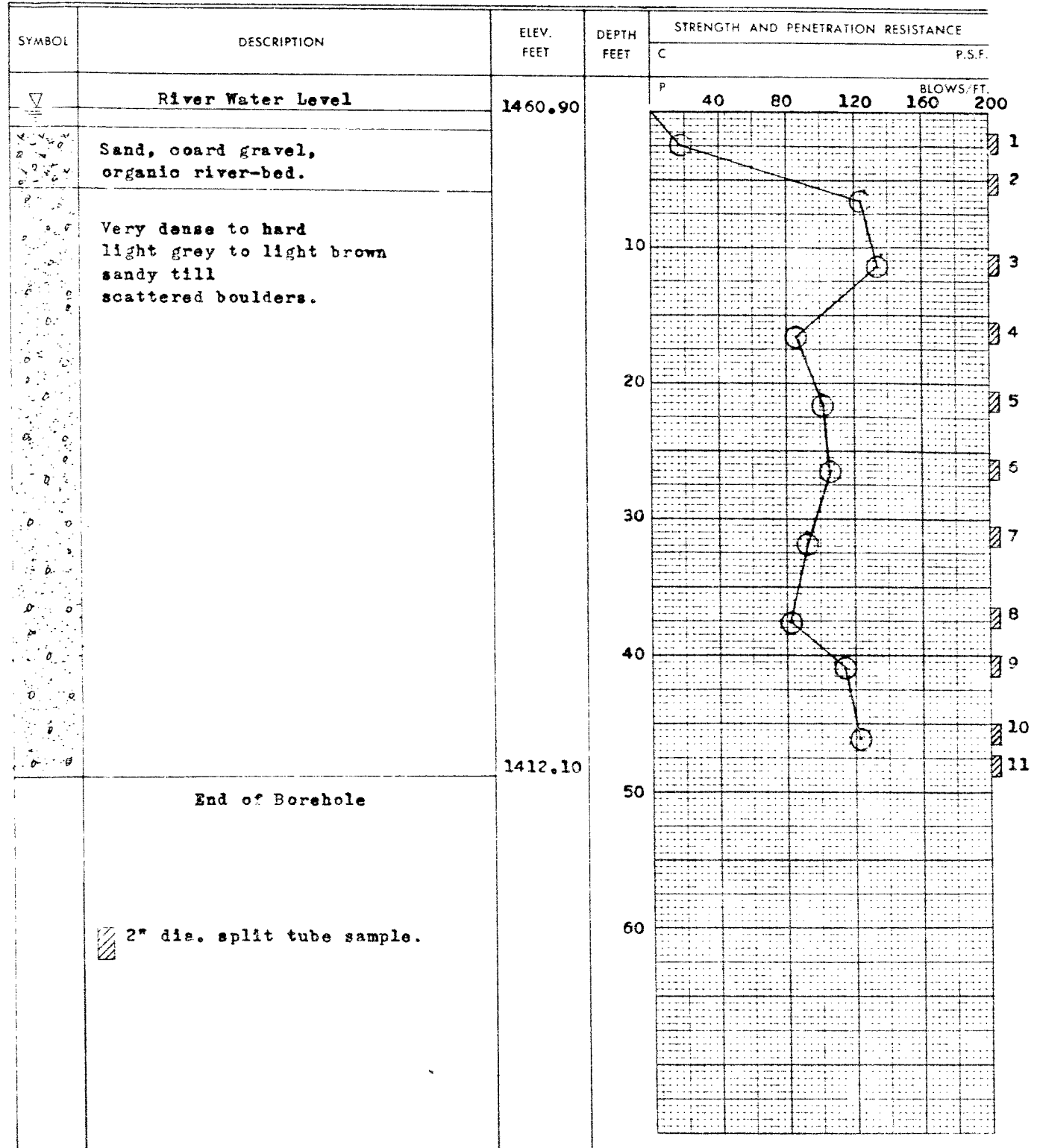
Vane test and sensitivity (S)

Penetration Resistance (P)

2" Split tube

2" Dia. Cone

Casing

⊕
+5

RACEY MacCALLUM AND ASSOCIATES LTD.

Foundation Engineering Division

Engineering Data Sheet for Borehole: 3

Project: Bridge Foundation Investigation

Location: Hwy. #6 Arthur, Ontario

Hole Location: N.E. Corner of Bridge

Hole Elevation and Datum: 1460.90

Field Supervisor: V.K.H. Prep.: V.K.H.

Driller:

Checked:

Date: 17 Aug., 1959

LEGEND

Shear Strength C

Unconfined compression

Vane test and sensitivity (S)

Penetration Resistance P

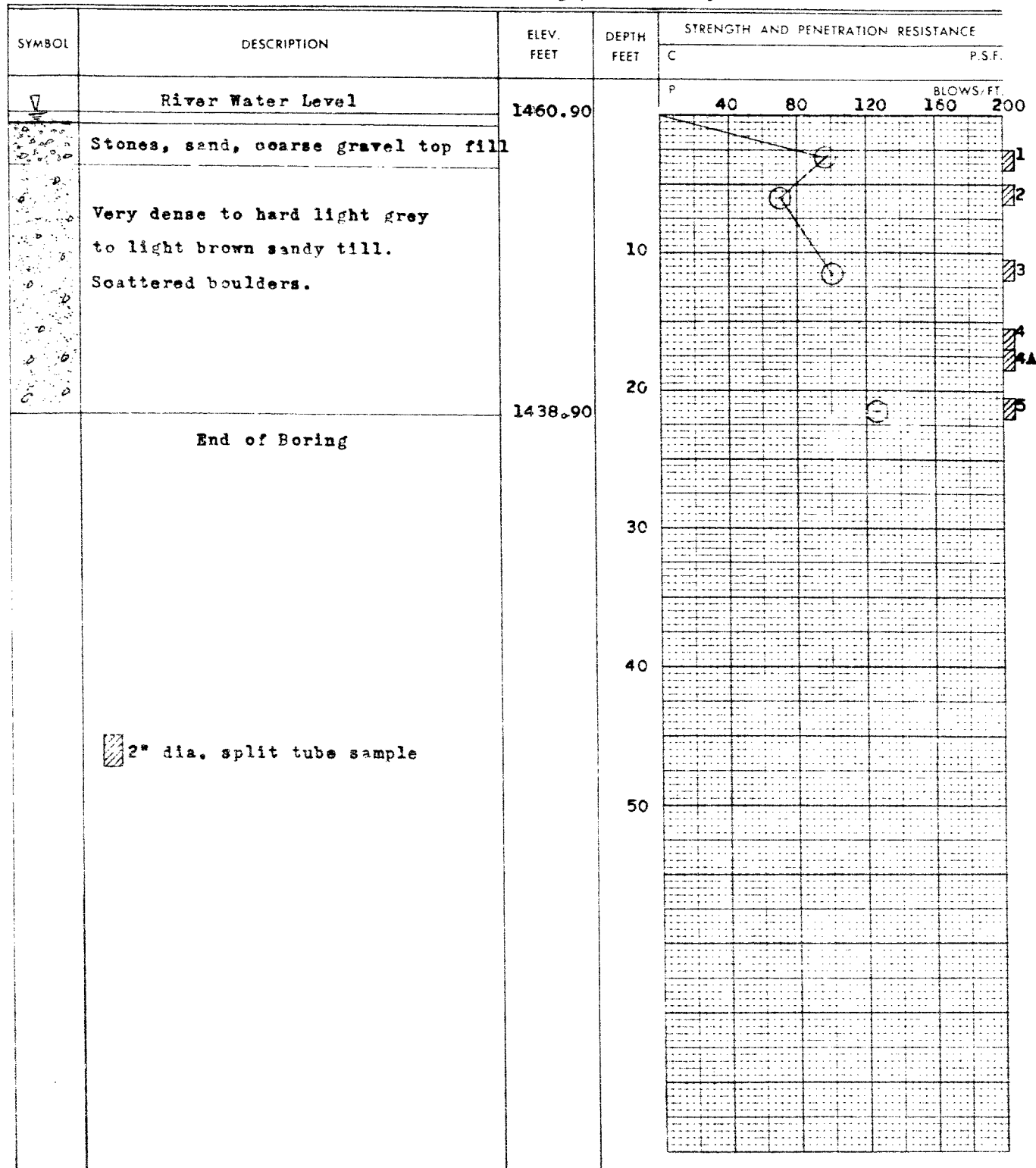
2" Split tube

2" Dia. Cone

Casing

⊕

+S



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Engineering Data Sheet for Borehole: 4

Project: Bridge Foundation Investigation

Location: Hwy. #6 Arthur, Ontario.

Hole Location: S.W. corner of bridge

Hole Elevation and Datum: 1462.90

Field Supervisor: V.K.H. Prep.: V.K.H.

Driller: Checked:

Date: 17 Aug., 1959

LEGEND

Shear Strength (C)

Unconfined compression
Vane test and sensitivity (S)

Penetration Resistance P

2" Split tube

2" Dia. Cone

Casing

⊕
+S