

CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: November 2, 1998

TO: Richard Pauser
Technical Services Supervisor
Transportation District 6

FROM: Dennis G. Althaus
Geologist

SUBJECT: Site Investigation Report
Project I.D. 7210-05-01
Structure B-47-117
STH 63 over Branch of Rush Creek
Ellsworth to North County Line
Pierce County

Attached is the Site Investigation Report for the above project.

DGA:\

Attachments

cc: District 6 (4)
C.O. Bridge
C.O. Design
Geotechnical File

SITE INVESTIGATION REPORT
Project I.D. 7210-05-01
Structure B-47-117
STH 63 over Branch of Rush Creek
Ellsworth to North County Line
Pierce County

1. GENERAL

Three borings were taken for a proposed structure to carry STH 63 over a branch of Rush Creek at about station 231+575. One additional boring was taken for a temporary bridge about 28 meters east of the existing bridge. The existing bridge is about 16.46 meters long by 12.2 meters wide. The proposed structure will be about the same width by about 18.46 meters long. The site is located about 960 meters north of the junction of STH 29 west and STH 63 north or about 640 meters south of the Pierce and St. Croix county line on STH 63. The 6.7 meter bituminous pavement looks to be in good condition. The 1.8 meter appears to be in good condition. There is heavy riprap on the south abutment slope. Rolling hills with woods and pasture for ground cover make up the surrounding terrain. The creek was dry when the borings were taken. Rock boulders were observed but no rock outcrops were noted. The surface soil should be a silty loam.

2. SUBSURFACE CONDITION

Four borings conforming to AASHTO Method T-206, Standard Penetration Test, to estimate relative density, fix presumptive bearing capacity, investigate soil properties to select suitable pile types with their support values, make a cursory review of alternative foundation possibilities, and recover samples for soil textural identification and classification. Soil textures in the borings logs are field identifications made by the drillers and were later verified in the C.O. Geotechnical Lab.

Boring 1 was taken at station 20+241.064, 8 meters right of the existing centerline.

<u>Elevations</u>	<u>Soil Description</u>
323.79 to 319.90	very loose to loose brown / dark brown sandy silt, trace of gravel
319.90 to 318.40	firm brown sand, trace of silt
318.40 to 316.00	very dense brown limestone (run 1, 19.5' to 23.5' - 62% recovery, 0% RQD * run 2, 23.5' to 26' - 97% recovery, 13% RQD)

Boring 2 was taken at station 20+232.444, 8 meters left of the existing centerline.

<u>Elevations</u>	<u>Soil Description</u>
320.38 to 318.90	brown silty sand
318.90 to 315.70	very loose to firm brown sand, trace of silt
315.70 to 314.40	firm to very dense weathered limestone
314.40 to 313.10	very dense weathered limestone & limestone

Boring 3 was taken at station 20+232.444, 12 meters right of the existing centerline.

<u>Elevations</u>	<u>Soil Description</u>
320.53 to 319.30	brown silty sand
319.30 to 316.00	loose to firm brown sand, trace of silt
316.00 to 315.90	very dense limestone

Boring 4 was taken at station 20+223.005, 5 meters left of the existing centerline.

<u>Elevations</u>	<u>Soil Description</u>
324.61 to 319.50	loose to firm brown sandy silt
319.50 to 317.10	firm to very dense brown sand, trace of silt
317.10 to 316.80	very dense weathered limestone
316.80 to 316.70	limestone

3. BEARING CAPACITY

The subsurface soils within a practical footing depth have insufficient bearing capacity to support spread footings for this structure. However, spread footings could be placed on the rock at about elevation 313.20 for the pier location.

4. PILES

A cursory review indicates that the soils above rock/weathered rock would not be adequate to support friction/displacement piles at practical load levels.

H-piles or oil field pipe piles however could be driven to 62 MPa load in the steel section if driven to rock at elevation 318.4 for the north abutment, 313.5 for the pier location and 317 for the south abutment. The temporary bridge should tip out at 316 for the pier location and probably higher for the abutments.

5. ALTERNATIVE FOUNDATION TYPE

Drilled caissons could be used here but the cost would be more. Dynamic and vibratory methods could not be used effectively here.

6. LATERAL EARTH PRESSURE

Grade 1 granular backfill will exert an equivalent fluid pressure of 1.4 to 1.7 kPa, silty sands 2.2 kPa, silts 3.2 kPa, silty clays and clays 4.1 kPa or more.

7. CONSTRUCTION PROBLEMS

Boulders are present on top of the surface soil and may be in the existing soils where piles are to be driven.

8. RECOMMENDATIONS

A) If a grade 1 granular material is not used as backfill behind the abutments or any other earth retaining structure some sort of drainage system should be installed behind these structures to prevent water caused problems such as washout of material from behind these structures.

B) The use 254 mm H-piles driven to rock at 62 MPa load in the steel section. The piles should tip out at about elevation 318.4 for the north abutment, 317 for the south abutment and 313.2 for the pier location.

C) The use of H-piles driven to rock at about elevation 316 for the pier location and probably higher for the abutment locations, should support the temporary bridge that is to be constructed for the STH 63 temporary bypass.

If you have any questions, please contact the Geotechnical Unit.

ABBREVIATIONS
F—Fine M—Medium C—Coarse
Vs—Weathered So—Sound

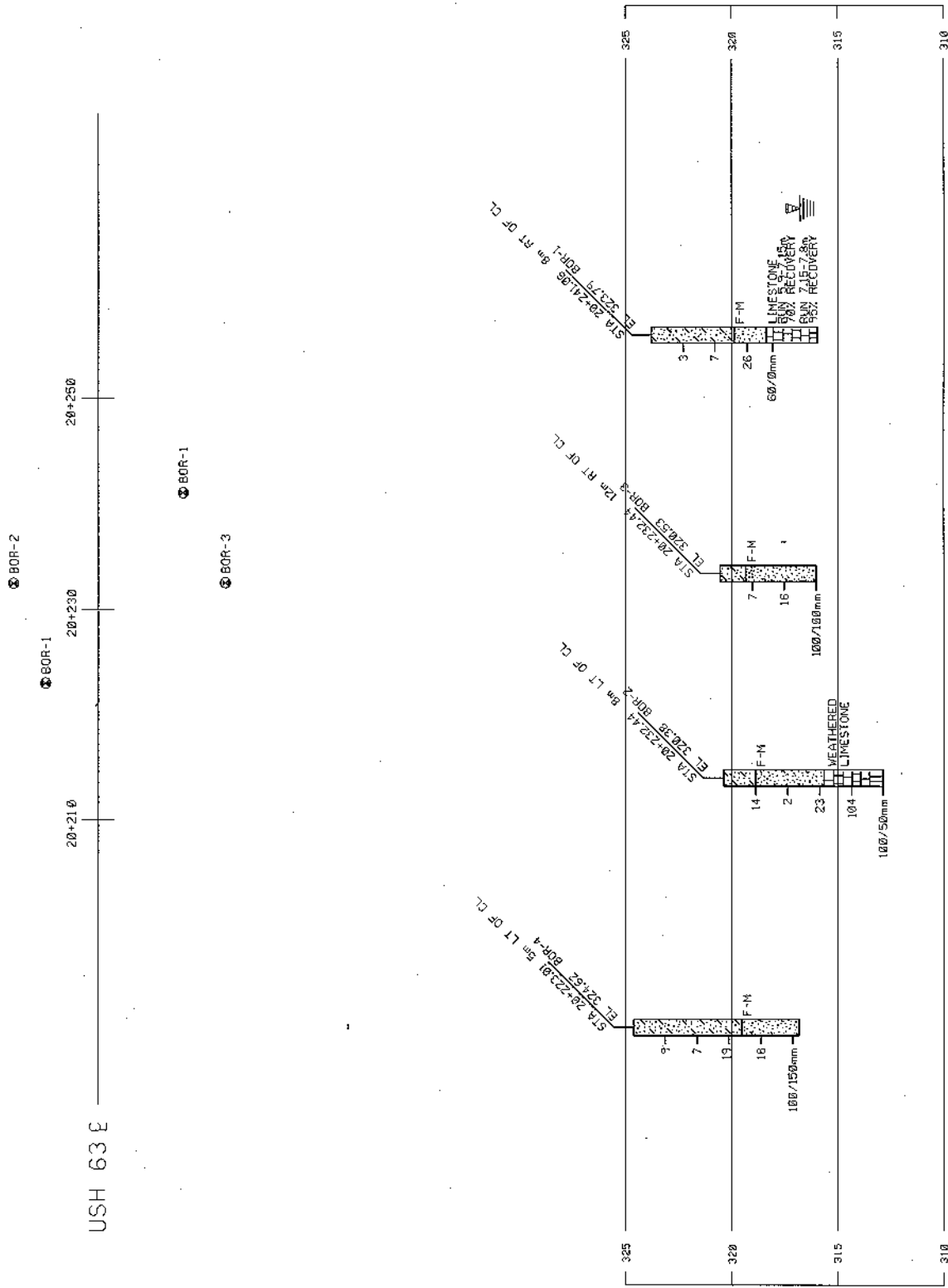
MATERIAL SYMBOLS
Topsoil Silt Sandstone
Sand Peat Limestone
Gravel Clay Igneous Rock

LEGEND OF PROBING
95/152=95 Blows for
152mm Penetration
Probing taken with a
159.1Kg Wt.
Falling 457mm on a
51mm O.D. Point.
Refusal 95/152

LEGEND OF BORING
Unconfined Elev.
Strength
Blows Per 300mm
Using 63 Kg Wt.
Falling 762mm
Wash Sample
Shallow Tube—S.T.
Ground Water
Elevation
No Ground Water
Observed Above
This Elevation
Sandy Gravel
Boulders or
Cobbles
Sand
Silty Clay
Limestone

SUBSURFACE EXPLORATION FOR FOUNDATION
DESIGN AND BIDDERS INFORMATION
To obtain relative data concerning the character of
material in and upon which the foundation might be built
borings and/or soundings were made at points approximately
as indicated on this drawing. The data presented herein
represents the findings of the subsurface explorations made.
However, because the depths investigated are limited and
the area of the borings and/or soundings is very small in
relation to the entire area, the duration of highways does not
warrant conditions below the depths investigated or that the
classification of material encountered in these investigations
is necessarily typical of the entire area.

NO.	DATE	REVISION	BY
1		STATE OF WISCONSIN DEPARTMENT OF TRANSPORTATION DIVISION OF HIGHWAYS	
2		STRUCTURE B-47-117	
3		CONST. 1996	
4		DESIGN 87	
5		PLAN 87	
6		SEC.	
7		SUBSURFACE EXPLORATION	
8		SHEET 1 OF 1	



Boring No. 1

Structure B47-117

County Pierce

Sheet of 1

Project 7210-05-01

Road STH 63

Station 242+525

Offset 8 m RT 05 1/4

Surface Elevation 323.794

20+241.064

GROUND WATER OBSERVATIONS

Streambed Elev. _____

Time After Drilling 10-28-98 - H2O wet 8m

Water Elev. _____

Top of Well Elev. _____

Depth to Water 7 m

MOISTURE

D = Damp
M = Moist
W = Wet

DRILLING METHOD

A = Auger
C = Coring
CA = Casing Advancer
WA = Wash Ahead
HS = Hollowstem

DM = Drilling Mud
RB = Rockbit
SS = Splitspoon
ST = Shelby Tube
E = Easy

NW = Casing, 76.2mm I.D. (3")
HW = Casing, 101.6mm I.D. (4")
BV = Corebarrel, 36.5mm Core Dia. (1 7/16")
NV = Corebarrel, 47.6mm Core Dia. (1 7/8")
M = Medium
H = Hard

Start 1027 Unit 1

Finish Chief Clark

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Drilling Method	Probe Blows
		0-15	15-30							
						30 cm				
						60 cm				
						90 cm				
						120 cm				
1	M	1	2	100%	3	1.5 m loose	1.5 m			
						180 cm				
						210 cm				
						240 cm				
						270 cm				
2	M	3	4	100%	7	3 m loose Rock in close	3 m			
						330 cm				
						360 cm				
						390 cm				
3	M	10	4	100%	26	4.5 m loose F.M. SAND TO SILT	4.5 m			
						420 cm				
						450 cm				
						480 cm				
						510 cm				
						540 cm				
						570 cm				
						6 m				
1st Run						630 cm				
						660 cm				
						690 cm				
						720 cm				
2nd						7.5 m				
						780 cm				
						810 cm				
						840 cm				
						870 cm				
						9 m				
						930 cm				
						960 cm				
						990 cm				
						1020 cm				
						10.5 m				
						1080 cm				
						1110 cm				
						1140 cm				
						1170 cm				
						12 m				

FIELD BORING LOG
12 Meter Log

Boring No. 2 Structure B47-117 County PIERCE Sheet of 1
Project 7210-05-01 Road STA 63
Station 231.575 Offset 8m LT Surface Elevation 320.381

20+232.444 GROUND WATER OBSERVATIONS

Streambed Elev. _____ Time After Drilling _____
Water Elev. _____
Top of Well Elev. _____ Depth to Water _____

MOISTURE		DRILLING METHOD				Start	Unit
D = Damp	A = Auger	DM = Drilling Mud	NW = Casing, 76.2mm I.D. (3")			10.27.8	1
M = Moist	C = Coring	RB = Rockbit	HW = Casing, 101.6mm I.D. (4")				
W = Wet	CA = Casing Advancer	SS = Splitspoon	BV = Corebarrel, 36.5mm Core Dia. (1 7/16")				
	WA = Wash Ahead	ST = Shelby Tube	NV = Corebarrel, 47.6mm Core Dia. (1 7/8")				
	HS = Hollowstem	E = Easy	M = Medium	H = Hard			
					Finish	Chief	C/Adk

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Drilling Method	Probe Blows
		0-15	15-30							
	M					30 cm				
						60 cm				
						90 cm				
						120 cm				
1	M	4	6	14	14	1.5 m				
		8				180 cm				
						210 cm				
						240 cm				
						270 cm				
2	M	2	1	2	2	3 m				
	W	1				330 cm				
						360 cm				
						390 cm				
						420 cm				
3	D	15	12	23	23	4.5 m				
		11				480 cm				
						510 cm				
						540 cm				
						570 cm				
4	D	2	50	52	54	6 m				
		54				630 cm				
						660 cm				
						690 cm				
5	D	100	2"	102	2	7.5 m				
						720 cm				
						750 cm				
						780 cm				
						810 cm				
						840 cm				
						870 cm				
						9 m				
						930 cm				
						960 cm				
						990 cm				
						1020 cm				
						10.5 m				
						1080 cm				
						1110 cm				
						1140 cm				
						1170 cm				
						12 m				

Checked by _____

METRIC CONVERSION FACTORS

1 cm = 0.3937 inches
1 m = 3.281 feet

1 inch = 2.54 cm
1 foot = 30.48 cm, 0.3048 m

Boring No. 2

12 Meter Log

Boring No. 3

Structure B47-117

County Pierce

Sheet 1 of 1

Project 7210 85 01

Road 5TH 63

Station 231.595

Offset 12 m RT of 1/2

Surface Elevation 320.533

20 + 232.444

GROUND WATER OBSERVATIONS

Streambed Elev.

Time After Drilling

Water Elev.

Top of Well Elev.

Depth to Water Dry

MOISTURE

DRILLING METHOD

Start 10-27 Unit 1

Finish Chief C/ARK

D = Damp
M = Moist
W = Wet

A = Auger
C = Coring
CA = Casing Advancer
WA = Wash Ahead
HS = Hollowstem

DM = Drilling Mud
RB = Rockbit
SS = Splitspoon
ST = Shelby Tube
E = Easy

NW = Casing, 76.2mm I.D. (3")
HW = Casing, 101.6mm I.D. (4")
BV = Corebarrel, 36.5mm Core Dia. (1 7/16")
NV = Corebarrel, 47.6mm Core Dia. (1 7/8")
M = Medium
H = Hard

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Drilling Method	Probe Blows
		0-15	15-30							
	M					30 cm				
						60 cm				
						90 cm				
						120 cm				
1	M	4	3		7	1.5 m loose 180 cm 210 cm 240 cm 270 cm				
		4								
2	D	3	5		16	3 m Firm 330 cm 360 cm 390 cm 420 cm				
		11								
3	N	55	100/9		100/9	4.5 m 480 cm 510 cm 540 cm 570 cm				
						6 m				
						630 cm 660 cm 690 cm 720 cm				
						7.5 m				
						780 cm 810 cm 840 cm 870 cm				
						9 m				
						930 cm 960 cm 990 cm 1020 cm				
						10.5 m				
						1080 cm 1110 cm 1140 cm 1170 cm				
						12 m				

Checked by

METRIC CONVERSION FACTORS

Boring No.

1 cm = 0.3937 inches
1 m = 3.281 feet

1 inch = 2.54 cm
1 foot = 30.48 cm, 0.3048 m

12 Meter Log

Boring No. 4

Structure B47-117

County PIERCE

Sheet of 1

Project 7210-05-01

Road STH 63

Station 221+932

Offset 5m LT 25 9/16

Surface Elevation 324.617

20+223.005 GROUND WATER OBSERVATIONS

Streambed Elev. _____

Time After Drilling _____

Water Elev. _____

Top of Well Elev. _____

Depth to Water _____

MOISTURE

D = Damp
M = Moist
W = Wet

DRILLING METHOD

A = Auger
C = Coring
CA = Casing Advancer
WA = Wash Ahead
HS = Hollowstem

DM = Drilling Mud
RB = Rockbit
SS = Splitspoon
ST = Shelby Tube
E = Easy

NW = Casing, 76.2mm I.D. (3")
HW = Casing, 101.6mm I.D. (4")
BV = Corebarrel, 36.5mm Core Dia. (1 7/16")
NV = Corebarrel, 47.6mm Core Dia. (1 7/8")
M = Medium
H = Hard

Start 10-28 Unit 1

Finish _____ Chief Clark

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Total Blows	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Drilling Method	Probe Blows
		0-15	15-30							
						30 cm				
						60 cm				
						90 cm				
						120 cm				
1	M	4	3		9	1.5 m loose				
		6				180 cm				
						210 cm				
						240 cm				
						270 cm				
2	M	2	2		7	3 m loose				
		5				330 cm				
						360 cm				
						390 cm				
						420 cm				
3	M	6	8		19	4.5 m Firm				
		11				480 cm				
						510 cm				
						540 cm				
						570 cm				
4	D	10	9		18	6 m Firm				
		9				630 cm				
						660 cm				
						690 cm				
						720 cm				
5	D	100	6		106	7.5 m DENSE				
						780 cm				
						810 cm				
						840 cm				
						870 cm				
						9 m				
						930 cm				
						960 cm				
						990 cm				
						1020 cm				
						10.5 m				
						1080 cm				
						1110 cm				
						1140 cm				
						1170 cm				
						12 m				

Checked by _____

METRIC CONVERSION FACTORS

1 cm = 0.3937 inches
1 m = 3.281 feet

1 inch = 2.54 cm
1 foot = 30.48 cm, 0.3048 m

Boring No. 4