GEOTECHNICAL DATA REPORT

PRELIMINARY GEOTECHNICAL EXPLORATION

SAN-SOUTH-00.16
SFN: 7260261

SOUTH ST BRIDGE OVER RACOON CREEK
SANDUSKY COUNTY, OHIO

January 30, 2014

URS

1375 Euclid Avenue
Cleveland, Ohio 44115
216-622-2400
Project No. 15018079

TABLE OF CONTENTS

ATTACHMENTS

Figures

Appendices

This project, **SAN-SOUTH-00.16**, includes the removal, replacement and widening of an existing bridge carrying South Street over Racoon Creek in southwest Clyde in Sandusky County, Ohio. The existing bridge is a single span precast or prestressed concrete bridge on concrete abutments. The proposed bridge is single span structure on reinforced concrete substructures over Racoon Creek.

A subsurface exploration was performed at the bridge site, in general accordance with the Ohio Department of Transportation's (ODOT's) *Specifications for Geotechnical Explorations* (SGE). The exploration focused on characterizing the subsurface profile at the site, information that will be used to support the design and construction of the replacement bridge structure. A total of two (2) borings were drilled, one boring near each abutment. The borings were advanced within South Street right-of-way, to depths of 50 and 51 ft below the ground surface.

The subsurface profile consisted of surficial materials (consisting of asphalt and granular base roadway materials), overlying fill materials, and native granular deposits overlying fine grained deposits. The fill soils encountered were both coarse and fine-grained materials with classifications of sandy silt (A-4a) and coarse and fine sand (A-3a). The underlying native soils consisted of coarse-grained and fine-grained soil deposits. The coarse-grained soils were loose coarse and fine sand (A-3a) overlying a very stiff fine-grained native deposit classified as sandy silt (A-4a) or silt and clay (A-6a).

1.1 PROJECT UNDERSTANDING

The existing bridge is structurally deficient and based on the critical ratings and ODOT review, it has been concluded that the structure is subject to demolition and complete replacement. As part of the reconstruction process, the proposed replacement bridge is anticipated to be a single span structure with reinforced concrete substructures. Foundations are to be completely reconstructed, with no reuse of any existing elements. The project is to be let as a design/build contract.

2.1 GENERAL GEOLOGIC SETTING

The project site is located in the glaciated region of Ohio. According to the Ohio Department of Natural Resources (ODNR) Map entitled *Physiographic Regions of Ohio, 1998* the site is located west of the Columbus Escarpment within the Maumee Lake Plains of the Huron-Erie Lake Plains of the Central Lowland Providence. The ODNR *Surficial Geology of the Lorain 30 x 60 Quadrangle, 2005* indicates the regional soil to consist of Wisconsin age (14,000 to 25,000 years ago) soils up to 50 ft of clay, silt, sand, and unsorted mixture of soils. According to the ODNR Map entitled *Bedrock Geologic Map of Ohio,* the regional soils are underlain by Silurian-age (416 to 423 million years ago) sedimentary rock consisting of dolomite, gypsum, salt, and shale. The ODNR *Reconnaissance Bedrock Topography of the Clyde, Ohio, Quadrangle* indicates the depth of bedrock to vary in range of approximately fifty (50) feet to sixty (60) feet below ground surface (bgs). According to the ODNR Map entitled *Ohio Karst Areas,* the site is near mapped probable Karst areas.

2.2 EXISTING SITE CONDITIONS AND RECONNAISSANCE SUMMARY

The existing bridge on South Street over Racoon Creek is located in southeast Sandusky County, Ohio. The general site location is shown in **Figure 1 – General Site Location Map** in the report attachments.

Site reconnaissance was performed on December 6, 2013 and ODOT Bridge Inventory reports were reviewed in the office. The existing bridge structure was originally built in July of 1900 and underwent a major rehabilitation in January 1970. The current structure was constructed with either precast or pre-stressed concrete deck supported by concrete abutments. The structure dimensions are 41.5 ft structural width and 25 ft long single span. Based on observation made in the field, no discernable signs of slope instabilities were noted in the vicinity of the existing structure.

The properties adjacent to the structure are generally residential parcels. Existing utilities noted onsite include an overhead electrical power line supported by timber utility poles was, located on the southern side of South Street.

3.1 SUBSURFACE EXPLORATION

Borings were located in the field by URS personnel during initial site reconnaissance. Borings were located as close as possible to the abutments of the existing structure, in deference to traffic safety and access. The Ohio Utilities Protection Service was notified, and boring locations were verified as clear of utility conflicts prior to the start of drilling activities. Traffic control was implemented using traffic barricades and roadway signs to alert and redirect traffic during drilling operations. Furthermore, drilling operations were coordinated with the Sandusky County Engineer's office.

URS's subsurface exploration at the project site included two (2) soil borings, B-001-0-13 and B-002-0-13. Boring B-001 was located near the eastern abutment and B-002 near the western abutment. Soil boring B-001 was drilled to termination depth of 51 ft below the ground surface (bgs) and boring B-002 was drilled to 50 ft bgs.

URS subcontracted Ohio TestBor, Inc. of Hinckley, Ohio to provide drilling services. All soil borings were drilled using a Mobile B-57 truck mounted drill rig utilizing 3¼-inch inner diameter hollow stem augers. Drilling activities were conducted on January 14 and 15, 2014.

A URS geologist accompanied and directed the subcontractor during all aspects of the drilling operation and logged the soils encountered in accordance with the ODOT's *Specifications for Geotechnical Explorations* (ODOT SGE). During drilling activities, representative soil samples were collected from the borings for classification and/or testing. The s samples were obtained by Standard Penetration Testing (SPT) utilizing a split-spoon sampler in general accordance with the ODOT SGE. Where applicable, a pocket penetrometer was used to estimate unconfined compression strength of cohesive fine-grained soils. Samples were visually classified in the field and then placed in sealed glass jars upon recovery for additional analysis. Soil samples were returned to URS's Cleveland, Ohio office, where the visual classification was confirmed and samples were prepared for shipment to the laboratory for index property testing. Where groundwater was encountered, the water level in the open borehole was measured prior to backfilling. Complete graphical boring logs are provided in **Appendix A**.

Upon completion, borings were backfilled with cement bentonite slurry or auger cuttings mixed with cement to seal the borehole. When advanced through the existing roadways, borings were patched with an asphalt cold patch, in general accordance with SGE requirements.

3.2 LABORATORY TESTING

Sealed soil samples were transported to the URS Cleveland office, where a geotechnical engineer selected samples for laboratory testing. The selected split spoon soil samples were then sent to URS's soil testing lab subcontractor CTL Engineering in Brunswick, Ohio for testing.

Laboratory testing was performed to confirm soil classifications and to establish the index and engineering properties of the soils. The laboratory-testing program included the following type and number of tests, which were assigned in general accordance with SGE requirements:

Table 1: Summary of Laboratory Testing

Test Specification	Reference Standard	Number Of Tests
Natural Moisture Content	ASTM D 2216	11
Atterberg Limits (Plasticity Index, Liquid Limit)	ASTM D 4318	11
Particle Size Analysis	ASTM D 422	11

Complete lab result sheets are presented in **Appendix B**.

4.1 SUBSURFACE CONDITIONS

The following sections present the site-specific subsurface conditions in detail. The discussion is based on the results of the soil borings and laboratory testing.

In summary, the subsurface exploration encountered surficial materials such as asphalt pavement and granular base, underlain by fill materials, native fine-grained deposits, and sedimentary bedrock. These strata are discussed in detail below.

4.1.1 Surficial Materials

Both borings were drilled within the roadway near the existing structure. The thickness of surficial materials encountered is summarized in **Table 2** below:

Table 2: Summary of Surficial Materials

BORING OR CORE ID	ASPHALT THICKNESS (INCHES)	GRANULAR BASE THICKNESS (INCHES)
B-001	5	8
B-002	10.5	7.5

4.1.2 Fill Materials

Fill material were encountered below the surficial materials in both borings. The fill materials in boring B-001 was fine-grained with classification of moist, brown and gray, sandy silt (A-4a) and fill in boring B-002 was coarse-grained with classification of moist, brown, fine sand (A-3).

The fill materials extended to depths of 4 to 6.75 feet below ground surface (bgs) with thickness varying from 2.5 to 5.8 ft thick. Standard Penetration test (SPT) N_{60}-values within the coarse-grained fill was 8 blows per foot (bpf), indicating a loose consistency. N_{60}-values within the fine-grained fill varied from 3 to 16 bpf with an average of 8 and pocket penetrometer results varied from 0.5 to 4 tons per square foot (tsf) with an average of 2 tsf, indicating a stiff consistency on average. Laboratory results in the fine-grained fill soils include; moisture content of 15%, Liquid Limit (LL) of 25, and Plasticity Index (PI) of 8. Laboratory results in the coarse-grained fill soils include a moisture content of 19% and non-plastic fines.

4.1.3 Native Coarse-Grained Deposits

Beneath the fill materials a native deposits consisting of coarse-grained soils was encountered in both borings. The native coarse-grained soils were generally classified as moist to wet, brown or light brown coarse and fine sand (A-3a) with varying amounts of silt. This deposit was first encountered at depths of 4 and 7 ft bgs and extended to 9.25 (B-001) and 8 (B-002) ft bgs at the native fine-grained deposits (described below). Standard Penetration test (SPT) N_{60}-values within the deposit varied from 3 to 11 bpf, with an average near 5 bpf indicating a loose consistency on average.

4.1.4 Native Fine-Grained Deposits

A native fine-grained deposit was encountered beneath the native coarse-grained deposit. The native fine-grained soil was classified as moist to moist, grayish brown sandy silt (A-4a) or silt and clay (A-6a) with gravel content in trace amounts. This layer was first encountered at 8 to 9.25 ft bgs and extended to the bottom of the borings at 51 ft bgs in B-001 and 50 ft bgs in B-002 at the apparent top of rock. In boring B-002, this fine-grained deposit was interbedded with a 7.7 ft thick granular layer consisting of coarse and fine sand (A-3a) and gravel and/or stone fragments with sand (A-1-b). Standard Penetration test (SPT) N_{60}-values within the native fine-grained soils varied from 18 to more than 50 bpf, with an average near 39 bpf. Pocket penetrometer results varied from 0.75 to greater than 4.5 tons per square foot (tsf) with an average near 3.8 tsf, indicating a very stiff consistency on average. Average laboratory results in the fine-grained deposit include; moisture content of 12.3% [range of 9 to 20%], LL of 24 [range of 18 to 29], and PI of 9 [range of 5 to 12]. Laboratory results in the coarse-grained interbedded layer had a moisture content of 14% and non-plastic fines.

4.2 GROUND WATER CONDITIONS

Groundwater was noted in the samples during drilling, and water levels in the completed boreholes were measured prior to borehole sealing. The presence of groundwater was detected in both borings B-001 and B-002 and was first encountered at depths of 6 to 7 ft bgs. The measured water levels were generally found within the fill and native coarse-grained soil interface near the existing creek water levels.

Based on the short time the boreholes were left open, groundwater levels during the subsurface exploration most likely did not reach equilibrium. The static groundwater table will most likely follow the natural topography of the site area and will fluctuate with seasonal variations in climate. Fluctuations in the level of perched water zones above the static water table are anticipated to be more sensitive to weather conditions

This report presents only the findings and data obtained during the course of the subsurface exploration performed. Geotechnical recommendations, design, and interpretation is the responsibility of the Design-Build Team.

The data presented herein represent the conditions encountered at the specific locations and at the specific times at which our exploration took place. It should be noted that variations in soil and rock stratigraphy and characteristics and groundwater conditions between exploration locations, that may become evident during construction, are possible.

The geotechnical information presented in this report is based on the data collected for this project. The geotechnical information presented in this report should not be used for other projects or purposes. Conclusions made from these data by others are their responsibility. Our services were provided in a manner consistent with the level of care and skill ordinarily exercised by other professional consultants under similar circumstances. No other representation is intended.