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City of Byram, MS
Big Creek Sanitary Sewer Interceptor
Pickering Firm, Inc. Project 26401.00

Plans, Specifications, and Contract Documents

TO: ALL PLANHOLDERS

FROM: Jonathan McLeod, PE

DATE: Friday, 14 June 2024

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

ADDENDUM #1

CLARIFICATIONS

1. Geotechnical Engineering Report dated has been attached **FOR INFORMATION ONLY**

2. Is a field office required? No

3. Is burning onsite allowed of the clearing and grubbing?

   Contractor must comply with all state and local laws, including all necessary permitting, when burning on-site.

PLANS & SPECIFICATIONS

1. Steel Casing

Remove the following table from *Plan Sheet SD1.01*:

CARRIER PIPE NOMINAL DIAMETER	4	6	8	10	12	16	20	30	36	42
MINIMUM CASING OUTSIDE DIAMETER (INCHES)	16	16	18	20	24	30	36	42	54	60
MINIMUM CASING WALL THICKNESS (INCHES)	.250	.250	.250	.250	.250	.312	.375	.500	.500	.500

Refer to *Specification Section 02326 Pipe Jacking, Boring, and Tunneling, Part 2- Products, 2-01 Materials, B. Casing Pipe*; for Casing Pipe requirements and MINIMUM wall thickness requirements.

ADD the following to *Specification Section 02326 Pipe Jacking, Boring, and Tunneling, Part 2-Products, 2-01 Materials, B. Casing Pipe* : "f. Furnish steel casing pipe of sufficient thickness to withstand the forces exerted by the insertion operations."

REMOVE the following from *Specification Section 02326 Pipe Jacking, Boring, and Tunneling, Part 3-04 Carrier Pipe Installation;* "C. Backfilling: Backfill the annular space between Carrier Pipe and Casing Pipe using annular sand, cellular concrete, or flowable fill."

2. Storage of Material

   Specification Section 1080 Preconstruction Conference, 1.3 Agenda, A, 18;
   REMOVE "There will be no storage of material onsite except to string the pipe."

3. Pipeline Excavation and Backfill

   ADD *Specification Section 02222 Pipeline Excavation and Backfill*; Attached

4. Mandrel Testing

   REMOVE the following from Specification Section 02731 Wastewater Gravity Mains and Appurtenances, Part 3.17 Tests, D. Deflection Tests; "The system will be subject to a mandrel check at the eleven (11) month warranty inspection"

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
14 June 2024

BURNS COOLEY DENNIS, INC.

GEOTECHNICAL AND MATERIALS ENGINEERING CONSULTANTS

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June 11, 2024

Jon McLeod, P.E.
Pickering Firm, Inc.
2001 Airport Road, Suite 201
Flowood, Mississippi 39232

Report No. 240296

Geotechnical Exploration
Proposed Big Creek Sewer Interceptor – Phase I
City of Byram, Mississippi

Dear Mr. McLeod:

Submitted here is the report of our geotechnical exploration for the above-captioned project. This exploration was authorized by Pickering Firm, Inc. Purchase Order Number 17491 dated May 9, 2024 and was generally performed in accordance with our Proposal No. 23001P-148R of the same date.

We appreciate the opportunity to be of service. If you should have any questions concerning this report, please do not hesitate to call us.

Very truly yours,

BURNS COOLEY DENNIS, INC.

Amber Templeton Reeb

Amber Templeton Reeb, P.E.

Jeffrey W. Williams, P.E.

JEFFREY WAYNE WILLIAMS
REGISTERED PROFESSIONAL ENGINEER
16392
STATE OF MISSISSIPPI

JWW/ATR/khb
Copy Submitted: (via e-mail)

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1.0 INTRODUCTION AND PURPOSE

1.1 General

Plans are being made by the City of Byram for construction of approximately 2,400 ft of new 42-in. sewer line for Phase I of the proposed Big Creek Sewer Interceptor project. The new sewer line will begin at an existing manhole located southwest of Apache Drive and will run along Big Creek to the south/east Interstate 55 right-of-way. The depths to the inverts of the line below the existing ground surface will range from about 20 ft to 38 ft. At your request, this exploration focused solely on the sewer line segment within the City of Jackson and the Lewis Family Trust properties. The bedding level for the 42-in. sewer pipe within the City of Jackson and the Lewis Family Trust properties will range from approximately 21 ft to 24 ft below the surface. A site plan showing the alignment of the new sewer line can be seen in Figure 1.

1.2 Purposes

The specific purposes of this investigation were:

1) to make exploratory soil borings along the planned alignment for the 42-in. sewer line segment within the City of Jackson and the Lewis Family Trust properties;

2) to evaluate pertinent physical properties of the soils encountered in the borings by means of visual examination of the samples and laboratory tests performed on select samples; and

3) after analysis of the soil borings and laboratory test data, to provide guideline design and construction recommendations for the proposed 42-in. sewer line.

Detailed trench excavation slope stability and groundwater seepage control/dewatering plans are beyond the scope of this geotechnical investigation. Our current scope of work also does not include: environmental study; detailed pavement design; structural foundation design; review of plans and specifications; responses to contractor requests for information (RFI's); and construction phase services.

2.0 SUBSURFACE EXPLORATION

2.1 General

Subsurface soil conditions along the proposed alignment for the sewer line within the City of Jackson and the Lewis Family Trust properties were explored by means of three borings. The approximate locations of the borings relative to the proposed sewer alignment are illustrated on Figure 1.

The borings were approximately located using GPS coordinates that were generated using the provided site plan overlain on a Google Earth image. Ground surface elevations at the boring locations were not determined by survey. The elevations shown on the graphic logs were estimated from the topographic information provided and should be considered approximate.

All soils were classified in general accordance with the Unified Soil Classification System. A synopsis of the Unified Soil Classification System is presented on Figure 2 along with symbols and terminology typically utilized on graphical soil boring logs. Logs of the soil borings are presented on Figures 3, 4 and 5. The graphical logs illustrate the types of soil and stratification encountered with depth below the existing ground surface at the individual boring locations. Approximate GPS coordinates for the boring locations as determined by our drilling personnel using a hand-held device are shown at the bottom of the graphical logs within the "Comments" section.

2.2 Drilling, Sampling Methods, and Groundwater Observations

The borings were made along the proposed alignment for the sewer line within the City of Jackson and the Lewis Family Trust properties to exploration depths of 25 ft and 30 ft. The borings were advanced full depth by dry augering. Disturbed auger cutting samples were obtained at approximate 2-ft to 3-ft depth intervals in the borings. The depths at which the auger cutting samples were taken are illustrated as small I-shaped symbols under the "Samples" column of the graphic boring logs. Observations were made continuously during auger drilling to detect free water entering the open boreholes. Notes pertaining to groundwater observations are included at the bottom right corner of the graphic boring logs.

Temporary piezometers were installed at the locations of Borings 2 and 3 after completion of drilling to monitor free water conditions. The piezometers consisted of 2-in. diameter slotted PVC pipes set in the open boreholes. The annular spaces around the piezometers were sealed at the surface to prevent the intrusion of surface water. Groundwater levels observed in the piezometers are discussed in a subsequent section of this report.

2.3 Field Classification, Sample Preservation, and Borehole Abandonment

All soils encountered during drilling were examined and classified in the field by a geotechnical engineering technician. The auger cutting samples were sealed in jars to provide material for visual examination and testing in the laboratory. Unless other disposition is requested, we routinely discard soil samples after about six months of storage. The boreholes were filled with cement-bentonite grout after completion of drilling and sampling and after the temporary piezometers were removed.

LABORATORY INVESTIGATION

3.1 General

Laboratory tests were performed on the samples to assist in evaluating the classifications and volume change properties of the soils encountered. The types of laboratory tests performed are described in the following paragraphs. In addition to the laboratory tests described, all samples were visually examined and classified in the laboratory. Soil strength estimates of consistency or relative density were made by visual/physical evaluation of soil samples and considering the other physical test data on the soil.

3.2 Classification Tests

The classifications and volume change properties of the fine-grained soils encountered in the borings were investigated by means of Atterberg liquid and plastic limit tests. In accordance with the Unified Soil Classification System, fine-grained soils are classified as either clays or silts of low or high plasticity based on the results of liquid and plastic limit tests. The numerical difference between the liquid limit and plastic limit is defined as the plasticity index (PI). The magnitudes of the liquid limit and plasticity index and the proximity of the natural water content to the plastic limit are indicators of the potential for a fine-grained soil to shrink or swell upon changes in moisture content or to consolidate under loading. The proximity of the natural water content to the plastic limit is also an indicator of soil strength. The results of the liquid and plastic limit tests are plotted as small crosses interconnected by dashed lines in the data section of the graphic boring logs.

The classifications of soils consisting predominantly of sand were investigated by means of minus No. 200 sieve tests performed on selected samples. The percentages of fines resulting from the minus No. 200 sieve tests are tabulated at the appropriate depths under the "% Passing No. 200 Sieve" column of the graphic boring logs.

3.3 Water Content Tests

Water content tests were performed on the samples to corroborate field classifications and to extend the usefulness of the plasticity data. The results of the water content tests are plotted as small shaded circles in the data section of the graphic boring logs. The water content data have been interconnected on the logs to illustrate a continuous profile with depth.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General

A general description of subsurface soil and groundwater conditions revealed by the borings made for this investigation is provided in the following paragraphs. The graphical logs shown on Figures 3, 4 and 5 should be referred to for specific soil and groundwater conditions encountered at each boring location. The general stratification along the alignment of the planned sewer line within the City of Jackson and the Lewis Family Trust properties is illustrated by the stick log profile shown on Figure 6 to aid in visualizing subsurface soil conditions. Tabulated adjacent to the stick log are Atterberg liquid and plastic limits, water contents and percentages of fines passing the No. 200 sieve. Figure 6 also depicts the approximate ground elevations and bottom of pipe elevations at the boring locations.

4.2 Soil Stratification

Subsurface soils encountered within the 30-ft maximum completion depth of the borings made for this exploration generally consist of silty clays (CL and CL-ML), clays (CH) and silty sands (SM).

Very soft, soft and medium stiff silty clays (CL and CL-ML) and loose sands (SM) that are considered to have low to low-moderate strength and moderate to moderate-high compressibility were encountered from the ground surface to a depth of about 17 ft at Boring 1, from the ground surface to a depth of about 19 ft at Boring 3 and within the approximate depth intervals of 4 ft to 17 ft at Boring 2. Otherwise, the subsurface soils are generally considered to be strong with moderate to high strength and low to moderate compressibility. The silty clays (CL and CL-ML) are considered to have low shrink/swell potential. The silty sands (SM) have no potential for shrinking and swelling.

Clays (CH) were encountered at a depth of about 17 ft at Borings 1 and 2 and a depth of about 19 ft at Boring 3. The clays (CH) are considered to be expansive with high shrink/swell potential. The clays (CH) extend to the 25-ft and 30-ft termination depths of the borings.

4.3 Groundwater

Free water was encountered during auger drilling for the borings. Auger drilling was temporarily suspended after encountering free water, the boreholes were allowed to stand open for a brief observation period, and the water levels in the open boreholes were measured at the end of the observation period. Additionally, observations were made in temporary piezometers installed at Borings 2 and 3 after a period of about 24 hrs. A summary of groundwater observations is provided in the following table.

Boring Number	**Initial Depth to Groundwater, Feet**	**Depth after 15-min Observation, Feet**	**Depth after 24-hr Observation, Feet**
1	7	6	NA
2	8	7	7.5
3	4	3	4

Groundwater conditions along the alignment of the sewer line will be influenced by nearby bodies of water such as the existing creeks and small tributaries, by the time of year the construction is performed and by rain events. Groundwater conditions at the site can also be influenced by man-made changes. <u>Surficial soils can become saturated and weak to relatively shallow depths during periods of prolonged and heavy rainfall.</u>

5.0 DISCUSSION AND GUIDELINE RECOMMENDATIONS

5.1 Summary

Subsurface soils encountered within the 30-ft maximum completion depth of the borings made for this exploration generally consist of silty clays (CL and CL-ML) and silty sands (SC) underlain by clays (CH). Very soft, soft and medium stiff silty clays (CL and CL-ML) and loose sands (SM) that are considered to have low to low-moderate strength and moderate to moderate-high compressibility were encountered from the ground surface to a depth of about 17 ft at Boring 1, from the ground surface to a depth of about 19 ft at Boring 3 and within the approximate depth intervals of 4 ft to 17 ft at Boring 2. The remaining subsurface soils are generally considered to be strong with moderate to high strength and low to moderate compressibility. The silty clays (CL and CL-ML) are considered to have low shrink/swell potential. The silty sands (SM) have no potential for shrinking and swelling. The clays (CH) have high shrink/swell potential.

After a 15-minute observation period, free water was encountered during auger drilling for all of the borings and the water level stabilized in the open boreholes for Borings 1, 2 and 3 at depths of 6 ft, 7 ft and 3 ft, respectively. Free water was at depths of 7.5 ft and 4 ft after 24 hours in the piezometers at Borings 2 and 3, respectively.

The bedding level for the 42-in. sewer pipe within the City of Jackson and the Lewis Family Trust properties will range from approximately 21 ft to 24 ft below the surface. Open trench excavation will be required to install the pipe. Refer to Figure 6 for a depiction of approximate ground elevations and bottom of pipe elevations at the boring locations. Trench boxes or other stabilization methods may be needed in the excavations. The presence of very soft, soft, medium stiff and loose soils and groundwater encountered at the boring locations must be adequately considered in planning and conducting construction activities. Project specifications and pre-construction meetings should emphasize these factors. The following subsections of this report include guideline recommendations pertaining to the geotechnical-related aspects of design and construction for the planned sewer line.

5.2 Trenching and Excavation

After dewatering, as appropriate, excavating to the desired grade can proceed. The excavation for the sewer line will extend through strata of silty clays (CL and CL-ML), silty sands (SM) and clays (CH). Considering the stratifications encountered at the boring locations and the planned invert elevations for the sewer line, the bottom of the excavation for the sewer line will bear in clays (CH). A stick log profile is presented on Figure 6 to aid in visualizing subsurface soils encountered at the locations of the borings made along the planned alignment for the sewer line and depicts the approximate ground elevations and bottom of pipe elevations at the boring locations.

Stiff and very stiff clays (CH) were encountered near the proposed sewer line invert elevations at the locations of all the borings. It should be recognized that exceptions to the subsurface conditions indicated at specific boring locations could be encountered during construction. The relatively strong and stable subsurface soils encountered at the time of our investigation could become weak and compressible during the excavation process due to the presence of groundwater. In comparison to reaches where the soils are generally found to be relatively strong, more trench bracing and/or flatter excavation slopes will be required in reaches where weaker soils are encountered. We recommend that project specifications require replacement of any natural soft or wet soils that may be encountered at the subgrade level and any subgrade soils that may become soft or wet during construction with suitable compacted soils placed to depths as determined to be necessary to provide proper pipe support.

As indicated previously, groundwater was encountered in all of the borings. Based on the general sewer line invert elevations, water-bearing and saturated soils will be encountered during excavation. We recommend that flow of groundwater under hydrostatic pressure into the bottom and sides of the trench excavation be considered in planning before and during construction along the entire alignment.

There are many various possible slope configurations and excavation stabilization procedures that can be used for construction of the sewer line. A detailed analysis of slope stability for specific trench excavations is beyond the scope of this investigation. Stability of slopes will depend upon the type of soil present within the slope and water seepage conditions and other factors. Typically, short term construction slopes on the order of 2H:1V are stable for a majority of the soil present at the site, provided seepage is adequately controlled. The situation may exist such that excavation slopes become unstable, possibly with only shallow sloughing, which will require occasional slope maintenance, or may require reconfiguration of the slope or different excavation stabilization procedures. Also, critical to excavation operations is placement of spoil adjacent to slopes. In general, the spoil pile should be no higher than 5 ft and should be no closer than 15 ft from the slope edge for a 2H:1V temporary slope; however, this will require a specific slope stability evaluation during construction planning. Trenching and excavation for the pipeline performed by the contractor are required by law to comply with OSHA regulations. On construction projects, the contractor is given complete responsibility for the adequacy and safety of his trenching and excavation. Due to the presence of very soft to medium stiff soils, potentially unstable soils and groundwater, the contractor should be prepared to furnish sheeting, shoring and bracing necessary to support the sides of trenches and excavations. A suitable sliding trench box or shield could also be utilized. Sheeting and shoring should be removed in a manner that will not cause voids or significant weakening or loosening of natural or backfill soils. Special care should be taken in trenching and excavation operations to prevent damage to any existing structural features, pavements, or facilities located adjacent to the trenches/excavations.

It should be noted that the site soils are highly susceptible to pumping or rutting under wet conditions. The construction techniques and types of equipment utilized and site drainage provided during construction will have a great effect on the performance of these soils throughout the project. It should be recognized that soils which are demonstrated to be stable can become unstable if they are disturbed by construction traffic or exposed to rainfall or groundwater.

We recommend that the specifications require the contractor to develop and implement measures to control all groundwater encountered as necessary to achieve a stable excavation and a stable surface for support of the pipe and also to achieve the required compaction of the bedding and backfill soils. More specifics regarding groundwater are presented in the following subsection.

5.3 Groundwater Control

As discussed previously, groundwater was encountered above and within the approximate bedding range depths of the pipe at the boring locations and must therefore be accounted for during planning and construction. It is likely the presence and quantity of water seepage will be influenced by the season of the year when construction is performed and the water level in the existing and any nearby tributaries and ponds. As excavation for the sewer line extends deeper into fine-grained soils at some depth excess piezometric heads within the underlying soils can cause heaving and blow-out of the excavation bottom. Excavation into any more coarse-grained soils may encounter considerable groundwater, therefore positive dewatering may be required to lower the groundwater level at those locations. Groundwater control is the responsibility of the excavating contractor. The silty clays (CL and CL-ML) and clays (CH) are considered to exhibit generally low permeability. These fine-grained soils could contain undefined higher permeability seams and layers. The silty sands (SM) could exhibit greater permeabilities. Removing and/or controlling water retained within the fine-grained soils may require additional effort. The actual extent of needed groundwater control must be evaluated during excavation and should be monitored closely during construction.

Adequate surface drainage will also be required to minimize the amount of surface water entering the excavation. It should be noted that an effective dewatering program takes time to dewater a site. As such, dewatering systems should be installed well in advance of construction. We recommend that the Contractor retain the services of a dewatering expert to assist them in evaluating dewatering methods for excavation.

5.4 Bedding and Backfill

Both strong and slightly weaker soils were encountered at the boring locations. It should be recognized that soils found to be strong at the time of our investigation can become weak while being excavated and/or disturbed in the presence of rainwater or groundwater seepage. Also, piezometric pressures that cause upward flow into the trench bottom during the excavation process can cause weakening of the soils. Therefore, the exact extent of any weak or unstable soils along the bottom of the trench can only be determined during construction. All weak or unstable soils extending below the trench bottom should be overexcavated for the full design width of the trench to depths determined during construction in the specific reaches where such conditions are encountered. Areas of overexcavation should be backfilled with suitable excavated soils. The classification and compaction of the backfill soils should meet the recommendations provided subsequently for materials placed as bedding around the pipe.

The design width of the pipe trench should be established with consideration given to providing sufficient horizontal space between the pipe and the trench walls to permit proper compaction of bedding soils up to the top of the pipe. As compared to compaction by hand tamping, a greater horizontal space will be required for compaction with hand-held mechanical compactors. A greater horizontal space will also be required for installation with a trench box, shield or sheeting.

In the following discussion the term "bedding" refers to fill soils placed within the vertical zone from the bottom of the trench to a level of 1 ft above the top of the pipe. The term "backfill" refers to fill soils placed between the top of the bedding soils and the ground surface. We recommend that materials used for bedding consist of nonorganic and debris-free soils that are not too wet or too dry and have a liquid limit not greater than 50. The liquid limit of 50 will exclude the use of the clays (CH). Any imported materials used for bedding should consist of either silty clays (CL), sandy clays (CL) or sands (SP, SM and SC). The contractor should be allowed to select whichever of these material types best suits the subsurface soil and groundwater conditions and the required groundwater control as necessary to perform the work. With the exception of the expansive clays (CH), the existing site soils removed during construction can be used as backfill provided they do not contain excess deleterious matter and are not too wet or too dry prior to placement as fill.

The following guidance is for general pipe bedding and backfill, but specific pipe requirements should be accommodated as needed in design and planning. The pipe should initially be bedded in 4-in. to 6-in. of suitable bedding soils placed over the bottom of the trench. This initial lift and each successive bedding lift up to a level of 1 ft above the top of the pipe should have a maximum loose thickness of 6 in. or less and should be compacted to not less than **95** percent of standard Proctor maximum dry density (ASTM D 698) by hand tamping or by utilizing a hand-held mechanical compactor. The moisture content within the bedding soils should be as required to provide a firm and stable condition for compaction. The bedding soils should be brought up simultaneously at the same level on both sides of the pipe.

The planned pipeline will primarily cross areas that are undeveloped, but some portions of the line may extend into developed areas or roadways. A variation in compaction requirements is considered to be appropriate for these two general conditions. Backfill placed above the level of the bedding materials should consist of the same types of soil utilized for bedding. In undeveloped areas, the backfill should be compacted in relatively thin lifts to not less than **90** percent of standard Proctor (ASTM D 698) maximum dry density. In developed areas where existing or future construction is planned, the backfill soils should be compacted in relatively thin lifts to not less than **95** percent of standard Proctor (ASTM D 698) maximum dry density. Excavations should be backfilled as soon as practicable. Special care and planning will be required in the areas of any existing creeks and any other lakes or ponds while excavating along the embankments to prevent instability of the embankments.

The final surface at the top of the backfill over the pipeline should be sloped to provide effective and rapid drainage of rainfall and surface water away from the pipe alignment. Assuming future settlement will occur within the backfill, we recommend that the backfill materials generally be crowned or mounded along the length of the pipeline in undeveloped areas at least 12 in. higher at the centerline and sloped downward to natural ground levels. The surface at the top of the backfill in developed areas should be monitored for settlement and maintained to provide drainage away from the alignment.

It is advised that some consolidation settlement may occur within the trench fill over time, even with tested-compacted backfill that meets the project specifications. We recommend the contractor be required to account for this possibility in planning and scheduling – releveling paved areas may be required post-construction and a waiting period of a few weeks to a month or longer could be utilized prior to applying a final pavement lift in order to minimize post-construction pavement surface settlement.

5.5 Design Soil Parameters

The following guidance is for general pipe soil design, but pipe specific design requirements should be accommodated as needed. Pipeline strength design considers stresses produced by a combination of internal pressure and external loads. The external loads include dead loads due to the weight of backfill soils over the pipe and live loads imposed by highway trucks, trains, construction traffic and other structures. Dead loads are normally calculated by the Marston equations for specific section dimensions of the pipe, trench and embankment and for specific or estimated backfill parameters. Recommended soil parameters for calculation of earth pressure on the pipe are as follows:

- Unit weight for backfill soils compacted to **90** percent of standard Proctor density = 120 pcf
- Backfill soils compacted to **95** percent of standard Proctor density = 125 pcf
- Ratio of lateral to vertical earth pressure, K = 0.49
- Coefficient of sliding friction between fill materials and trench walls, μ= 0.33

- Settlement ratio, R_{sd}, = 0.8 for rigid conduits and R_{sd}, = -0.4 to 0 for flexible conduits

In the calculation of earth pressures, additional dead loads may result from future construction over the pipeline, such as widening of roadways and railroad embankments.

Live loads imposed on pipes by highway trucks, construction equipment and buildings or other structures over or adjacent to the pipeline can be calculated using Boussinesq equations (with appropriate impact factors for dynamic loading) or they can be obtained from published tables in design manuals of the AWWA and others. Live loads which may be imposed by heavy construction equipment should be given special consideration, and certain limitations should be set forth in the project specifications. These limitations should establish a minimum depth (or depths) of earth cover over the top of the pipe before construction equipment is permitted to cross the pipe, in conjunction with the maximum wheel load allowed for the minimum or greater depths of earth cover.

For calculations predicting the deflection of buried flexible pipe, the modulus of soil reaction, E', can be approximated by a value of about 400 lbs per sq in. for the previously recommended bedding condition.

6.0 REPORT LIMITATIONS

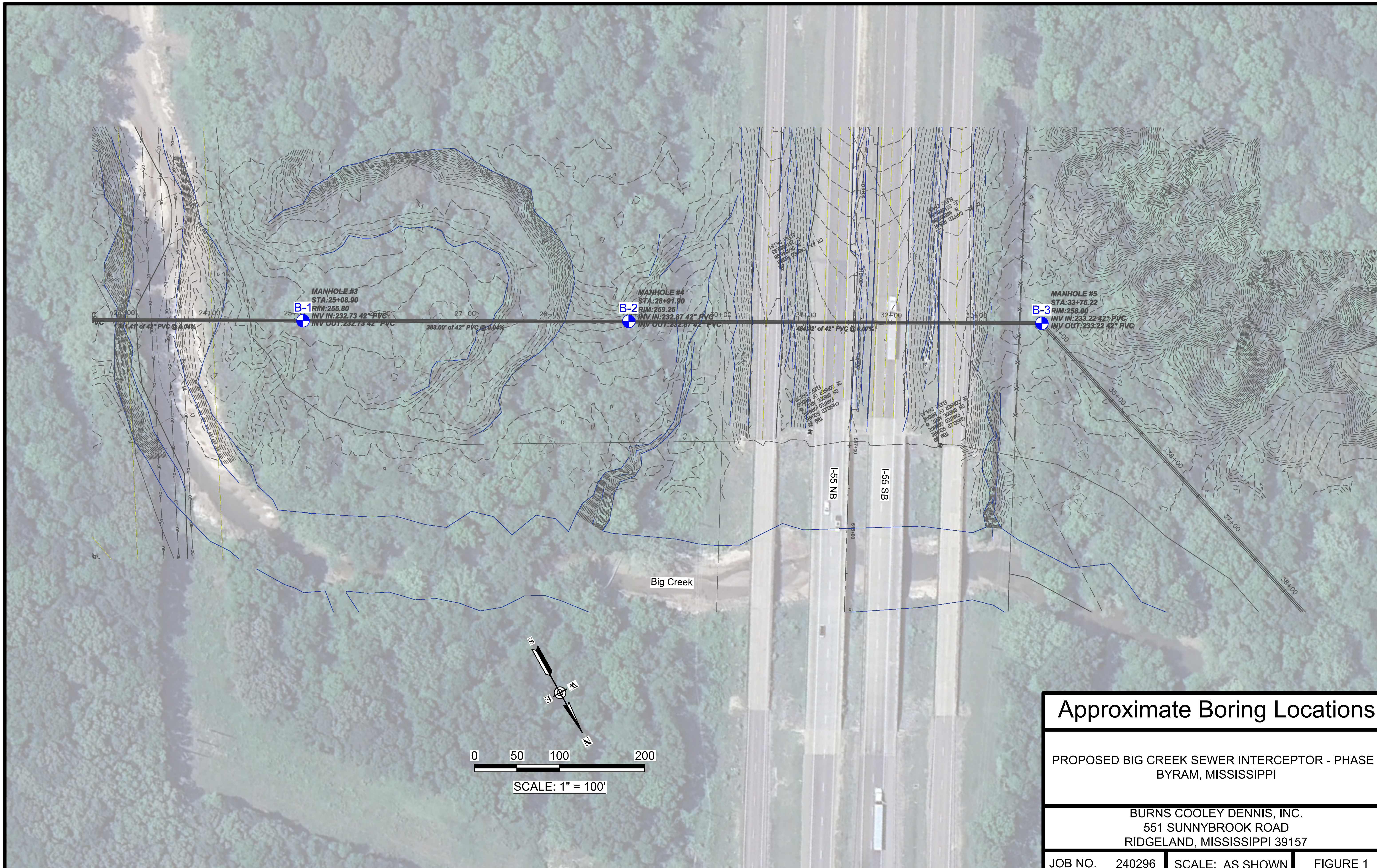
The analyses, conclusions and recommendations discussed in this report are based on conditions as they existed at the time of our field investigation and further on the assumption that the exploratory borings are representative of subsurface conditions throughout the areas investigated. It should be noted that actual subsurface conditions between and beyond the borings might differ from those encountered at the boring locations. If subsurface conditions are encountered during construction that vary from those discussed in this report, Burns Cooley Dennis, Inc. should be notified immediately in order that we may evaluate the effects, if any, on the recommendations provided.

Burns Cooley Dennis, Inc. should be retained for a general review of project plans and specifications. It is advised that we be retained to observe construction for the project in order to help confirm that our recommendations are valid or to modify them accordingly. Burns Cooley Dennis, Inc. cannot assume responsibility or liability for the adequacy of recommendations if we do not observe construction.

This report has been prepared for the exclusive use of Pickering Firm, Inc. for specific application to the geotechnical aspects of design and construction for the proposed 42-in. sewer line for

Phase I of the proposed Big Creek Sewer Interceptor project in Hinds County, Mississippi. The only warranty made by us in connection with the services provided is 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, express or implied, is made or intended.

FIGURES



Approximate Boring Locations

PROPOSED BIG CREEK SEWER INTERCEPTOR - PHASE I
BYRAM, MISSISSIPPI

BURNS COOLEY DENNIS, INC.
551 SUNNYBROOK ROAD
RIDGELAND, MISSISSIPPI 39157

JOB NO. 240296	SCALE: AS SHOWN	FIGURE 1

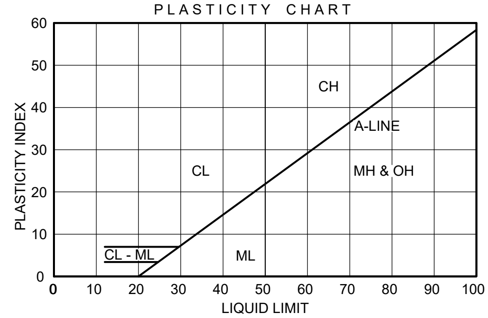
UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			SYMBOL & LETTER	DESCRIPTION
COARSE-GRAINED SOILS — More than half of material larger than No. 200 sieve size	GRAVELS — More than half of coarse fraction larger than No.4 sieve size	Clean Gravels (Little or no fines)	GW	WELL GRADED GRAVEL, GRAVEL-SAND MIXTURE
			GP	POORLY GRADED GRAVEL, GRAVEL-SAND MIXTURE
		Gravels with fines (Appreciable amount of fines)	GM	SILTY GRAVEL, GRAVEL-SAND-SILT MIXTURE
			GC	CLAYEY GRAVEL, GRAVEL-SAND-CLAY MIXTURE
	SANDS — More than half of coarse fraction smaller than No.4 sieve size	Clean Sands (Little or no fines)	SW	WELL GRADED SAND, GRAVELLY SAND
			SP	POORLY GRADED SAND, GRAVELLY SAND
		Sands with fines (Appreciable amount of fines)	SM	SILTY SAND, SAND-SILT MIXTURE
			SP-SM	SLIGHTLY SILTY SAND
			SC	CLAYEY SAND, SAND-CLAY MIXTURE
FINE-GRAINED SOILS — More than half of material smaller than No. 200 sieve size	SILTS AND CLAYS	Liquid limit less than 50	ML	SILT WITH LITTLE OR NO PLASTICITY
			ML	CLAYEY SILT, SILT WITH SLIGHT TO MEDIUM PLASTICITY
			ML	SANDY SILT
			CL	SILTY CLAY, LOW TO MEDIUM PLASTICITY
			CL	SANDY CLAY, LOW TO MEDIUM PLASTICITY (30% TO 50% SAND)
	SILTS AND CLAYS	Liquid limit greater than 50	MH	SILT, FINE SANDY OR SILTY SOIL WITH HIGH PLASTICITY
			CH	CLAY, HIGH PLASTICITY
			OH	ORGANIC CLAY OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS			PT	PEAT, HUMUS, SWAMP SOIL
SEDEMENTARY ROCK TYPES:			LS	LIMESTONE
			MARL	MARL

TERMS CHARACTERIZING SOIL STRUCTURE

Slickensided	- Clays with polished and striated planes created as a result of volume changes related to shrinking, swelling and/or changes in overburden pressure.
Fissured	- Clays with a blocky or jointed structure generally created by seasonal shrinking and swelling.
Laminated	- Composed of thin alternating layers of varying color and texture.
Calcareous	- Containing appreciable quantities of calcium carbonate.
Parting	- Paper thin (less than 1/8 inch).
Seam	- 1/8 inch to 3 inch thickness.
Layer	- Greater than 3 inches in thickness.

PLASTICITY CHART



FOR CLASSIFICATION OF FINE GRAINED SOILS

DENSITY AND CONSISTENCY

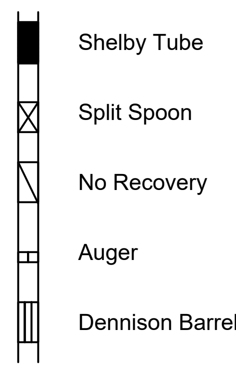
COARSE-GRAINED SOILS

DENSITY	PENETRATION RESISTANCE, N Blows per Foot
Very loose	0 - 4
Loose	5 - 10
Medium Dense	11 - 30
Dense	31 - 50
Very Dense	>50

FINE-GRAINED SOILS

CONSISTENCY	COHESION Kips/Sq. Ft	PENETRATION RESISTANCE, N Blows per Foot
Very Soft	<0.25	0 - 1
Soft	0.25 - 0.50	2 - 4
Medium Stiff	0.50 - 1.00	5 - 8
Stiff	1.00 - 2.00	9 - 15
Very Stiff	2.00 - 4.00	16 - 30
Hard	>4.00	>30

SAMPLE TYPES
(Shown in Sample Column)



PARTICLE SIZE IDENTIFICATION

Cobbles	- Greater than 3 inches
Gravel	- Coarse - 3/4 inch to 3 inches
	Fine - 4.76 mm to 3/4 inch
Sand	- Coarse - 2 mm to 4.76 mm
	Medium - 0.42 mm to 2 mm
	Fine - 0.074 mm to 0.42 mm
Silt & Clay	- Less than 0.074 mm

RELATIVE COMPOSITION

Slightly	5 - 15%
With	16 - 29%
Sandy (or gravelly)	30 - 50%

CLASSIFICATION, SYMBOLS AND TERMS USED ON GRAPHICAL BORING LOGS

LOG OF BORING NO. 1

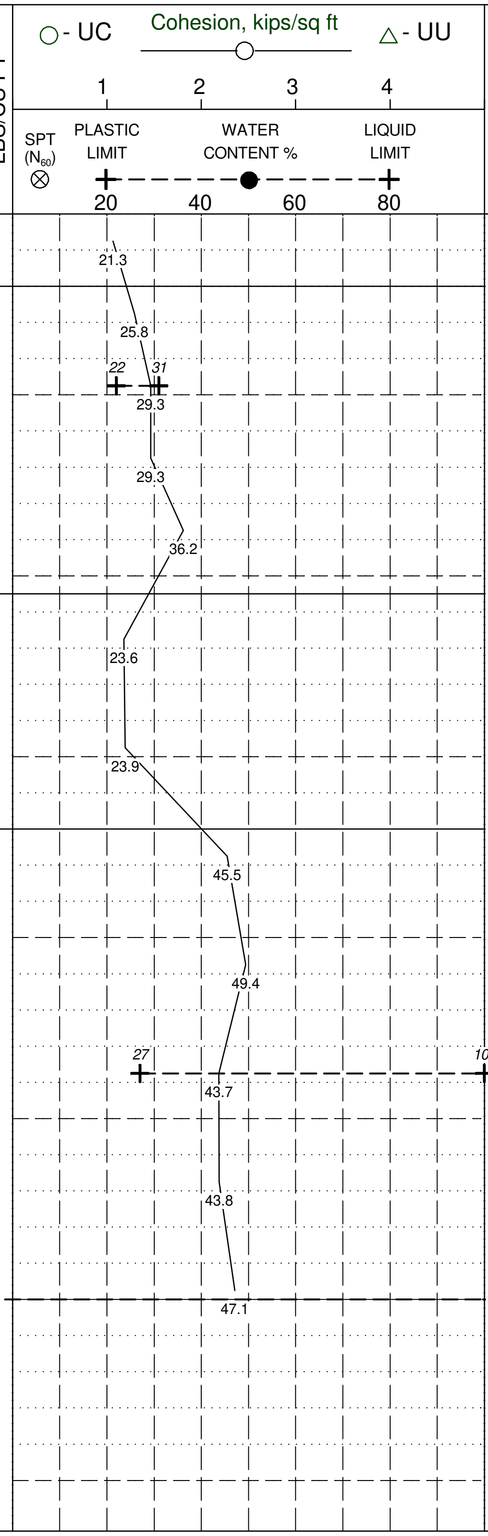
PROPOSED BIG CREEK SEWER INTERCEPTOR - PHASE I
CITY OF BYRAM, MISSISSIPPI

TYPE: 4" Continuous-flight auger

LOCATION: See Figure 1

SURFACE EL: 253.9 ±ft

DEPTH, ft	DESCRIPTION OF MATERIAL	FIELD SPT DATA	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0 – 2	Loose tan silty fine sand (SM)			
2 – 10.5	Medium stiff tan silty clay (CL), slightly sandy - soft 4' - 7' - very soft below 7'			
10.5 – 17	Loose tan silty fine sand (SM)			33.1 (at 15 ft)
17 – 30	Very stiff gray clay (CH)			



BORING DEPTH: 30 ft

DATE: 05/24/24

COMMENTS: Borehole filled with cement-bentonite grout after completion of drilling and sampling.
GPS Coordinates
N 32° 9' 44.4"
W 90° 16' 7.0"

GROUNDWATER DATA: Free water encountered at an approximate depth of 7' during auger drilling. Water level at an approximate depth of 6' after about 15 minutes.

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FIGURE 3

LOG OF BORING NO. 2

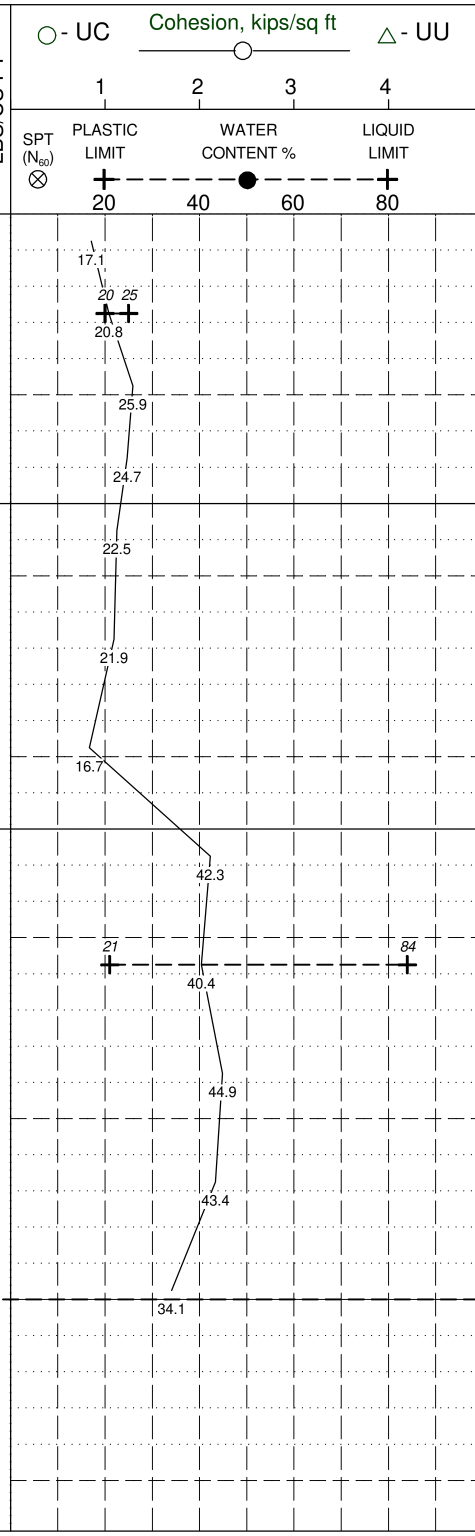
PROPOSED BIG CREEK SEWER INTERCEPTOR - PHASE I
CITY OF BYRAM, MISSISSIPPI

TYPE: 4" Continuous-flight auger

LOCATION: See Figure 1

SURFACE EL: 257.2 ±ft

DEPTH, ft	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	FIELD SPT DATA	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0 – 8			Stiff tan very silty clay (CL-ML) - medium stiff below 4'			
8 – 17			Loose tan silty fine sand (SM)			27.4
17 – 30			Very stiff gray clay (CH)			



BORING DEPTH: 30 ft

DATE: 05/24/24

COMMENTS: Set piezometer following completion of drilling and sampling.
GPS Coordinates
N 32° 9' 46.1"
W 90° 16' 11.0"

GROUNDWATER DATA: Free water encountered at an approximate depth of 8' during auger drilling. Water level at an approximate depth of 7' after about 15 minutes.

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FIGURE 4

LOG OF BORING NO. 3

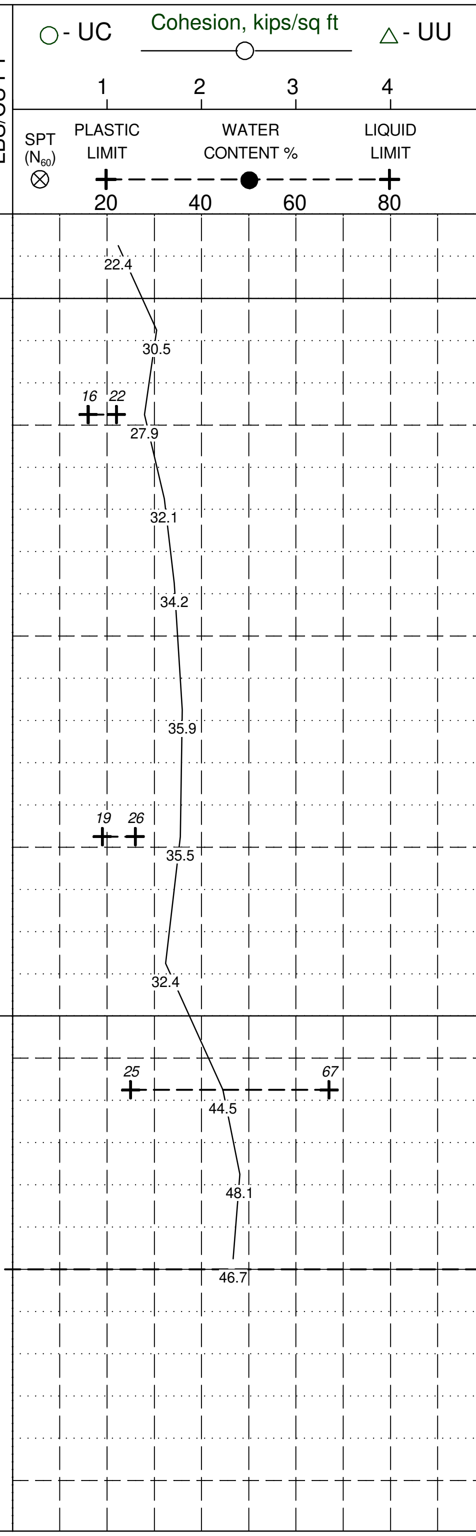
PROPOSED BIG CREEK SEWER INTERCEPTOR - PHASE I
CITY OF BYRAM, MISSISSIPPI

TYPE: 4" Continuous-flight auger

LOCATION: See Figure 1

SURFACE EL: 254.2 ±ft

DEPTH, ft	DESCRIPTION OF MATERIAL	FIELD SPT DATA	DRY DENSITY LBS/CU FT	% PASSING NO. 200 SIEVE
0 – 2	Very loose tan and light gray silty fine sand (SM)			
2 – 19	Soft tan and light gray very silty clay (CL-ML)			
	- slightly sandy below 4'			
	- very soft below 8'			
19 – 25	Stiff gray clay (CH)			



BORING DEPTH: 25 ft

DATE: 05/28/24

COMMENTS: Set piezometer following completion of drilling and sampling.
GPS Coordinates
N 32° 9' 48.4"
W 90° 16' 16.0"

GROUNDWATER DATA: Free water encountered at an approximate depth of 4' during auger drilling. Water level at an approximate depth of 3' after about 15 minutes.

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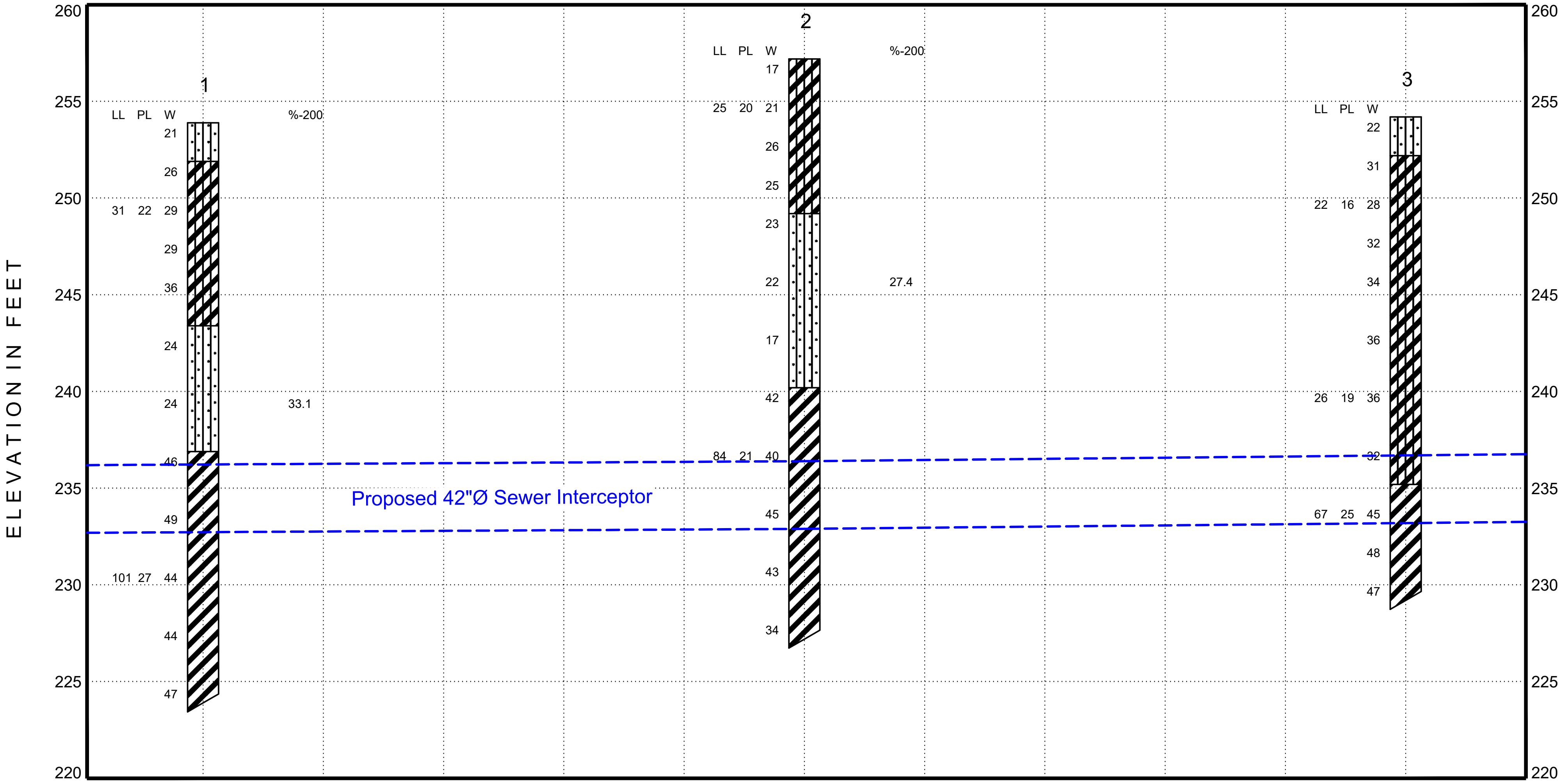
FIGURE 5



LEGEND:

LL = Liquid Limit
PL = Plastic Limit
W = Water Content
DD = Dry Density (pcf)
C/N = Cohesion (ksf)/Penetration Resistance, N. (blows per ft) in the same column
% -200 = % Passing No. 200 Sieve

NOTE: See Figure 2 for boring log legend.

SUBSURFACE SOIL PROFILE		
PROPOSED BIG CREEK SEWER INTERCEPTOR - PHASE I CITY OF BYRAM, MISSISSIPPI		
Job No. 240296	Date 6/11/24	Figure 6

GENERIC FENCE ELEV. (NEW 12-6-21)

BURNS COOLEY DENNIS, INC.

SECTION 02222

PIPELINE EXCAVATION AND BACKFILL

PART 1. GENERAL

1.1 SCOPE: The requirements set forth in this Section govern the excavation, trenching, pipe bed preparation, select pipe bedding material, select pipe backfill material, trench backfilling with excavated material, and trench backfilling with select material.

PART 2. MATERIALS

2.1 EXCAVATED MATERIAL: Native material removed during excavation and trenching shall generally be used for backfilling. Any material encountered that is incapable of proper consolidation or is otherwise unsuitable for use in the work will be hauled to waste.

2.2 SELECT BEDDING MATERIAL: Select granular material for pipe bedding shall be as specified in Section 02731 Wastewater Gravity mains and Appurtenances.

2.3 SELECT BACKFILL MATERIAL: Select material for backfilling pipe trenches shall be select sand-clay material as specified in Section 02731 Wastewater Gravity Mains and Appurtenances

All testing costs required by the Engineer to verify that select material from the trench excavation meets the specified limits shall be borne by the Contractor.

All testing costs associated with verifying that off-site select material meets the specified limits shall also be borne by the Contractor.

PART 3. CONSTRUCTION REQUIREMENTS

3.1 EXCAVATION AND TRENCHING: All excavation of every description and of whatever substances encountered shall be performed to the depths indicated on the Plans or as otherwise specified.

Excavation shall be done by open-cut from the surface except when a trenchless method is expressly herein permitted or directed in writing by the Engineer. Trenches shall be excavated along the lines and to the grades established by the Engineer and shall conform to the widths specified.

During excavation, material suitable for backfilling shall be piled in an orderly manner a sufficient distance from the banks of the trench to avoid overloading and to prevent slides or cave-ins. All excavated materials not required or not suitable for backfill shall be removed and wasted as indicated or as directed by the Engineer.

Grading shall be done as may be necessary to prevent surface water from flowing into trenches or other excavations. Any water accumulating therein shall be removed by pumping or by other approved methods.

Temporary sheeting and shoring shall be used where necessary for the protection of the work and for the safety of the personnel.

Should running sand, quicksand or other treacherous ground be encountered, the work shall be prosecuted vigorously night and day without interruption, when directed by the Engineer. Water encountered in trench or structure excavation shall be drained to slumps through subdrains or by other methods devised by the Contractor and approved by the Engineer to provide dry trench conditions.

Whenever lenses or pockets of wet, unstable soil are encountered in the trench bottom, it shall be removed and the pipe shall be bedded to a depth that will properly support the pipe. This paragraph shall not relieve the Contractor of his responsibility to adequately dewater the trench in natural sandy strata.

Dewatering is required to maintain the water level a minimum of 18 inches below the trench bottom. The Contractor will not be allowed to work when the water level is above this elevation. The Contractor shall dewater the trench to maintain this level in sandy strata.

If the Contractor does not adequately dewater the trench and the trench bottom remains or becomes saturated, the Contractor shall not be entitled to additional compensation for undercutting (over excavating) the trench bottom and bedding the pipe with select materials.

3.2 TUNNELLING: Tunnelling will be permitted only in short sections by special permission of the Engineer. Wherever tunnelling is permitted, the space between the pipe and the undisturbed earth shall be completely filled with sand and/or gravel or other suitable select material, thoroughly compacted.

The installation of pipe by jacking or boring or the installation of pipe in casing or lined tunnelled section shall be in strict conformance with the provisions of these Specifications governing the respective methods.

3.3 EXCAVATION FOR MANHOLES: Excavation for manholes shall be sufficient to permit the carrying out of the construction as required. Where manholes are to be plastered, a clear space of at least twelve inches (12") shall be provided.

Care shall be taken not to excavate for the manholes below the depth specified. Space so excavated through error or neglect shall be refilled with concrete at the Contractor's expense. If extra depth of excavation is necessitated by the nature of the soil and is ordered by the Engineer, the Contractor will be paid for the selected fill material as provided for in the General Conditions of these Contract Documents unless the Contract contains Unit Prices.

3.4 SHEETING, SHORING, AND BRACING: Sheeting, shoring and bracing shall be furnished, placed and maintained by the Contractor, as may be required to support the sides of the excavation and shall be fully responsible for the sufficiency of such supports to prevent any movement which can in any way injure or delay the work or endanger or cause damage to adjacent pavements, buildings or other structures or create undue hazards to workmen. Care shall be taken to prevent voids outside of the sheeting, but if voids are formed, they shall be immediately filled and rammed to the satisfaction of the Engineer. Where, in the Engineer's opinion, damage is likely to result from withdrawing sheeting, the sheeting shall be left in place when so ordered and payment therefore will be made in accordance with the General Conditions unless the Contract contains Unit Prices.

All sheeting, shoring and bracing which are not ordered by the Engineer to be left in place shall be removed in such a manner as not to endanger the constructed sewer or other structures, utilities or property. All voids left or caused by the withdrawal of sheeting shall be immediately refilled with sand by ramming with tools specifically adapted to the purpose by watering or otherwise as may be directed.

The right of the Engineer to order sheeting and bracing left in place shall not be construed as releasing the Contractor from liability for damage to persons or property resulting from any settlement, caving or moving of the ground due to his operations.

3.5 EXCAVATED MATERIAL: Excavated material from trench and structure excavation suitable for backfill shall be placed compactly on the uphill sides of the excavation and kept up so as not to endanger the work and be of as little inconvenience as possible to the public travel and abutting property, and so that free access may be had at all times to fire hydrants and water valves in the vicinity of the work. Any material encountered in the excavation which, in the opinion of the Engineer, is of such unsuitable nature as to be incapable of proper consolidation or is otherwise unsuitable for use in the work, shall be removed and wasted as directed and not stockpiled along the side of the excavation.

The disposal of all surplus and unsuitable excavation shall be the responsibility of the Contractor at his own expense. The surplus and unsuitable material not to be used in the construction of the Project shall not be left on the right-of-way or easement of the Project, or adjacent thereto, except by written permission of the property owner.

3.6 DEWATERING: The Contractor shall provide and maintain adequate dewatering equipment to remove and dispose of all surface and ground water entering excavations, trenches or other parts of the work. Each excavation shall be kept dry during subgrade preparation and continually thereafter until the structure to be built or the pipe to be installed therein is completed to the extent that no damage from hydrostatic pressure, flotation or other cause will result. The normal water table shall be restored to its natural level in such a manner that will not disturb the pipe and its foundation.

All excavation for concrete structures or trenches which extend down to or below static ground water shall be dewatered by lowering and keeping the ground water level beneath such excavations except where the pipe is laid in an impervious strata, the lower trench section shall be maintained in a dry condition for bedding. The dewatering operation, however accomplished, shall be carried out so that it does not destroy or weaken the strength of the soil under or alongside the trench.

Surface water shall be diverted or otherwise prevented from entering excavated areas or trenches to the greatest extent practicable without causing damage to adjacent property.

The Contractor will be responsible for the condition of any pipe or conduit, which he may use for drainage purposes. All such pipes or conduits shall be left clean and free of sediment.

3.7 BEDDING

A. General: Unless otherwise noted on the Plans or directed by the Engineer, the foundation for the pipe shall be so shaped that at least the lower quarter of the pipe shall be in continuous contact with the bottom of the trench.

When bell and spigot pipes or pipe couplings are used, spaces shall be cut to accommodate the bells or couplings. These spaces shall be deep enough to ensure that the bells or couplings do not bear the load of the pipes. When the pipes are laid, the barrel of each section of pipe shall be in contact with the quadrant shaped bedding throughout its full length, exclusive of the bell or coupling, to support the entire load of the pipe. All adjustments to line and grade shall be made by scraping away or filling in and compacting the earth under the body of the pipe and not by wedging or blocking up the pipe. Pipe shall not be laid on frozen ground.

Where select bedding material is used, the trench shall be uniformly undercut and all lumps and objects removed that may be injurious to the pipe prior to placement of the select pipe bedding material.

3.8 BACKFILLING

A. General: After due consideration has been given to the type of backfill material, its moisture content and its ability to consolidate to the required density when the required compaction processes are applied, the backfill shall be continued as hereinafter provided by one of the following methods.

B. In areas where street paving, sidewalks, driveways and other restoration work is required, the backfill shall be completed and maintained in such a manner to eliminate voids and future settlement as prescribed herein and by any other satisfactory methods approved by the Engineer for obtaining the desired results.

The backfill shall be placed in six-inch (6") lifts. Each lift shall be thoroughly compacted to a density at least equal to ninety-five percent (95%) of the density determined by the Standard Proctor Method (AASHTO Designation T–99) before the next lift is placed. Each lift of the backfill material shall have proper moisture content to permit compaction to this density.

C. In open fields or undeveloped areas, the backfill may be placed in twelve-inch (12") layers and compacted to a density of not less than that of the surrounding earth. The top of the filled trench shall be mounded slightly above the natural ground to allow for settlement.

D. Jetting: This method of backfill shall only be used when an analysis and physical examination of the backfill materials have been made and has been determined to be conducive to water settlement without impairing the final completion of the work in a satisfactory manner. Highly expansive clays are excluded from this method of backfill. Material of such quality that the portion passing the number forty (40) sieve has a liquid limit of not more than forty (40) and a plasticity index of not more than ten (10) shall generally be considered as acceptable for this method of backfill.

After the trench or other excavation has been backfilled to within one foot (1') above the top of the pipe as hereinabove provided, the balance of the trench shall be loosely filled in depths of not more than three feet (3') to within two feet (2') of the top of the trench. Each lift of the loose material shall be uniformly and completely consolidated by jetting with water having a minimum pressure of forty (40) pounds per square inch at the nozzle using a rigid pipe or nozzle of sufficient length to reach to the full depth of each lift. Care shall be taken to use only sufficient water at each jetting point to ensure permeation of backfill and proper consolidation and not result in surface saturation.

After the loosely filled backfill (to within two feet [2'] of the top of the trench) has been settled or compacted by jetting and the surface is dry enough to be stable, the balance of the backfill shall be placed in six inch (6") lifts as prescribed above.

END OF SECTION 02222