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Since 1946

City of Pearl, MS
Grandview Heights Sewer Rehabilitation
Pickering Firm, Inc. Project 18152.32

Plans, Specifications, and Contract Documents

TO: ALL PLANHOLDERS

FROM: Jonathan McLeod, PE

DATE: Tuesday, 28 February 2023

The Plans, Specifications, and Contract Documents for this Project shall be amended as follows:

ADDENDUM #1

CLARIFICATIONS

1. Engineer's Opinion of Probable Construction Cost

   $2,750,000 - $3,000,000

2. Geotechnical Engineering Report dated April 8, 2016, consisting of three (3) bore locations on the West side of Childre Road has been attached **FOR INFORMATION ONLY**

3. Dewatering

   No direct compensation will be made for dewatering. Refer to Specification Section *01025 Measurement and Payment, Section 1.2 Compensation* for additional information.

4. Questions/Requests for Interpretation

   Cutoff for questions will be Thursday, March 2 at 5:00 p.m.

ITEMS IN CONFLICT WITH THIS ADDENDUM ARE HEREBY DELETED.

THIS ADDENDUM IS TO BE ACKNOWLEDGED BY THE BIDDER ON THE BID FORM.

Pickering Firm, Inc.

Jonathan McLeod, PE
28 February 2023

Geotechnical Engineering Associates, LLC
Post Office Box 86, Brandon, MS 39043
1700 W. Government Street, Building A, Suite D, Brandon, MS 39042

David M. Coleman, P.E. Principal Engineer Phone: 601-824-2060 Fax: 601-824-2466

April 8, 2016

Mr. Dan Townsend, P.E.
The Pickering Firm, Inc.
2001 Airport Road, Suite 201
Flowood, MS 39232

RE: Geotechnical Investigation
Grandview Heights Sewer Interceptor Rehabilitation
Pearl, Mississippi
GEA Project: 16013

Dear Mr. Townsend:

Submitted herein are the results of our geotechnical investigation completed for the above-referenced project. This work was performed in accordance with our March 23, 2016 proposal as authorized by Consultant Purchase Order Number 15901 dated March 24, 2016.

1.0 INTRODUCTION

1.1 Purpose and Scope

Geotechnical Engineering Associates, LLC (GEA) was retained by The Pickering Firm, Inc. (Pickering) to conduct a geotechnical investigation related to the rehabilitation of approximately 2,600 linear feet of existing 15-inch diameter sewer line between Childre Road and the 48-inch north-south sewer line that is north of the Kansas City Southern Railway High Oak Yard in Pearl, Mississippi. We understand that the existing sewer line has a depth that varies from about 12 feet to about 22 feet below the existing ground surface. Further we understand that the pipe-bursting method is being considered as a method for rehabilitating the line. This investigation was intended to provide a general understanding of the soil and groundwater conditions within the proposed location of the sewer line.

The scope of this geotechnical investigation included the following:

- Reconnaissance of the project site by the project geotechnical engineer to document physical conditions pertinent to the geotechnical investigation;
- Drilling and sampling of 2 soil borings to terminal depths of 32 feet within the area of the proposed sewer line location;
- Installation of piezometers within the boreholes with collection of one set of groundwater readings on the piezometers;
- Inclusion of geotechnical data and groundwater level readings from a previously installed piezometer performed during a 2014 project entitled, *Proposed High Oak Sewer Line Directional Bore,* submitted to Kansas City Southern Railway Company on March 3, 2014;
- Determination of index, engineering, and strength properties of selected soil samples by means of visual classification, moisture content, Atterberg limits, grain size determinations; and unconfined compression testing; and
- Development of this report to present the findings of the investigation.

1.2 Procedures

This investigation followed procedures established by our firm as routine for a geotechnical investigation of this nature with soil sampling and laboratory testing performed in general accordance with appropriate guidelines established by the American Society for Testing and Materials (ASTM).

The soil boring locations were selected by the project geotechnical engineer in coordination with Mr. Dan Townsend, P.E. of The Pickering Firm. The borings were located in the field by the project geotechnical engineer based on the locations of the existing manholes. Upon completion of the borings, the borings were located using a hand-held GPS receiver that allowed determination of the latitude and longitude to within an accuracy of about 15 feet. These latitude and longitudes are shown at the top of each of the soil boring logs. The elevations at the boring locations were surveyed by GEA referenced to bench marks or control points established by Pickering.

Both borings for the new investigation and the boring for the 2014 investigation were advanced using hollow stem drilling techniques (ASTM D 6151). In this method a 4-1/4 inch diameter hollow auger is used to case the borehole as the hole is advanced into the ground. An inner rod containing the drilling bit operates inside the hollow portion of the auger to cut the soil with the soil cuttings brought to the surface by the exterior flights of the auger. At the designated sample intervals, the drill bit is removed from the auger and the sampler is lowered through the hollow auger to the soil and the sample obtained. After the sample is retrieved, the bit is replaced and the hole advanced.

The soil sampling included the collection of both disturbed and undisturbed soil samples. Relatively undisturbed samples were obtained by pushing a three-inch diameter, Shelby tube sampler a distance of 24 inches into the soil in general accordance with ASTM D1587. A shaded portion in the “Sample Type” column of the attached boring logs indicates depths at which these undisturbed samples were obtained. After the Shelby tube was removed from the boring, the sample was extruded in the field and visually classified. Relative strength estimates of the sample were obtained by pocket penetrometer readings. These penetrometer readings in units of tons per square foot (tsf) are provided in the "Pocket Pen (tsf)" column of the boring logs. Disturbed portions of the sample were discarded and the undisturbed sample was wrapped in aluminum foil and sealed in a plastic bag prior to being placed in a protective tube container for transportation to the laboratory. An additional portion of the sample was placed in a plastic jar to minimize moisture loss during transport to the laboratory and to aid in visual classification of the sample.

Due to the granular nature of some of the soil encountered, split spoon sampling with standard penetration testing was used to collect samples and strength data in the more granular material. In this case, representative disturbed samples were obtained in cohesionless soils by driving a 2-inch OD split spoon sampler a distance of 18 inches into the soil with blows from a 140-pound hammer falling a distance of 30 inches (ASTM D 1586). Two crossed slashes in the "Sample Type" column of the boring logs indicate depths at which split-spoon samples were taken. The number of blows required to drive the sampler for each 6-inch increment was recorded. The penetration resistance is the number of blows required to drive the split-spoon sampler the final 12 inches of penetration. Information related to the penetration resistance is presented in the "Blow Counts & N Value (bpf)" column of the boring logs as the number of blows per foot (bpf). Representative samples were removed from the split spoon sampler and placed in plastic jars to minimize moisture loss and provide a sample for laboratory testing.

During advancement of the soil borings, the groundwater conditions were observed and the depth where groundwater occurred was documented. The depth at which groundwater was

encountered is marked by blue triangles in the “Material Description” section and in the Ground Water Section at the top of the soil boring log.

Two temporary piezometers were installed at both boring locations to provide a better indication of groundwater conditions. After the drilling of the borehole to a depth of 32 feet, a 2-inch diameter by 20-foot long PVC slotted screen with a slot size of 0.010-inch and associated riser pipe was lowered into the borehole. A sand pack consisting of size 20-40 clean sand was tremied into place around the screen and brought to an elevation of at least 2 feet above the top of the screen. An approximate 18-inch thickness of bentonite pellets was placed over the sand to seal the boring and the remainder of the boring backfilled with cuttings and bentonite. Groundwater levels were initially obtained immediately after installation of the piezometers and on April 8, 2016. These temporary piezometers will be allowed to remain in-place until completion of the project so that the groundwater levels can be determined at any time.

Laboratory testing of selected soil samples was performed in accordance to the appropriate ASTM standards. These tests included visual classification (D 2488), moisture content determination (D 2216), Atterberg limit determination (D 4318), grain size determination (D 422) and (D 1140) and unconfined compression testing (ASTM D 2166) for strength determinations. The reader is referred to the appropriate ASTM standard for details of these test procedures. Results of the laboratory testing are presented on the soil boring logs.

1.3 Limitations

Variations in the soil and groundwater conditions can and do occur between or away from the boring locations. Variations in the soil conditions should be expected.

Groundwater conditions will change seasonally; with variations in local rainfall; with changes in the water levels of nearby streams, or lakes; and depending on the local ground surface topography. The ability to conduct excavations will be dependent upon the groundwater conditions at the time of construction and further investigation of the groundwater conditions may be necessary.

These borings were located outside of the existing sewer line alignment and are intended to be representative of the natural soil and groundwater conditions. It is likely that the soil and groundwater conditions within the zone of the previous excavation and backfill for the original sewer line construction could be more highly variable and possibly different from the adjacent natural soil and groundwater conditions.

This investigation and these findings are intended for specific application to the site described herein. Application of this data or the opinions expressed in this report to any other location may not be applicable.

This investigation and these findings are intended for specific application to the site described herein. Application of this data or the findings, opinions, or recommendations expressed in this report to any other location may not be applicable.

If the location or nature of the project should change from the descriptions provided herein, the findings and recommendations should be reevaluated.

GEA is not responsible for misinterpretation or misapplication by others of the findings and recommendations provided herein. The project geotechnical engineer should be consulted should questions arise related to this investigation.

The only warranty made in connection with the services provided, is that we have used that degree of care and skill ordinarily exercised under similar conditions by reputable members of

our profession practicing in the same or similar locality. No other warranty, expressed or implied, is made or intended.

Questions may arise during the review of this report which may need clarification. If so, we will be glad to assist you with providing these clarifications. Should additional engineering analysis be desired for this project, we will be pleased to provide these analysis in accordance with our standard fee schedule.

2.0 SITE DESCRIPTION, SOIL AND GROUNDWATER CONDITIONS

2.1 Physical Setting

The proposed sewer line rehabilitation is located north of the Kansas City Southern High Oak Rail Yard in Pearl, Mississippi. The beginning, or west end, of the project is at the north-south sewer line that is located approximately 0.4-mile west of Childre Road at the metering station. The east end of the project is at manhole number 35432 located immediately west of Childre Road. Generally the topography along the existing sewer alignment is flat with a slight downward slope from east to west. There is approximately 5 feet of elevation difference between the east and west ends of the project. The vegetation along the existing alignment varies from lawn grass at the east end to thick wooded areas with medium to large pine trees and moderate underbrush.

2.2 Geologic Setting

The site is located within the alluvial deposits of Pearl River and its nearby tributary, the Richland Creek. The alluvial deposits overlie the soils of the Yazoo formation. In general these alluvial soils will consist of interbedded layers of clay, silt, clayey silt, silty clay, sandy clay, clayey sand, silty sand, and sand. The deposition of these different soil types will be highly variable. Typically, there is a fining upward sequence, with the heavier granular soil particles toward the bottom of the alluvial deposit and the lighter silt and clay soils found near the top of the deposit.

Underlying the alluvial deposits at this location are the soils of the Yazoo formation. Typically, the soils of the Yazoo formation are overconsolidated and can be divided into three zones. The uppermost soil zone generally consists of highly-weathered stiff, tan and light gray, silty clay (CL). These silty clays generally extend to depths that range up to about 10 feet, have a low to moderate plasticity and are nonexpansive. In some locations, the silty clay soils are not present due to regrading or surface erosion. Underlying the near-surface silty clays is the second soil zone comprised of highly plastic stiff to very stiff, tan and light gray, weathered clays (CH). These calcareous weathered clays contain numerous desiccation cracks and slickensides. The desiccation cracks are often 1 to 2 inches in width at the ground surface and may extend to significant depths. The depth of this second zone of weathered clays generally extends to about 30 to 40 feet below the ground surface. Underlying the weathered clays is the third soil zone consisting of unweathered very stiff to hard, dark gray to blue, clays (CH). This third soil zone has not been exposed to the effects of the weathering process, except by the actions of man. This third soil zone can extend to depths of 400 to 500 feet below the ground surface.

Typically, within the alluvial deposits of the Pearl River, the upper two zones of the Yazoo have eroded away leaving only the very stiff to hard blue clay of the unweathered Yazoo formation. This is the case at this location.

2.3 Soil Conditions

Two soil borings were performed for this investigation. The borings were located just outside of the existing sewer line alignment and should be representative of the naturally deposited, in-

place soils. The location of each soil boring is shown on Figure 1. Soil Boring Logs presenting the field and laboratory data are presented in Figures 2 and 3. Also provided as Figure 4 is Soil Boring B-3 (14005 B-1), which was drilled by GEA in 2014 for the KCS *Proposed High Oak Sewer Line Directional Bore* project. A Soil Boring Legend is presented as Figure 5. Several samples were selected for particle size analysis. The resulting a grain size distribution curves are provided on Figure 6.

Shown on the lower portion of Figure 1 are the ground surface elevations and sewer profile along with a generalized soils profile. This provides a graphic indication of the soil and groundwater conditions that could were encountered along the alignment. Proper note should be taken that this generalized soils profile was based on the soil and groundwater conditions at the specific boring locations. The soil and groundwater conditions can and will change between and away from the boring locations. Additionally, the groundwater elevations shown on the generalized soils profile were those observed on April 8, 2016.

Boring B-1 was advanced near the west end of the project, approximately 20 feet west and 20 feet north of the meter station. The soils encountered consisted of very dense red Clayey Gravel (Unified Soil Classification – GP) from the ground surface to a depth of 1 foot. This appeared to be the remains of a working surface that had been previously placed around the meter station. This surface material was underlain by hard, brown and gray Silty Clay (CL) that was present from 1 foot to 14 feet below the ground surface. Loose, gray Sandy Silt (ML) was present from 14 feet to 16 feet and was damp. At 16 feet, the Sandy Silt (ML) graded into a tan, wet Sand (SP) that was loose from 16 to 20 feet and very loose from 20 to 24 feet and very dense to medium dense below 24 feet. The sand continued to a depth of 30.5 feet where very stiff, blue Clay (CH) was encountered that extended to the 32-foot terminal depth of the boring. The soils at this boring location were wet below a depth of about 14 feet at the time of the investigation.

At the location of Boring B-2 on the east end of the project, a very stiff, brown Sandy Clay (CL) was present from the ground surface to a depth of 2 feet. This upper 2 feet appeared to be previously disturbed material. Soft to very stiff, brown and gray Silty Clay (CL) was present from 2 to 14 feet. This stratum contained traces of sand below a depth of 6 feet. Medium dense, gray Clayey Sand (SC) was present from 14 feet to 16.5 feet. Loose to medium dense, gray to tan Sand (SP) was encountered at 16.5 feet and extended to a depth of 30 feet. Very stiff, blue Clay (CH) was encountered at 30 feet and extended to the 32-foot terminal depth of the boring. These soils were wet below a depth of about 17 feet at the time of the investigation.

At the location of Boring B-3, (14005 B-1), soft to firm, black to brown and light gray Silty Clay (Unified Soil Classification – CL) was present from the ground surface to a depth of 8 feet. This near-surface Silty Clay was underlain by soft, light gray Sandy Clay with sand seams (CL) that was present from 8 feet to 11 feet below the ground surface. Medium dense to loose, light gray Clayey Sand (SC) was present at 11 feet and extended to a depth of 17 feet. Between 17 and 28 feet the soil consisted of medium dense, light gray Sand (SP). This sand became coarse grained below a depth of 20 feet. Very stiff, blue Clay (CH) was encountered at a depth of 28 feet and extended to the 42 foot terminal depth of then boring. Wet soil conditions were encountered below a depth of about 11 feet at the time of the investigation (2014).

2.4 Groundwater Conditions

At the time of this field investigation, groundwater was present in the new Borings B-1 and B-2 as well as in at the location of Boring B-3 (14005 B-1). To allow a more accurate determination of the groundwater levels two temporary piezometers were installed in the two new borings. This provides temporary piezometers at each end and near the mid-point of the proposed rehabilitation project. The results of these groundwater level readings are presented in Table 1.

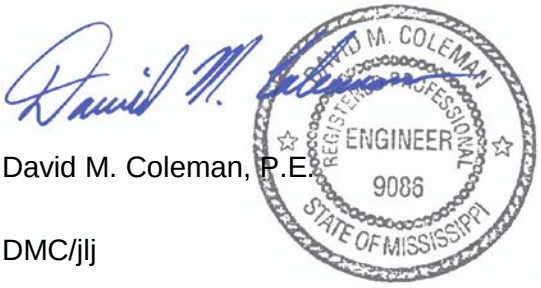
At the time of this report (April 8, 2016), the groundwater elevations varied from EL 252.99 feet at the location of Boring B-1 at the west end, to EL 261.13 feet at the location of Boring B-3 near the center, to EL 261.21 feet at the location of Boring B-2 on the east end. This indicates that the groundwater table in this area is sloping downward from east to west.

Proper note should be taken that groundwater levels will vary: seasonally; with variations in local rainfall; with changes in the water levels of nearby streams, or lakes; and depending on the local ground surface topography. The ability to compete excavations for this project will be highly dependent upon the groundwater conditions. We recommend that test pits be excavated at the time of construction to evaluate the groundwater conditions. A dewatering system may be needed for excavations conducted for this project.

3.0 CLOSING

We appreciate the opportunity to assist you with this project. Please call if we can answer any questions or provide any additional information.

Sincerely,
Geotechnical Engineering Associates, LLC



David M. Coleman, P.E.

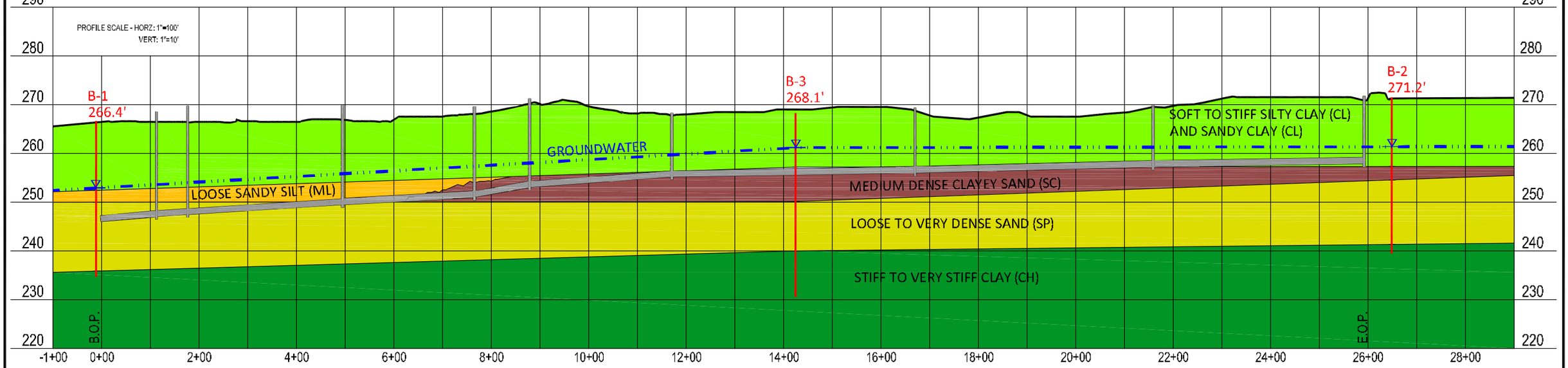
DMC/jlj

Electronic Submittal: dtownsend@pickeringfirm.com

Geotechnical Engineering Associates, LLC
Mississippi Certificate of Authorization E-2061
Expires December 31, 2016

Table 1
Groundwater Levels
Grandview Heights Sewer Interceptor Rehabilitation
Pearl, Mississippi
16013

Boring Number	**B-1**		**B - 2**		**B - 3 (14005 B-1)**		**Notes**
Ground Surface Elevation (feet)	**266.35**		**271.16**		**268.13**		
Top of Riser Elevation (feet)	**269.09**		**274.15**		**271.32**		
Date of Installation	**April 4, 2016**		**April 5, 2016**		**February 14, 2014**		
	Depth to Water	Water Elevation	Depth to Water	Water Elevation	Depth to Water	Water Elevation	
Date installed	13.20	253.15	17.00	249.35	7.07	259.28	After bailing.
April 8, 2016	16.10	250.25	12.94	253.41	10.19	256.16	



GEA
GEOTECHNICAL ENGINEERING ASSOCIATES, LLC

POST OFFICE BOX 86
BRANDON, MS 39043
PHONE 601-824-2060

	BY	DATE
DRAWN	JAP	4-08-16
CHECKED	DMC	4-08-16
DRAWING NAME	16013.DWG	

Soil Boring Locations and Generalized Soils Profile

Grandview Heights Sewer Interceptor Rehabilitation
Pearl, Mississippi

The Pickering Firm, Inc.
Flowood, MS

Figure
1

Geotechnical Engineering Associates
1700 W. Government Street
Brandon, MS 39042

Soil Boring B-1

CLIENT The Pickering Firm
PROJECT NAME Grandview Heights Sewer Interceptor Rehabilition
PROJECT NUMBER 16013
PROJECT LOCATION Pearl, MS
LATITUDE 32° 15.648 ' **LONGITUDE** -90° 09.180 '
STATION **OFFSET FT**
DATE STARTED 4/4/16 **COMPLETED** 4/4/16
GROUND ELEVATION FT 266.4
DRILLER Garry Moyers **RIG:** CME-55
GROUND WATER LEVELS Piezometer scree 0-30 feet
DRILL METHOD 4.25" Hollow Stem Auger
AT TIME OF DRILLING ▽ 18.0 feet at 1400 hours
LOGGER D. Coleman
AT END OF DRILLING ▽ 14.0 feet at 1545 hours
GROUND SURFACE Grass and weeds
AFTER DRILLING ▼ 13.2 feet at 1715 hours
NOTES 20 ft North of sewer line, 20 ft West of meter station, 43 ft Northeast of CP50. Piezometer installed.

DEPTH (feet) Below Ground Surface	ELEV (feet)	SAMPLE TYPE	MATERIAL DESCRIPTION	UNIFIED SOIL CLASSIFICATION	BLOW COUNTS & N VALUE (bpf)	POCKET PEN (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			SIEVE (%)			UNDRAINED SHEAR STRENGTH (ksf)	UNIT WT.	
								LIQUID	PLASTIC	PLASTICITY INDEX	GRAVEL	SAND	FINES		MOIST	DRY
0	266.4		0.0-14.0				5.4									
			Hard brown and gray SILTY CLAY	CL		4.00	14.8	35	18	17				4.004	126.7	110.4
						3.50	18.0									
						4.5+	18.3									
			gray and brown below 5.5 feet			3.50	18.5	39	16	23				4.667	129.4	109.2
10						4.5+	19.6									
	252.4	▼														
	250.4	X	14.0-16.0 Loose gray SANDY SILT, damp	SM	2-3-3		27.1	20	18	2	0.0	34.0	66.0			
			16.0-30.5		5		19.7									
		▽	Loose tan SAND moist	SP												
20			wet below 18 feet													
		X	very loose below 20 feet		1-1-2											
					3		27.6				0.0	98.9	1.1			
			very dense below 24 feet													
		X			42-50/1.5"											
					100+		23.5				0.9	98.1	1.0			
30			medium dense below 28 feet													
	235.9	X			7-12-15		19.2									
	234.9		30.5- 32.0 Stiff blue CLAY	CH	27		39.9	77	25	52						

Boring Terminated at 32 feet
Piezometer installed with bentonite cap.

Figure 2

Geotechnical Engineering Associates
1700 W. Government Street
Brandon, MS 39042

Soil Boring B-2

CLIENT The Pickering Firm
PROJECT NAME Grandview Heights Sewer Interceptor Rehabilition
PROJECT NUMBER 16013
PROJECT LOCATION Pearl, MS
LATITUDE 32° 15.449 ' **LONGITUDE** -90° 08.774 '
STATION **OFFSET FT**
DATE STARTED 4/5/16 **COMPLETED** 4/5/16
GROUND ELEVATION FT 271.2
DRILLER Garry Moyers **RIG:** CME-55
GROUND WATER LEVELS Piezometer installed 0-30 feet.
DRILL METHOD 4.25" Hollow Stem Auger
AT TIME OF DRILLING ▽ 17.0 feet at 0800 hours
LOGGER J. Robertson
AT END OF DRILLING ▽ 17.0 feet at 0900 hours
GROUND SURFACE grass and weeds over 6 inches of topsoil
AFTER DRILLING ▼ 17.0 feet at 1000 hours
NOTES 32 ft East of Childre Road

DEPTH (feet) Below Ground Surface	ELEV (feet)	SAMPLE TYPE	MATERIAL DESCRIPTION	UNIFIED SOIL CLASSIFICATION	BLOW COUNTS & N VALUE (bpf)	POCKET PEN (tsf)	MOISTURE CONTENT (%)	ATTERBERG LIMITS			SIEVE (%)			UNDRAINED SHEAR STRENGTH (ksf)	UNIT WT.	
								LIQUID	PLASTIC	PLASTICITY INDEX	GRAVEL	SAND	FINES		MOIST	DRY
0	271.2															
	269.2		0.0-2.0 Very stiff brown SANDY CLAY	CL		2.50										
			2.0-14.0 Firm brown SILTY CLAY	CL		0.50	18.2							0.635	121.8	103.0
			very stiff, brown and gray below 4 feet			3.00										
			with Sand below 6 feet			3.00										
10						3.50	20.5							2.372	130.6	108.3
	257.2															
			14.0-16.5 Medium dense gray CLAYEY SAND	SC		1.25										
	254.7															
		▼	16.5-30.0 Loose gray SAND	SP												
20		X			3-4-3 7						0.7	92.0	7.3			
			medium dense below 24 feet													
		X			7-13-13 26											
30	241.2															
	239.2	X	30.0-32.0 Very stiff blue CLAY	CH	6-9-16 25											

Boring Terminated at 32 feet
Piezometer installed with bentonite cap.

Figure 3

Soil Boring Log
Boring B - 3 (14005 B-1)

Project: High Oak Yard Sewer Line Directional Bore **Project No.:** 14005 **Location:** Pearl, MS
Client: Kansas City Southern Railway Company **Engineer:** D. Coleman, P.E. **Date:** 2/14/2014
Logged By: D. Coleman **Driller:** G. Moyer **Drill Rig:** CME 55 ATV
Boring Location: See Figure 1 ~ Station 10+25 **Lat:** N 32° 15.523' **Long:** W 90° 08.980' **Elev:** 268.13 ft

Depth (feet)	Sample Type	Groundwater	Pocket Pen / SPT (tsf / bpf)	Soil Description	Unified Soil Classification	Moisture Content (%)	Atterberg Limits LL	Atterberg Limits PL	Atterberg Limits PI	Sieve Analysis % Gravel	Sieve Analysis % Sand	Sieve Analysis % Fines	Undrained Shear Strength (ksf)	Unit Weight (pcf) Moist	Unit Weight (pcf) Dry
				Soft brown **Silty Clay**	CL										
				- brown and light gray below 2 feet											
				- firm, with iron staining & nodules below 5 feet		22.0	29	14	15				0.981	127.0	104.1
			1.00 tsf												
10				Stiff light gray **Sandy Clay**	CL										
				- with Sand seams		19.3	28	18	10	0.0	35.5	64.5	1.299	131.2	110.0
			1.50 tsf	Medium dense light gray **Clayey Sand**	SC	19.2									
				- wet and loose below 14 feet											
			6 bpf			27.1				0.0	86.9	13.1			
			4-4-2												
				Medium dense light gray **Sand**	SP										
20				- slightly Clayey											
			17 bpf	- coarse-grained below 20 feet		24.3									
			4-7-10												
			21 bpf			22.9				0.5	96.3	3.2			
			10-10-11												
30				Very stiff blue **Clay**	CH										
			39 bpf	- with calcareous nodules		39.3									
			5-18-21												
			3.25 tsf			42.2	87	37	50				2.676	113.9	80.1
40															
			4.00 tsf			39.8							3.775	116.4	83.2
				Boring Terminated at 42 feet											
50															

Boring Advancement

H Stem Auger	Rotary Wash
0 - 42 feet	

Boring Abandonment
☐ Cuttings
☒ Grout — cement-bentonite

Groundwater Information

Initial:	14.0	at	15:31
Median:	11.0	at	17:30
Final:	7.07	at	2/15/2014 9:15

Topsoil Depth / Surface Conditions / Notes:
Grass and weeds
Set Piezometer with 3.5 feet of stickup
Screened 10 to 30 feet below ground surface
Sand pack 5 feet to 40 feet below ground surface
5-foot thick bentonite plug

Figure 4

SOIL BORING LEGEND

SAMPLE TYPES		GROUNDWATER OBSERVATIONS		FIELD TESTS	
	Auger		Level Initially Encountered	T	Torvane
	Shelby Tube		Level After Specified Period	tsf	Pocket Penetrometer (tons per square foot)
	Split Spoon				
	No Recovery		Final Groundwater Level After Specified Period	bpf	blows per foot during Standard Penetration Test (SPT)
	Rock Core	NFW	No Free Water	ND	Not Determined
				NA	Not Applicable

STRENGTH TERMS

COARSE GRAINED SOILS Generally Noncohesive		FINE GRAINED SOILS Generally Cohesive	
More than 50% retained on No. 200 sieve Includes gravels, sands, and silts. Density determined by the Standard Penetration Test (ADTM D 1586).		50% or more passing the No. 200 sieve Includes inorganic and organic silts and clays; gravelly, sandy, or silty clays and clayey silts. Consistency determined by laboratory shear strength testing or by field visual-manual procedures.	
Descriptive Term (Density)	Standard Penetration Resistance (blows per foot)	Descriptive Term (Consistency)	Undrained Shear Strength (kips per square foot or ksf)
Very Loose	0 to 4	Very Soft	Less than 0.25
Loose	5 to 9	Soft	0.25 to 0.50
Medium Dense	10 to 29	Firm	0.51 to 1.00
Dense	30 to 50	Stiff	1.01 to 2.00
Very Dense	Above 50	Very Stiff	2.01 to 4.00
		Hard	Above 4.00

SOIL STRUCTURE TERMS

Blocky - Having a structure that can be broken into smaller angular lumps which resist further breakdown.
Calcareous - Containing appreciable quantities of calcium carbonate.
Fissured - Having definite fracture planes with little resistance to fracturing.
Friable - Easily crumbled.
Glauconitic - Containing a green mineral commonly occurring in soils of marine origin.
Heterogeneous - Having differing or various colors, appearance, or texture throughout.
Homogeneous - Having the same color and appearance throughout.
Jointed - A fissured condition with fracture planes that are numerous and limited in extent.
Indurated - Hardened by pressure or cementation.
Layer - A soil deposit with a thickness of about 6 inches.
Parting - A very small thickness of soil within another soil.
Seam - A bed of soil less that 6 inches thick deposited within another soil mass.
Slickensided - Having fracture planes that appear polished and glossy.
Stratified - Composed of alternating layers of varying material or color.

Grain Size Distribution Curves

Grandview Heights Sewer Interceptor Rehabilitation

16013

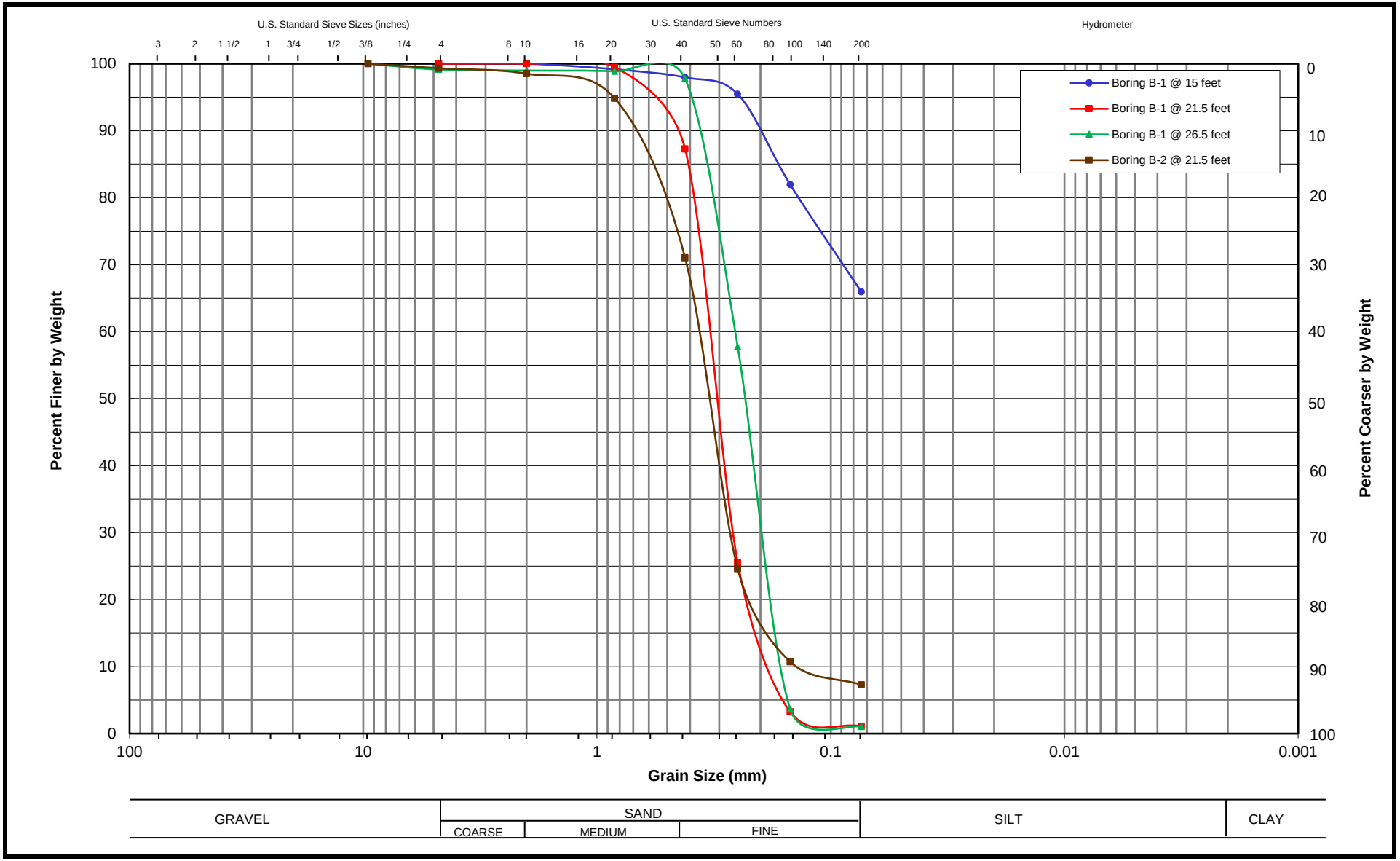


Figure 6