

DATE: March 31, 1994

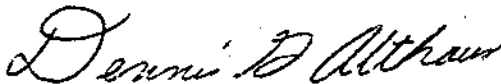
TO: Richard J. Pauser  
Construction and Material Supervisor  
Transportation District 6

FROM: Bruce J. Pfister, P.E.  
Chief Geotechnical Engineer

SUBJECT: Site Investigation Report  
Project I.D. 8949-04-03  
USH 12 Over Branch of Carr Creek  
Baldwin to East County Line  
Structure B-55-134  
St. Croix County

We are attaching copies of a Site Investigation Report for the project noted above.

by:



Dennis G. Althaus

BJP:DGA:m00115  
Attachments

cc: District 6 (orig. +3)  
C.O. Bridge (2)  
C.O. Files  
C.O. Design  
J.E. Haverberg  
Geotechnical File

SITE INVESTIGATION REPORT  
PROJECT I.D. 8949-04-03  
USH 12 OVER BRANCH OF CARR CREEK  
BALDWIN TO EAST COUNTY LINE  
STRUCTURE B-55-134  
ST. CROIX COUNTY

1. GENERAL

Two borings were made for a proposed single span structure to replace the present single span concrete girder structure. The proposed structure looks to be 10 feet wider and 10 feet longer than the existing structure. USH 12 will be carried over a branch of Carr Creek at station 187+47± by the proposed structure. The structure is located 3.5 miles east of the junction of USH 12 and USH 63. There is some cracking on the abutment walls of the existing structure which appears to be in fair condition. The existing pavement is cracked, patched and in generally poor condition. The 4 foot approach fills show no signs of sloughing, seepage or erosion and look to be in good condition. There was no riprap noted on the slopes or creek banks. The topography is mostly rolling with farm fields and woods for ground cover. The 40 foot wide Carr Creek channel flows south. The water depth is 4± feet. No rock outcrops, boulder or marsh were noted. The surface soil is a silty loam.

2. SUBSURFACE CONDITION

Two borings were made 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 alternate foundation possibilities, and recover samples for soil textural identification and classification. Soil textures noted on the drilling logs are drillers field identification with a later check at the Central Geotechnical Section Office.

Boring 1 was taken at station 187+20 26 feet right of the existing centerline. Boring 1 was logged as the following; elevation 1147.5 to 1146.5 black topsoil, 1146.5 to 1120 firm silt with a 3 foot sand layer at 1142, 1120 to 1102 dense silt and sand, 1102 to 1093 very dense white sand, 1093 to 1082 firm brown silt, 1082 to 1075.5 brown and white sandstone (cored 5', 20% recovery).

Boring 2 was taken at station 187+75 8.5 feet left of the existing centerline. Boring 2 was logged as the following; elevation 1150.7 to 1149.8 asphalt, 1149.8 to 1147.3 concrete, 1147.3 to 1121 loose to firm gray silt, 1121 to 1083, dense to firm silt and sand layers, 1083 to 1081 gravel, 1081 to 1078.5 very dense brown/white sand, 1078.5 to 1072 brown limestone (cored 5', 20% recovery).

<u>Structure Unit</u>	<u>Station</u>	<u>Rock Elevation</u>	<u>Rock Type</u>
West Abutment	187+20	1082±	Sandstone
East Abutment	187+75	1080	Sandstone
		1078	Limestone

The water elevation was 1145.3 at the time the borings were made. The topsoil thickness was 1 foot  $\pm$ .

### 3. BEARING CAPACITY.

A cursory review indicates that the soils down to a practical footing depth are inadequate for bridge support on footings.

### 4. PILES.

The following chart can be used to set pile lengths.

<u>Structure Unit</u> <u>Elevation</u>	<u>Skin Friction (psf)</u> <u>(SF=2)</u>	<u>End Bearing (psf)</u> <u>(Displ.) (SF=2) (H-Piles)</u>	
West Abutment			
1145 to 1120	150		
1120 to 1102	250		
1102 to 1093	800	202,000	121,000
1093 to 1082	400		
1082 to 1076	Weathered Rock and Rock		
East Abutment			
1145 to 1121	150		
1121 to 1083	350		
1083 to 1072	Weathered Rock and Rock		

The above pile values are applicable to piles having a normal cross section ranging from 10 to 14 inches.

The approximate pile tip elevations are as follows:

<u>West Abutment</u>		<u>East Abutment</u>
1097 $\pm$ ?, 1081 $\pm$ for sure	H-piles	1081 $\pm$
1099	CIP-piles	1082 $\pm$

H-piles or oil field pipe piles could be driven to 9000 psi load in the steel section if driven to rock at elevation 1081 $\pm$ . They could fetch up at elevation 1097 $\pm$  on the west abutment.

### 5. ALTERNATE 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.

The active lateral earth pressure can be held to a minimum of 30 to 35 psf if the fill material behind the abutment or other earth retaining structures is a good sand material and adequate compaction and thorough drainage is maintained. If a silt material is used increase the pressures to 65 psf or more.

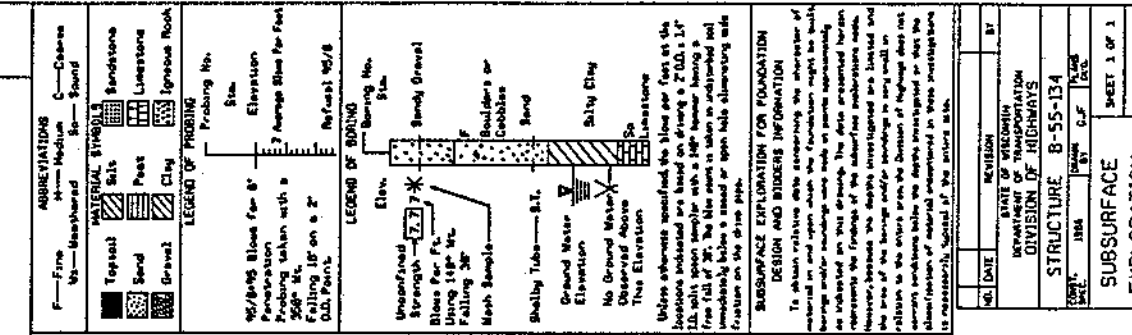
## 7. CONSTRUCTION PROBLEMS.

- A. If silts were used to build the abutment fills, a drainage system behind the abutments would alleviate water caused problems behind the abutments and other earth retaining structures.
- B. Silts are very much moisture sensitive and should be compacted below optimum moisture.
- C. Since the structure is to be widened the fills for the widening should be placed 6 months prior to the construction of the structure if possible to eliminate differential settlement between the old and newly filled areas.

## 8. RECOMMENDATIONS.

- A. Use H-piles driven to rock or 9000 psi load in the steel section. Rock elevation is  $1081 \pm$ . If the H-pile fetches up between elevation 1102 and 1097 on the west abutment it is ok to leave at that point. If the piles penetrate to elevation 1096 to 1093 before it fetches drive the piles to rock (elevation  $1081 \pm$ ).
- B. Use a good sand material for back fill and newly filled areas. If a silt material is used in place of sand put in a drainage system behind the abutments and any other earth retaining structures. Also since silts are very moisture sensitive, compact this type of material at below optimum moisture levels to prevent stability problems within the fill material.
- C. Since the structure is to be widened by  $10 \pm$  feet, the fill will most likely be widened by the same amount. Place the newly to be filled widenings at least 6 months prior to the construction of the structure to prevent differential settlement between the old existing fills and the adjacent newly filled widenings.

STATE PROJECT NUMBER	SHEET NO.
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## FIELD BORING LOG

EL3(5) 385

State of Wisconsin/Department of Transportation

Boring No. 1 Structure B-55-134 County St Croix Sheet Lot 2Project B949-04-03 Road USH 12Station 187+20 Offset 26' Rt Existing Surface Elevation 1147.5White drilling 26' Time after drilling \_\_\_\_\_Before casing removal revert Depth to water \_\_\_\_\_

After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_

Cave in 71' Water Notes \_\_\_\_\_

MOISTURE  
D = Damp  
M = Moist  
W = Wet

HS = Hollowstem  
WA = Washhead  
RB = Rockbit

ST = Shelby tube  
SS = Split spoon  
DM = Drilling mud

DRILLING METHOD  
A = Auger  
C = Coring  
W = Wash

E = Easy  
M = Medium  
H = Hard

Start 3-3-94 Unit 7  
Finish 3-22-94 Chief Horsstman

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Visual Field Classification and Remarks	Unclassified Strength	Boulders	Blows on		Drilling Method
		0/5	0/12					Casing Size	Probe Size	
					Water Elev. 1145.3					
					BI TOPSOIL					19
					DK grey SILT tr sand					
1	W	5	6							
		6	7		Firm grey SAND tr little silt tr gravel			Aut Down		
					Loose grey SILT tr clay					
2	M	4	5			1.5				
		7								
3	M	7	10			3.75				
		12						25		
								30		
4	W	14	12		Layer grey sand	4.0				
		10								
5	M	15	13		Firm Br. grey SILT tr sand + gravel tr. clay	4.0				
		12								
6	M	14	25		Dense	4.25				
		25								
7	W	17	27		Dense Br. & white SAND tr silt					
8	M	20	27		Dense Br. SILT tr fine sand	3.25				

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 1

## FIELD BORING LOG

E1.3(5) 385

State of Wisconsin Department of Transportation

Boring No. 1 Structure B-55-134 County St Croix Sheet 2 of 2Project 8949-04-03 Road 125 H 12Station 187+20 Offset 26' Rt Existing Surface Elevation 1147.5

## GROUND WATER OBSERVATIONS

While drilling 20' Time after drilling \_\_\_\_\_

Before casing removal \_\_\_\_\_ Depth to water \_\_\_\_\_

After Boring Completed \_\_\_\_\_ Depth to casing \_\_\_\_\_

Cave In 71' Water Notes \_\_\_\_\_

MOISTURE		DRILLING METHOD				Start	Unit
D = Damp	HS = Hollowstem	ST = Shelby tube	A = Auger	E = Easy	3-3-94	7	
M = Moist	WA = Washhead	SS = Split spoon	C = Coring	M = Medium	3-22-94	Chief Horstman	
W = Wet	RB = Rockbit	DM = Drilling mud	W = Wash	H = Hard			

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unclassified Strength	Boulders	Blows on:		Coring Method
		0/5	6/12					Casing Size	Probe Size	
8	m	20	27	40	Dense Br SILT to fine sand.	3.25				WFA RB KOB
9	m	20	65	45	V. Dense fine white SAND	4.75				
10	m	50	68	50						
	m	9	12	15	Firm Lt Br. SILT no recovery					
11	m	9	13	60	Firm gray SILT to sand	2.75				
12	w	13	34	65	SS. refusal Br. & white SANDSTONE Cored 66.5' - 71.5' 20% recovery					C
13	w	14	14	70	E.O.B.					

Checked by _____	Plat _____	Boring No. <u>1</u>
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## FIELD BORING LOG

BJ3(S) 385

State of Wisconsin Department of Transportation

Boring No. 2 Structure B-55-134 County St Croix Sheet 1 of 2Project 8949-04-03 Road USH 12Station 107475 Offset 8.5' Lt existing Surface Elevation 1150.7

## GROUND WATER OBSERVATIONS

While drilling \_\_\_\_\_ Time after drilling \_\_\_\_\_

Before casing removal \_\_\_\_\_ Depth to water \_\_\_\_\_

After Boring Completed \_\_\_\_\_ Depth to cave-in \_\_\_\_\_

Cave In \_\_\_\_\_ Water Notes \_\_\_\_\_

MOISTURE  
D = Damp  
M = Moist  
W = WetHS = Hollowstem  
WA = Washhead  
RB = RockbitST = Shelby tube  
SS = Split spoon  
DM = Drilling mudA = Auger  
C = Coring  
W = WashE = Easy  
M = Medium  
H = HardStart 3-4-94 Unit 4Finish 3-11-94 Chief Horizon

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	Visual Field Classification and Remarks	Unclassified Strength	Boulders	Blows on		Drilling Method
		0/6	6/12					3" Casing Size	Probe Size	
					Water Elev. 1145.3					
					11" Asphalt					A
					Concrete					
	m				Loose Gray SILT to sand, 2" gravel			Push		
1		3	4					↓		
		4	5					11		
								19		
								24		
2	w	3	3					18		WA
		3						Roll		RB
										Revert
3	m	2	2		Loose Gray SILT to clay	1.75				
		3								
4	m	6	8		Firm	3.75		↓		
		10						29		
								33		
								35		
								38		
5	m	7	7		Firm to grey SILT	4.0		40		
		8						42		
								45		
								48		
								47		
6	m	14	20		Dense <sup>med</sup> white SAND			47		
		20						45		
								48		
								47		
								49		
7	M	16	15		DENSE BEN TO GREY SILT	4.25		42.5		
		20						67		
								70		
								74		
								73		
8	D	9	12		FIRM BEN SILT SEAMS OF MED-FN	4.0		4.075		
		13			WHITE SAND			70		

Checked by \_\_\_\_\_ Final \_\_\_\_\_ Boring No. 2

