

CORRESPONDENCE/MEMORANDUM

STATE OF WISCONSIN

Date: July 1, 1983

File Ref:


To: Mr. Thomas R. Clark, District Director
Attn: Mr. John Biles, District Soils Engineer

From: Mr. G. H. Zuehlke, Chief Materials Engineer

Subject: MATERIALS
SOILS
SITE INVESTIGATION REPORT
S.T.H. 64 over Willow River - Knowles
Avenue in New Richmond
Structure 13-55-91
St. Croix County

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

By:


C. N. Laughter
Chief Soils Engineer

CNL:wh

cc: District 6 (3)
GHZ
DLS
SW
MO FILE
SOILS ✓

SITE INVESTIGATION REPORT
Project I.D. 1559-03-00
S.T.H. 64 over Willow River
Knowles Avenue in New Richmond
Structure B-55-91
St. Croix County

1. General

A subsurface investigation has been made for the proposed replacement carrying STH 64 (Knowles Avenue), station 29 + 50⁺ over the Willow River in New Richmond. The boring plan was predicated on the information that the existing piers will be used for the new bridge while the abutments will be moved back from the existing abutment line. No major grade line change is foreseen.

2. Subsurface Conditions

Four borings were made on the site. Standard Penetration Tests, AASHTO T-206, were made to estimate relative soil density, fix presumptive bearings, establish pile selection and support parameters, and recover samples for classification and identification. Two NW rock cores were cut to recover specimen for examination and evaluation. Recoveries of 56% on a 5 foot run, 100% on a 1 foot run, and 53% on a 45 foot run were logged. Soil textures noted on the drilling logs are driller's field identification.

Below the roadway structure from elevation 979⁺ down to bedrock at 962⁺, the soils were predominantly sands or sands and gravel. The upper zones are largely loose to firm while some dense zones were noted near bedrock. There is little or not stratification for density.

The ground water was essentially at river level. With the granular soils, ground water will be near and fluctuate with river stage.

3. Bearing Capacity

It is unlikely abutments will be founded on spread footing type support. However, should it be desirable to use footing-on-grade support the soils above bedrock should have a bearing capacity of 2000 psf plus 300 psf for each foot of embedment but not to exceed 4000 psf. The bedrock capacity would be 10 tsf.

4. Piles

If piles are used, the most suitable foundation type is steel H-piles driven to bedrock.

5. Alternate Foundation Types

Vibratory or impact methods such as Terra-Probe, Vibroflotation, or Dynamic Compaction can be used to improve bearing up to 2½ to 3 tsf. With the

mobilization costs of \$4-5,000 for this treatment, no cost saving is possible.

Similarly for drilled caisson or drilled shafts, no economic benefit is possible although a shaft socketed 4 feet into rock could be designed for 30 tsf.

6. Lateral Earth Pressure

For the locally available granular soils in a well drained condition, an active earth (equivalent fluid) pressure of 30 psf should be used.

7. Construction Problems

There are isolated hard zones, for example Boring 1 at elevation 970⁺ that may cause erratic driving of piles and difficulty in driving sheet piles if used.

8. Recommendations

Steel H-Piles driven to 10,000 psi in the steel section appear to be the most suitable foundation units for this structure.

E-L-3(S)- 8-76

State of Wisconsin/Department of Transportation

Boring No. 2

Structure B-55-91- Willow River

County St. Croix

Sheet 1 of 1

Project 1559-03-00

Road STM 65 in City of New Richmond

Station 30+36

Offset 17' 2" E

Surface Elevation 980.7

While drilling wet 12'

Time after drilling

Before casing removal

Depth to water

After Boring Completed

Depth to cave-in

Cave In

Water Notes

GROUND WATER OBSERVATIONS

MOISTURE

D = Damp

M = Moist

W = Wet

WA = Washahead

FT = Fish tail

RB = Rock bit

DRILLING METHOD

ST = Shelby tube

SS = Split spoon

DM = Drilling mud

A = Auger

C = Coring

W = Wash

E = Easy

M = Medium

H = Hard

Start 6/22/83

Unit II

Finish

Chief Meyers

| 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 | |
| | | | | | 7" Concrete | | | | | A |
| | | | | | Loose Br. Med SAND | | | | | |
| 1 | M | 3 | 2 | 5 | | | | 3 | | W |
| | | 6 | 5 | | | | | 4 | | |
| | | | | | | | | 7 | | |
| | | | | | | | | 37 | | |
| 2 | W | | 39 | 10 | Firm to Dense Br. SAND and GRAVEL | | | 53/19 | | |
| | | 11 | 7 | | Little s.s. | | | 37 | | |
| | | | | | | | | 30 | | |
| | | | | | | | | 41 | | |
| | | | | | Firm Br. Med SAND - Tr. | | | 32 | | |
| | | | | | | | | 17/2 | | |
| 3 | W | 4 | 5 | 15 | No Recovery. Gravel | | | 11 | | |
| | | 6 | | | wash Sample | | | 15 | | |
| | | | | | | | | 14 | | |
| | | | | | | | | 19 | | |
| | | | | | | | | 63 | | |
| | | | | | | | | 26 | | |
| 4 | W | 19 | 18 | 20 | Weathered Sandy Limestone | | | | | |
| | | 21 | 52 | | with layers of Sand Stone | | | 72 | | |
| | | | | | SS. Refused (R.B. Ahead) | | | | | |
| | | | | | First Run 1' 100% | | | | | |
| | | | | | Sec. Run 4.5' 53% Recovery | | | | | |
| | | | | | Limestone with Sandy Limestone layers | | | | | |
| | | | | | End of Bor. | | | | | |

State of Wisconsin/Department of Transportation

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| MOISTURE | | DRILLING METHOD | | | | Start | Unit |
|-----------|----------------|-------------------|------------|------------|---------|-------|------|
| D = Damp | WA = Washahead | ST = Shelby tube | A = Auger | E = Easy | 5/25/83 | FT | |
| M = Moist | FT = Fish tail | SS = Split spoon | C = Coring | M = Medium | | | |
| W = Wet | RB = Rock bit | DM = Drilling mud | W = Wash | H = Hard | Finish | Chief | |

| | | |
|------------|-------|--------------|
| Checked by | Final | Boring No. 4 |
|------------|-------|--------------|