

CORRESPONDENCE/MEMORANDUM

STATE OF WISCONSIN

Date: January 12, 1988

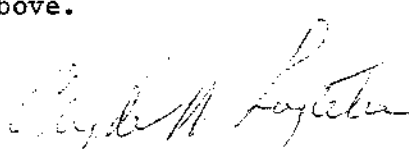
File Ref:

To: Mr. Fred Ross, District Director
Attention: Mr. Bruce Eastenson, District Materials Engineer

From: Mr. Gary C. Whited,
State Materials Engineer for Highways

Subject: MATERIALS/SOILS
SITE INVESTIGATION REPORT
Project I.D. 7106-01-00
STH 72 over Knights Creek-
West County Line to Downsville Rd.
Structure B-17-121
Dunn County

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


by Clyde N. Laughter,
Chief Soils Engineer

CNL/csw

cc: District 6 (Orig.+ 3)
Bridge (2)
Design
GCW
MOF
Soils

SITE INVESTIGATION REPORT
Project I.D. 7106-01-00
STH 72 over Knights Creek-
West County Line to Downsview Rd.
Structure B-17-121
Dunn County

1. General

A single span structure is planned to carry STH 72, Station 286+40±, over Knights Creek to replace the existing 3-span trestle type bridge. At the time of drilling, December 1987, the meandering stream was 15± feet wide and about 6 inches deep. The approach fills are about 20 feet high and there is no evidence of recent settlement or other distress. The adjacent soils are sandy and no boulders or marsh were observed. The local topography is open to wooded rolling farmland.

The existing bridge, designed in 1941, is supported on treated timber piles loaded to 15 ton/pile at 45 foot length. In the trestle with some 18 feet of the piling in the air, this would mean about 27 feet of penetration into natural ground to achieve 15 tons per pile. This assumes the driving followed plan quantity but no driving records exist. The stream banks are rip rapped.

2. Subsurface Conditions

Two borings were made on the site following ASTM Method T-206, Standard Penetration Test to evaluate relative soil densities, set out presumptive bearings, establish values for deep foundation design, scan alternative foundation methods and recover samples for soil identification and classification. Soil textures noted are driller's field identification with a later check in the Central Soils Office.

Boring 1, Station 286+89, 7.5' right of center line was made through the bridge deck, elevation 814±. The first 7 feet was air to elevation 807±. Below this loose gray sand was logged to elevation 786± where loose green sand was noted. This continued to elevation 754± where firm white sands were logged down to a dense sand at elevation 749±. The dense sand overlies sandstone at 744±.

Boring 2, Station 287+94, 8.5 feet left of center line, was also made from the bridge deck elevation 815±. Air under the deck was logged to elevation 804±. Below this very loose to loose brown sands predominated to elevation 780± although a 5 foot strata of barely firm sand was logged between elevation 795±, firm green fine silty sand was logged to elevation 775 where a very dense greenish white medium sand was encountered. The very dense sand continued to elevation 768± where a very dense white sandstone was logged.

At the time of drilling, the ground water elevation was 788.5 which was creek level. In the relatively permable sands encountered here, the ground water will always approximate stream level and fluctuate with it.

3. Bearing Capacity

A superficial scan indicates the soils bearing capacity is not adequate to support a bridge of 105± foot span length. No additional analyses were made.

4. Piles

The subsurface conditions are radically different between the 2 abutments. Therefore each should use separate values.

West Abutment

<u>Elevation</u>	<u>File Skin Friction</u> (psf) (SF=2)	<u>End Bearing, psf</u> (Diapl.Piles)(H-Piles)	
Surface to 776±	150*	4,000	----
776± to 754±	350*	44,000	28,000
754± to Sandstone	500	150,000	95,000
Sandstone	---	Refusal	2-3' penetration

* Increase 25% for treated timber.

East Abutment

<u>Elevation</u>	<u>File Skin Friction</u> (psf) (SF=2)	<u>End Bearing, psf</u> (Diapl.Piles)(H-Piles)	
Surface to 780±	150*	4,000	----
780± to 775±	350*	44,000	28,000
775± to Bedrock	500	150,000	95,000
Sandstone Bedrock	---	Refusal	2-3' penetration

* Increase 25% for treated timber.

5. Alternate Foundation Types

Both vibratory approaches (Vibroflotation, Terra-Probe, etc.) and dynamic methods (Dynamic Compaction, ground pounding, etc.) can increase soil density to allow 2½-3 tsf bearing capacity. With a mobilization fee of \$3-5,000, for a structure of this size, no cost savings are possible. Also, the amount of existing rip rap tends to indicate a scour potential which lessens footings-on-grade attractiveness.

Drilled caissons or shafts would require casing or heavy mud with tremie pour which is not a desirable construction method if other choices are available. This technique also carries a hefty move-in outlay.

6. Lateral Earth Pressure

The locally available sands will exert an active lateral earth pressure (equivalent fluid) of 30-33 psf on abutment backwalls or other earth retaining structures, if well compacted and thoroughly drained. Silts with equivalent placement will create forces of 50-54 psf and a clay 80-85 psf regardless of placement.

Naturally if drainage is ineffective and water accumulates, the minimum pressure will be 63 psf and actual pressures up to 105 psf may be anticipated.

7. Construction Problems

The degree and depth of weathering of the sandstone will vary so slight variations in pile penetration is likely. No other foundation construction problems are foreseen.

8. Recommendations

For the span length involved here, spread footing on $N = 3$ to 6 are not workable. This then leaves piles as the indicated choice with a selection between timber piles at extremely low capacity, say 20 ton/pile, and higher loadings at greater depths. For a 105± foot span, treated timber sticks at 20 ton/pile will require a larger number of piles with possibly larger footings. The 20 ton/pile capacity is emphasized as in loose sands of the characters logged here the capacity will increase to about 20 tons at some 20-25 pile diameter with no further increase in bearing until better soil is reached.

This then leaves a choice between H-sections at 9,000 psi in the steel section and oil field thick wall pipe of the same capacity. Several things favor the oil well pipe with cost and a better bearing surface on weathered sandstone being the 2 most compelling considerations.

With the apparent bridge shortening from 119± feet to 105± feet, some new bridge end fill will be constructed. This should be constructed as early as possible as the loose sands in shallower depths will consolidate some under load. Early construction attenuates the bridge end bump.

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 1

Structure Knights Creek B-17121

County Dunn

Sheet 1 of 2

Project 7106-01-00

Road STH "72"

Station 286+89

Offset 7.5' At 2

Surface Elevation 814.2

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 = Wet

HS = Hollowstem

WA = Washahead

RB = Rockbit

ST = Shelby tube

SS = Split spoon

DM = Drilling mud

A = Auger

C = Coring

W = Wash

E = Easy

M = Medium

H = Hard

Start 10/30/87

Unit III

Finish 11-4-87

Chief Mayers

Sample No.	Moisture	Blows on Sampler		Sample and Recovery	VISUAL FIELD CLASSIFICATION AND REMARKS	Unconfined Strength	Boulders	Blows on		Drilling Method
		0/6	6/12					Casing Size	Probe Size	
					Concrete Deck					Core
					Air					
1	M	1	2		Loose Gray SAND - Tr Fine Gravel			4		
					Tr organic mnts			6		
								11		
								12		
								12		
2	M	2	2					6		RB
										Ahead
										Reverts
3	W	2	4							
4	W	5	4		No Recovery.					
					Loose Green SAND - Little silt					
					Tr of silt seams					
5	W	2	3							
6	W	5	4							
					Firm Green SAND - Little silt					
					Seams					
7	W	5	7							

Checked by

Final RFR

Boring No. 1

FIELD BORING LOG

EL3(S) 385

State of Wisconsin/Department of Transportation

Boring No. 2 Structure Knight's Creek B-17-121 County Dunn Sheet 2 of 2

Project 7106-01-00 Road STH 72

Station	287+94	Offset	8.5' LT C/L	Surface Elevation	815.0
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GROUND WATER OBSERVATIONS

Surface Elevation 815.0
Water - 788.5

While drilling _____ Time after drilling _____

Before casing removal = 17' → Depth to water

After Boring Completed _____ Depth to cave-in _____

Cave In _____ Water Notes _____

DRILLING METHOD

by tube

A = Auger

C = Coring
W = Wash

W = Wash

E = Easy

M = Medium
H = Hard

H = Hard

Start 12-10-87 Unit 3

Finish 11 Chief Davis

DRILLING METHOD

by tube

A = Auger

C = Coring
W = Wash

E = Easy

M = Medium
H = Hard

H = Hard

Start 12-10-87 Unit 3

Finish 11 Chief Davis

[illegible]

Checked by _____

Final

Boring No.

2