
Technical Memorandum

To: Robert A. Magliola S.E., P.E., Project Manager, Parsons Corporation
From: Mohammed (Mike) Kothawala, P.E., Project Manager *mk*
Date: June 30, 2015
Subject: Geotechnical Investigation
Potential Contractor Staging Area
Project: US 52/IL 64 over Mississippi River
IDOT Job Nos. P-92-001-11/D-92-001-11
IDOT PTB 158, Item 18
Wang Project No. 342-06-01

INTRODUCTION

The existing bridge carrying US 52 /IL 64 over Mississippi River will be replaced with a new structure. The bridge is located between Savanna, Carroll County, Illinois and Sabula, Jackson County, Iowa. As part of this project, a potential contractor staging area is identified at the east bank of Mississippi River north of Randolph Street in Savanna, Illinois. A *Site Location Map* is presented as Exhibit 1. Wang Engineering, Inc. (Wang) performed geotechnical investigation for the potential staging area. The purpose of our geotechnical investigation was to explore and identify the subsurface soil, rock, and groundwater conditions within this area that would provide information about the potential staging area. This technical memorandum presents the results of our field investigation, laboratory testing, and preliminary evaluation for potential design and construction.

The site is currently vegetated with riprap on the river bank slope. There is an access road between the BNSF railroad tracks and the river bank.

FIELD INVESTIGATION

For the potential contractor staging area, Wang drilled five borings, SAB-01 through SAB-05 to depths of 13 to 40 feet below ground surface (bgs). Drilling and sampling was completed in June 2015. At the time of our investigation the Mississippi River level was higher than normal and we were not able to access the proposed boring locations and we relocated borings 20 to 40 feet east of the proposed locations. The proposed and as drilled boring location plan is included as Exhibit 2. Four borings (SAB-01 through SAB-04) were

originally planned. Boring SAB-05 was performed after performing Borings SAB-03 and SAB-04 to determine top of bedrock variation between Borings SAB-03 and SAB-04.

ATV-mounted drilling rig was used to complete the borings. Drilling was conducted with hollow stem augers and casing was advanced to maintain open boreholes. Soil sampling was performed according to AASHTO T 206, "*Penetration Test and Split Barrel Sampling of Soils.*" The soil was sampled at 2.5-foot intervals to 30 feet and 5-foot intervals 30 to boring termination or to bedrock. Soil samples collected from each sampling interval were placed in sealed glass jars. As-drilled northing, easting, and elevations were surveyed by Wang using a mapping grade Trimble GPS survey system, capable of 4 inches more or less accuracy for vertical and lateral directions and they are shown in the attached *Boring Logs*.

Field boring log, prepared and maintained by a Wang soil inspector, included lithological descriptions, visual-manual soil and rock classifications, results of Rimac or pocket penetrometer unconfined compression tests, and Standard Penetration Tests (SPT) recorded as blows per 6 inches of penetration. The rock cores were measured for the recovery and Rock Quality Designation (RQD).

Groundwater levels were measured while drilling and at the completion of drilling operations.

RESULTS OF FIELD AND LABORATORY INVESTIGATIONS

Detailed descriptions of the soil conditions encountered during the subsurface investigation are presented in the attached *Subsurface Soil Data Profile* (Exhibit 3) and *Boring Logs*. Please note that strata contact lines shown on the borings represent approximate boundaries between soil types. The actual transition between soil types in the field may be gradual in horizontal and vertical directions.

The soils encountered below the surface are described in descending order as follows:

- a) Up to 6.7 feet of granular and/or cohesive man-made ground (fill). The granular fill is made up of loose gravelly loam to gravelly sand and the cohesive fill is made of stiff silty clay loam to clay loam characterized by unconfined compressive strength (Q_u) values of 1.0 to 1.5 tsf and moisture content (MC) values of 19 to 20%;
- b) Up to 25 feet interbedded layers of very loose to medium dense silt and fine sand characterized by SPT N-values of 0 to 10 blows/foot and MC values of 19 to 26%;
- c) Interbedded layers of very soft to soft, brown Silty clay loam were encountered within layer (b) This layer has Q_u values of 0.1 to 0.2 tsf and MC values of 25 to 28% underlain by medium stiff to stiff, red clay characterized by Q_u values of 0.9 to 1.1 tsf and MC values of 24 to 37%.

- d) Up to 9.2 feet of very dense, brown sandy gravel with cobble size weathered dolostone fragments characterized by SPT N-values of 64 blow/foot to sampler refusal, and moisture content (MC) of 4 to 15%;
- e) Silurian dolostone bedrock, encountered in Boring SAB-04 at 9.0 feet bgs described as strong, very poor to poor rock quality, horizontally bedded, moderately weathered dolostone with highly weathered joint, shale partings with recovery of 83 to 94% and rock quality designation (RQD) values of 0 to 33%.
- f) At 25 to 29.5 feet bgs in Borings SAB-01, SAB-02, SAB-03 encountered shale-mudstone interbedded bedrock, of Ordovician - Maquoketa Group, characterized by sampler refusal, MC values of 12 to 16%; Boring SAB-03 confirm the shale-mudstone bedrock presence described as weak, with very poor rock quality, and RQD values of 0%.

Groundwater was encountered during the drilling operations at 0 to 6 feet bgs and 0 to 8 feet bgs at completion of all borings.

PRELIMINARY EVALUATION

Based on subsurface soil conditions it is our opinion that steel H-piles could be used to support a staging area loading/unloading bulkhead. In the southern portion of the area where Borings SAB-04 and SAB-05 were performed, H-piles may not provide required fixity due to the bedrock at a relatively shallow depth and may need to be set into the rock. Driving of steel sheet piling will be very difficult below approximate elevation of 577 feet near Boring SAB-01 location, 564 feet near Borings SAB-02 and SAB-03 locations and 580 feet near Borings SAB-04 and SAB-05 because of very dense granular soils and/or bedrock.

Attachments:

Exhibit 1: Site Location Map

Exhibit 2: Boring Location Plan

Exhibit 3: Subsurface Soil Data Profile

Boring Logs



Mississippi River

Potential Contractor Staging Area



US 52

BNSF Railroad

IL 84

84

Wayne King Dr.

Clay St.

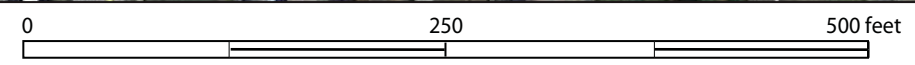
Randolph St.

Calhoun St.

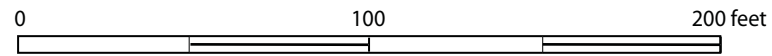
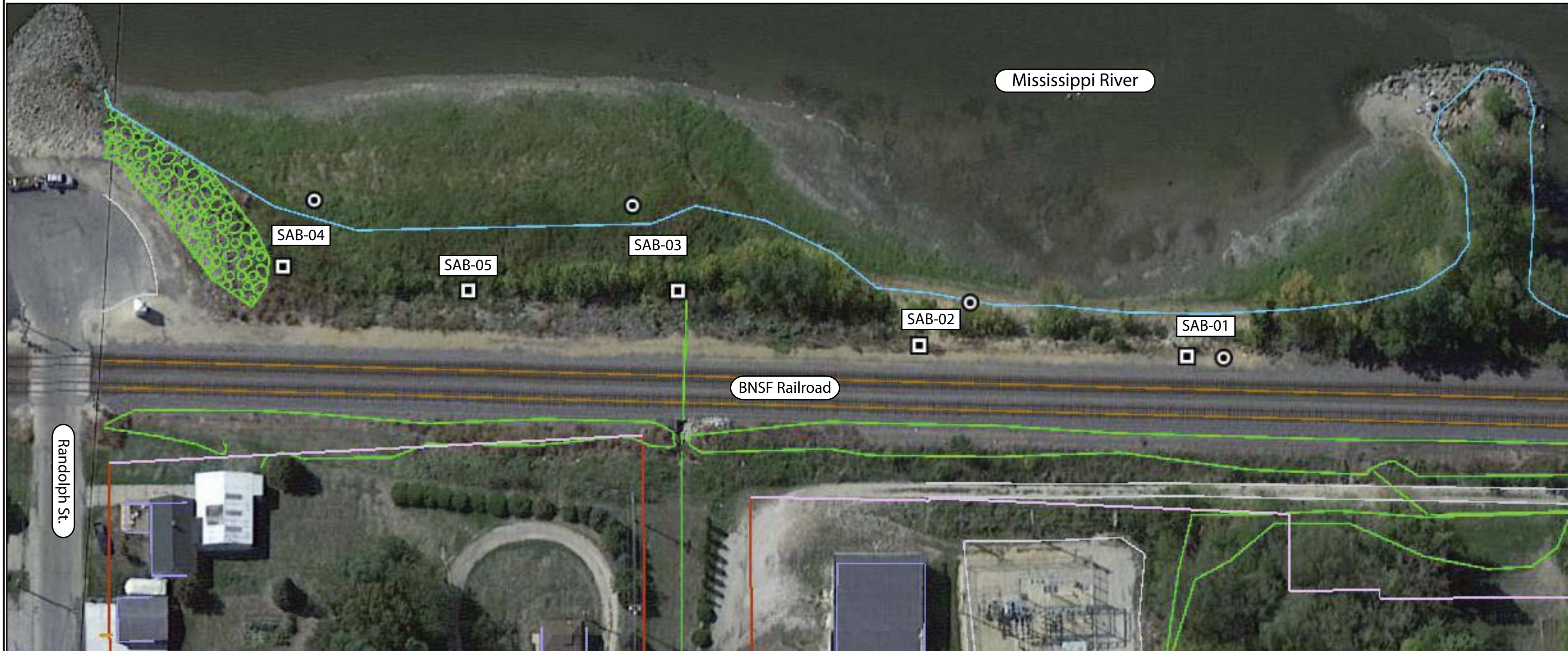
Main St

Google earth

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SITE LOCATION PLAN: US 52 OVER MISSISSIPPI RIVER, POTENTIAL CONTRACTOR STAGING AREA, SAVANNA, ILLINOIS		
SCALE: GRAPHICAL	EXHIBIT 1	DRAWN BY: B. Wilson CHECKED BY: M. Kothatwala
		1145 N. Main Street Lombard, IL 60148 www.wangeng.com
FOR PARSONS TRANSPORTATION GROUP, INC.		342-06-01



Legend

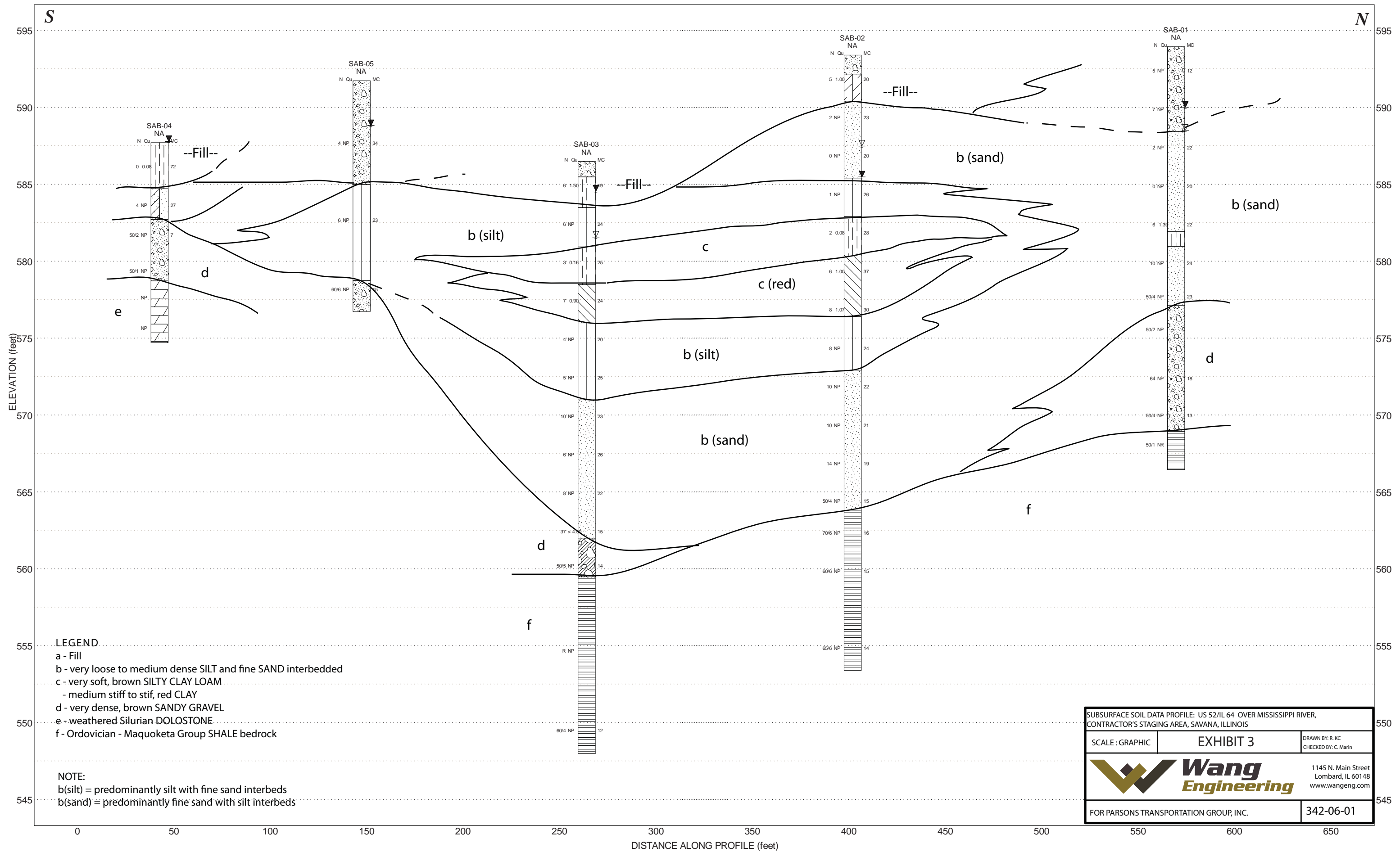
- Proposed Boring Location
- As-drilled Boring Location

BORING LOCATION PLAN: US 52 OVER MISSISSIPPI RIVER,
POTENTIAL CONTRACTOR STAGING AREA, SAVANNA, ILLINOIS

SCALE: GRAPHICAL EXHIBIT 2 DRAWN BY: B. Wilson
CHECKED BY: M. Kothatwala

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LEGEND

- a - Fill
- b - very loose to medium dense SILT and fine SAND interbedded
- c - very soft, brown SILTY CLAY LOAM
- medium stiff to stif, red CLAY
- d - very dense, brown SANDY GRAVEL
- e - weathered Silurian DOLOSTONE
- f - Ordovician - Maquoketa Group SHALE bedrock

NOTE:

- b(silt) = predominantly silt with fine sand interbeds
- b(sand) = predominantly fine sand with silt interbeds

SUBSURFACE SOIL DATA PROFILE: US 52/IL 64 OVER MISSISSIPPI RIVER, CONTRACTOR'S STAGING AREA, SAVANA, ILLINOIS		
SCALE: GRAPHIC	EXHIBIT 3	DRAWN BY: R. KC CHECKED BY: C. Marin
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		FOR PARSONS TRANSPORTATION GROUP, INC. 342-06-01



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BORING LOG SAB-01

WEI Job No.: 342-06-01

Client **Parsons Transportation Group, Inc.**
 Project **US 52 / IL 64 / IL 84**
 Location **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 593.95 ft
 North: 1980075.55 ft
 East: 2298786.25 ft
 Station: NA
 Offset: NA

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
		Loose, brown SANDY GRAVEL, trace cobbles			1	3 2 3	NP	12		566.5	--HARD, STEADY DRILLING at 25'-- Possible SHALE			11	50/1		NR
	589.7	Very loose, brown, fine SAND --Saturated--	5		2	3 4 3	NA					30					
					3	1 1 1	NP	22									
			10		4	0 0 0	NP	20				35					
	582.0	Stiff, brown SILTY CLAY LOAM			5	2 2 4	1.39 B	22									
	581.0	Medium dense, brown, fine SAND --interbedded SILT--	15		6	2 4 6	NP	24				40					
		--HARD DRILLING--			7	6	NP	23									
	577.1	Very dense, brown SANDY GRAVEL			8	50/4	NP										
		--HARD DRILLING-- --Possible Cobbles--	20		9	16 26 38	NP	18									
					10	24 45 50/4	NP	13				50					
	569.0		25														

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-16-2015** Complete Drilling **06-16-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
 Driller **N&M** Logger **F. Bozga** Checked by **C. Marin**
 Drilling Method **2.25" HSA, boring backfilled upon completion**

While Drilling ∇ **5.50 ft**
 At Completion of Drilling ∇ **4.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SAB-02

WEI Job No.: 342-06-01

Client **Parsons Transportation Group, Inc.**
 Project **US 52 / IL 64 / IL 84**
 Location **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 593.41 ft
 North: 1979907.69 ft
 East: 2298779.03 ft
 Station: NA
 Offset: NA

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	592.2	15-inch thick, brown SANDY GRAVEL --Gravel Sevice Road--			1	2 2 3	1.00 P	20		563.8				11	7 7 7	NP	19
	590.4	Stiff, brown and gray CLAY LOAM, little gravel --FILL--			2	1 1 1	NP	23			Very dense, greenish gray SILTY LOAM, laminated SHALE --SHALE BEDROCK--			12	9 22 50/4	NP	15
		Very loose, brown, fine SAND --interbedded SILT--	5		3	0 0 0	NP	20						13	70/6	NP	16
	585.4	Very loose, brown SILT --interbedded SAND--	10		4	1 0 1	NP	26						14	60/6	NP	15
	582.9	Very soft, brown SILTY CLAY LOAM			5	1 1 1	0.08 B	28									
	580.4	Stiff, red CLAY to SILTY CLAY	15		6	2 3 3	1.00 P	37		553.4	Boring terminated at 40.00 ft	40		15	65/6	NP	14
	576.4	Loose, gray SILT			7	3 3 5	1.07 B	30									
			20		8	3 3 5	NP	24									
	572.9	Medium dense, brown, fine SAND --Saturated--			9	4 4 6	NP	22									
			25		10	3 4 6	NP	21									

GENERAL NOTES

Begin Drilling **06-15-2015** Complete Drilling **06-16-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
 Driller **N&M** Logger **F. Bozga** Checked by **C. Marin**
 Drilling Method **2.25" HSA, boring backfilled upon completion**

WATER LEVEL DATA

While Drilling ∇ **6.00 ft**
 At Completion of Drilling ∇ **8.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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BORING LOG SAB-03

WEI Job No.: 342-06-01

Client **Parsons Transportation Group, Inc.**
 Project **US 52 / IL 64 / IL 84**
 Location **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 586.50 ft
 North: 1979772.08 ft
 East: 2298749.62 ft
 Station: NA
 Offset: NA

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	585.5	Brown GRAVELLY LOAM --Gravel Service Road--								559.5	LOAM, some weathered shale fragments --WEATHERED SHALE BEDROCK--						
	583.5	Stiff, brown SILTY CLAY LOAM, some gravel and brick fragments --FILL--			1	2 3 3	1.50 P	19			Weak, very poor rock quality, greenish gray, lamiated SHALE --RUN 1 - RECOVERY=12%-- --RQD= 0%--			11	22 50/5	NP	14
	581.0	Loose, gray SILT --interbedded SAND--			2	2 3 3	NP	24									
	578.5	Very soft, brown SILTY CLAY LOAM, trace plant fragments			3	1 1 2	0.16 B	25						1			
	576.0	Medium stiff, redish brown CLAY to SILTY CLAY			4	2 2 5	0.90 B	24									
	571.0	Loose, brown SILT --interbedded SAND--			5	1 2 2	NP	20		549.5 549.2	Very dense, greenish gray SHALE Boring terminated at 37.33 ft			12	60/4	NP	12
					6	1 2 3	NP	25									
					7	3 5 5	NP	23									
					8	3 3 3	NP	26									
					9	4 4 4	NP	22									
					10	12 15 22	4.50 P	15									
	562.0	Hard, greenish gray SILTY CLAY			25												

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-15-2015** Complete Drilling **06-15-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
 Driller **N&M** Logger **F. Bozga** Checked by **C. Marin**
 Drilling Method **2.25" HSA, boring backfilled upon completion**

While Drilling ∇ **5.00 ft**
 At Completion of Drilling ∇ **2.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

The stratification lines represent the approximate boundary between soil types; the actual transition may be gradual.

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BORING LOG SAB-05

WEI Job No.: 342-06-01

Client **Parsons Transportation Group, Inc.**
 Project **US 52 / IL 64 / IL 84**
 Location **Carroll County, IL and Jackson County, IA**

Datum: NAVD 88
 Elevation: 591.74 ft
 North: 1979654.61 ft
 East: 2298750.47 ft
 Station: NA
 Offset: NA

Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)	Profile	Elevation (ft)	SOIL AND ROCK DESCRIPTION	Depth (ft)	Sample Type recovery	Sample No.	SPT Values (blw/6 in)	Qu (tsf)	Moisture Content (%)
	585.0	Loose, black and dark brown GRAVELLY SANDY LOAM --Saturated--	5	1	3 3 1	NP	34										
	578.7	Loose, brown and gray SILT interbedded with SAND --Saturated--	10	2	2 3 3	NP	23										
	576.7	--HARD DRILLING-- --Possible Cobbles-- Very dense, brown GRAVEL, rock fragments --AUGER REFUSAL-- Boring terminated at 15.00 ft	15	3	60/6	NP	15										

GENERAL NOTES

WATER LEVEL DATA

Begin Drilling **06-17-2015** Complete Drilling **06-17-2015**
 Drilling Contractor **Wang Testing Services** Drill Rig **D-25 ATV**
 Driller **N&M** Logger **F. Bozga** Checked by **C. Marin**
 Drilling Method **2.25" HSA, boring backfilled upon completion**

While Drilling ∇ **3.00 ft**
 At Completion of Drilling \blacktriangledown **3.00 ft**
 Time After Drilling **NA**
 Depth to Water ∇ **NA**

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