ECS Florida, LLC

Geotechnical Engineering Report

JEA Galvanized Pipe (Packages A-C)

Luna Street
Jacksonville, Florida

ECS Project Number 35:30388

May 28, 2020

May 28, 2020

Mr. Robert Kermitz
ETM, Inc.
14775 Old St. Augustine Road
Jacksonville, Florida 32258

ECS Project No. 35:30388
Client ID: 0120

Reference: Geotechnical Engineering Report
JEA Galvanized Pipe (Packages A-C)
Luna Street
Jacksonville, Florida

Dear Mr. Kermitz:

ECS Florida, LLC. (ECS) has completed the subsurface exploration, laboratory testing, and geotechnical engineering analyses for the above-referenced project. Our services were performed in general accordance with the Technical Consulting Services Agreement No. 1, dated May 12, 2020. This report presents our understanding of the geotechnical aspects of the project, the results of the field exploration and laboratory testing conducted, and our design and construction recommendations.

It has been our pleasure to be of service to ETM, Inc. during the design phase of this project. We would appreciate the opportunity to remain involved during the continuation of the design phase, and we would like to provide our services during construction phase operations as well to verify the assumptions of subsurface conditions made for this report. Should you have any questions concerning the information contained in this report, or if we can be of further assistance to you, please contact us.

Respectfully submitted,

ECS Florida, LLC.

David W. Spangler, State of Florida, Professional Engineer, License No. 58770

This item has been digitally signed and sealed by David W. Spangler on the date indicated here.

Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

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Distribution: Mr. Robert Kermitz – ETM, Inc. 1 pdf

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EXECUTIVE SUMMARY

The following summarizes the main findings of the exploration, particularly those that may have a cost impact on the planned development. Further, our principal foundation recommendations are summarized. Information gleaned from the executive summary should not be utilized in lieu of reading the entire geotechnical report.

- The borings generally encountered between 6 inches and 1.1 feet of asphalt and limerock underlain by fine sand (A-3) and silty fine sand (A-2-4) to depths between 2.5 and 5.5 feet below ground surface and layers of fine sand (A-3), silty fine sand (A-2-4) and clayey fine sand (A-2-6) to the boring termination depths of 10 feet below top of asphalt. Groundwater was encountered between depths of approximately 3 feet and 6.5 feet below ground surface.

- In general, we consider the subsurface conditions at the site capable of supporting the proposed pipelines when constructed on properly prepared subgrade soils. Clayey soils (A-2-6) may be encountered at the pipeline invert elevations and will be required to be over-excavated and replaced as discussed in this report.

- Backfill should be placed in accordance with Section 103 of the *City Standard Specifications for City of Jacksonville Florida*.

1.0 INTRODUCTION

1.1 GENERAL

The purpose of this study was to provide geotechnical information for the design of new water pipelines in the College Street area of Jacksonville. The overall project will include understand approximately 37,000 linear feet of 2 inch, 4, inch 6 inch, and 8 inch diameter water main pipes. This report includes only the portions of the pipelines along portions of Luna Street, Gilmore Street, Dellwood Avenue, Lunar Court, Union Hall Place, Melba Street, Phyllis Street, and Roselle Street referenced as Packages A-C.

The recommendations developed for this report are based on project information supplied by ETM, Inc. This report contains the results of our subsurface explorations and laboratory testing programs, site characterization, engineering analyses, and recommendations for the design and construction of planned pipelines.

1.2 SCOPE OF SERVICES

To obtain the necessary geotechnical information required for design of proposed pipelines, ten soil test borings were performed at locations selected by ETM, Inc. A laboratory-testing program was also implemented to characterize the physical and engineering properties of the subsurface soils.

This report discusses our exploratory and testing procedures, presents our findings and evaluations and includes the following.

- A brief review and description of our field and laboratory test procedures and the results of testing conducted.
- A review of surface topographical features and site conditions.
- A review of area and site geologic conditions.
- A review of subsurface soil stratigraphy with pertinent available physical properties.
- Final copies of our soil boring logs.
- Recommendations for site preparation and construction of compacted fills.
- Recommendations for design of the pipelines.

1.3 AUTHORIZATION

Our services were provided in accordance with the Technical Consulting Services Agreement No. 1 dated May 12, 2020 and includes the Terms and Conditions of Service outlined with the Agreement.

2.0 PROJECT INFORMATION

2.1 PROJECT LOCATION

The project site is located along portions of Luna Street, Gilmore Street, Dellwood Avenue, Lunar Court, Union Hall Place, Melba Street, Phyllis Street, and Roselle Street in Jacksonville, Duval County, Florida. The site is bordered to the north by Lenox Avenue, to the east by McDuff Avenue South, to the south by Myra Street, and to the west by Comet Street and Lenox Avenue. The general site location is shown on Figure 1.

2.2 SITE CONDITIONS

At the time of our exploration, the site was developed as residential, asphalt roadways. The roads were two lanes with curb and gutter along both sides of the roads. Various underground and overhead utilities are located within the roadway corridor. Surface water was not observed near planned structural areas at the time of our exploration.

2.3 PROJECT DESCRIPTION

You provided project information via several discussions and an email dated May 8, 2020. We were provided with a copy of a site plan for the subject site, prepared by ETM, Inc. This plan indicated the boundary limits for the property, the existing roadways adjacent to and within the site, and the requested boring locations.

We understand the overall project will include understand approximately 37,000 linear feet of 2 inch, 4, inch 6 inch, and 8 inch diameter water main pipes. This report includes only the portions of the pipelines along portions of Luna Street, Gilmore Street, Dellwood Avenue, Lunar Court, Union Hall Place, Melba Street, Phyllis Street, and Roselle Street referenced as Packages A-C covering approximately 7,365 linear feet of pipeline. The depth of the water main was not available to our office at the time of this report. Therefore, we have assumed the pipelines will be shallower than 10 feet below existing grades.

If project information varies from these conditions, then the recommendations in this report may need to be re-evaluated. We should be contacted if any of the above project information is incorrect so that we may reevaluate our recommendations.

3.0 FIELD EXPLORATION AND LABORATORY TESTING

3.1 FIELD EXPLORATION PROGRAM

We performed a field exploration between May 15, 2020 and May 18, 2020. The approximate boring locations are indicated on the attached Field Exploration Plan (Figure 3). Our personnel determined the boring locations using our handheld GPS receivers. The boring locations on the referenced Field Exploration Plan should be considered accurate only to the degree implied by the method of measurement used.

We located and performed ten auger borings, drilled to depths of approximately 10 feet below the existing ground surface in general accordance with the methodology outlined in ASTM D 1452 to explore the subsurface conditions within the proposed pipeline areas. Representative soil samples also were recovered from the auger borings and returned to our laboratory for further evaluation. A summary of the field procedures is included in Appendix A.

3.2 LABORATORY TESTING

The laboratory testing performed by ECS for this project consisted of selected tests performed on samples obtained during our field exploration operations. The following paragraphs briefly discuss the results of the completed laboratory testing program.

An experienced geotechnical engineer visually classified each soil sample from the test borings on the basis of texture and plasticity in accordance with the AASHTO Soil Classification System in general accordance with ASTM D 2488. A Key to the Soil Classification System is included in Appendix A.

Selected samples of the soils encountered during the field exploration were subjected to quantitative laboratory testing to better define the composition of the soils encountered and to provide data for correlation to their anticipated strength and compressibility characteristics. The laboratory testing determined the moisture contents and particle size distributions of selected soil samples. The results of the laboratory testing are shown in the Laboratory Testing Summary included in Appendix B and summarized in the Roadway Soil Survey Sheet, Figure 2. Also, these results are shown on the Generalized Subsurface Profiles on Figures 4 and 5 and on the Log of Boring records at the respective depths from which the tested samples were recovered.

3.3 REGIONAL/SITE GEOLOGY

The study area is located within the Jacksonville Basin in Duval County, Florida. The near-surface geology consists of Plio-Pleistocene unconsolidated sands overlying Pliocene undifferentiated sandy clays/silts and clayey/silty sands. Below the undifferentiated sediments; sands, silts and clays of the Hawthorn Group are present. The Ocala Group (limestone) underlies the Hawthorn Group, and contains the Floridian aquifer. The Hawthorn Group acts as an aquiclude and separates the shallow water table from the Floridian aquifer within the Ocala Group and lower units.

The Hawthorn Group consists of a highly variable mixture of quartz sand, silt, clay, carbonates and phosphates, and is approximately 300 feet thick in the study area. The Hawthorn Group can be divided into three generalized units. The upper Hawthorn is primarily poorly consolidated dolomites and dolosilts with a mixture of clastics and phosphate. The middle unit is mostly clastic, and the lower unit is predominately dolomite. Occasionally, a lower unit of the Hawthorn will act as part of the Floridan aquifer. Beds of a single component (pure clay) do occur in the Hawthorn but are the exception to a widely varying lithology. Phosphate is nearly always present in the Hawthorn Group.

An unconformity exists between the Miocene Hawthorn Group and the overlying undifferentiated sandy clays and clayey sands from the Pliocene. These undifferentiated sediments often contain reworked phosphate from the Hawthorn near the contact. Shell beds and limestone ranging in thickness between approximately 10 and 20 feet were deposited on top of the Hawthorn in some areas prior to the major regression that occurred during late Miocene Period.

4.0 SUBSURFACE CHARACTERIZATION

The subsurface conditions encountered were generally consistent with published geological mapping. A graphical presentation of the generalized subsurface conditions is presented on Figures 4 and 5. Detailed boring records are included in Appendix A. It should be understood that the soil conditions will vary between the boring locations. The following table summarizes the soil conditions encountered.

4.1 SUBSURFACE STRATIGRAPHY

Table 4.1.1 Subsurface Stratigraphy

Approximate Depth Range (ft)	Stratum	Description
0 to 0.5-1.1	4	Asphalt and Limerock Base
0.5-1.1 to 2.5-5.5	1 and 2	Fine Sand (A-3) and Silty Fine Sand (A-2-4)
2.5-5.5 to 10	1, 2, and 3	Fine Sand (A-3), Silty Fine Sand (A-2-4), Clayey Fine Sand (A-2-6)

Notes: (1) Standard Penetration Test

4.2 GROUNDWATER LEVEL

Measured Groundwater: Groundwater was encountered at each boring location and recorded at the time of drilling at depths varying from 3 feet to 6.5 feet below the existing ground surface. We note that groundwater levels will fluctuate due to seasonal climatic variations, surface water runoff patterns, construction operations, and other interrelated factors. The groundwater depth at each boring location is noted on the Generalized Subsurface Profiles and on the Log of Boring records.

Preliminary Estimated Seasonal High Groundwater: The normal seasonal high groundwater level is affected by a number of factors. The drainage characteristics of the soils, land surface elevation, relief points such as drainage ditches, lakes, rivers, swamp areas, etc., and distance to relief points are some of the more important factors influencing the seasonal high groundwater level.

Based on our interpretation of the site conditions, including the boring logs and Web Soil Survey, we estimate the normal seasonal high groundwater level at the site at the boring locations to be approximately at the depths shown on the Generalized Subsurface Profiles. It is possible that groundwater levels may exceed the estimated normal seasonal high groundwater level as a result of significant or prolonged rains.

5.0 DESIGN RECOMMENDATIONS

5.1 GENERAL

Our geotechnical engineering evaluation of the site and subsurface conditions at the property, with respect to the planned construction and our recommendations for site preparation and foundation support, are based on (1) our site observations, (2) the field and laboratory test data obtained, (3) our understanding of the project information as presented in this report, and (4) our experience with similar soil and loading conditions.

If the stated project information is incorrect, or should the location of the pipeline areas be changed, please contact us so that we can review our recommendations. Also, the discovery of any site or subsurface conditions during construction that deviate from the data obtained during this geotechnical exploration should also be reported to us for our evaluation.

The recommendations in the subsequent sections of this report present design and construction techniques that are appropriate for the planned construction. We recommend that ECS be provided the opportunity to review the foundation plans and earthwork specifications to verify that our recommendations have been properly interpreted and implemented.

5.2 PIPELINE SUPPORT RECOMMENDATIONS

In general, we consider the subsurface conditions at the site capable of supporting the proposed pipelines when constructed upon properly prepared subgrade soils. Unsuitable clayey soils (A-2-6) encountered during excavation at the pipe invert elevations will require over-excavation and replacement with compacted suitable backfill soil. Provided the site preparation and earthwork construction recommendations outlined in Section 6.0 of this report are performed, the following parameters may be used for design.

5.2.1 Design Parameters

We anticipate the buried structures will exert little or no net downward pressure on the soils; rather, the structures may be subject to hydrostatic uplift pressure when the structures are empty. Below grade structures should be designed to resist lateral earth pressures and hydrostatic uplift pressures appropriate for their depth below existing grade and the normal seasonal high groundwater table.

The walls of the structures should be designed to resist at-rest lateral earth pressures, with equivalent fluid densities above and below the water table being as follows:

Above Water Table - Equivalent Fluid Density	60 pcf
Below Water Table - Equivalent Fluid Density	90 pcf

The above design values assume granular backfill around the pipelines. Lateral pressure distributions in accordance with the above do not take into account forces from construction equipment, wheel loads, or other surcharge loads.

5.2.2 Uplift Protection

When the water level within below-grade structures is maintained at or above the surrounding groundwater level, no net buoyancy will occur to the structure. However, a positive means of uplift protection may be necessary. Hydrostatic uplift forces can be resisted in several ways including:

1. Addition of dead weight to the structure.
2. Mobilizing the dead weight of the soil surrounding the structure.

At your request, we would be pleased to assist you in evaluating uplift protection requirements.

6.0 SITE CONSTRUCTION RECOMMENDATIONS

Site preparation as outlined in this section should be performed to provide more uniform foundation bearing conditions and to reduce the potential for post-construction settlements of the planned pipelines.

6.1 CLEARING

Prior to construction, the location of existing underground utility lines within the construction area should be established. Provisions should then be made to relocate interfering utilities to appropriate locations. It should be noted that if underground pipes are not properly removed or plugged, they may serve as conduits for subsurface erosion which may subsequently lead to excessive settlement of overlying pavement.

6.2 TEMPORARY GROUNDWATER CONTROL

The groundwater level was encountered in the borings at depths varying from 3 feet to 6.5 feet below the existing ground surface at the time of our exploration. Depending on the depth of excavation required for excavation to the pipeline bearing levels, and the potential need for over-excavation of clayey soils followed by compaction of the soils within the upper one foot below the exposed surface, it will be necessary to install temporary groundwater control measures to dewater the area to facilitate the excavation and compaction processes. The groundwater control measures should be determined by the contractor. The water table should be maintained at least 2 feet below the required depth of excavation. The dewatering system should not be decommissioned until sufficient deadweight exists on the structures to prevent uplift.

6.3 EXCAVATION SAFETY

All excavations and slopes should be made and maintained in accordance with OSHA excavation safety standards. The contractor is solely responsible for designing and constructing stable, temporary excavations and slopes and should shore, slope, or bench the sides of the excavations and slopes as required to maintain stability of both the excavation sides and bottom. The contractor's responsible person, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor's safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in local, state, and federal safety regulations. ECS is providing this information solely as a service to our client. ECS is not assuming responsibility for construction site safety or the contractor's activities; such responsibility is not being implied and should not be inferred.

6.4 PREPARATION OF FOUNDATION SOILS

For those proposed pipelines which are anticipated to bear in sandy soils (A-3 and A-2-4), the soils should be excavated to the proposed bearing elevation and the exposed excavation surface should be compacted as outlined in Section 6.5. Once the pipe is installed, the trench should be backfilled with compacted structural backfill to final grade.

Several borings encountered A-2-6 materials. We recommend that these unsuitable soils be removed in accordance with Sections 103.2 and 104.3.1 of the *City of Jacksonville Standard Specifications for Roadway Construction.*

6.5 COMPACTION OF BOTTOM OF EXCAVATION

After installing the temporary groundwater control measures, and achieving the required depth of excavation, the exposed surface of sandy soils should be compacted by the use of hand-operated equipment. Typically, the material should exhibit moisture contents within ±2 percentage points of the Modified Proctor optimum moisture content (AASHTO T-180) during the compaction operations. Compaction should continue until densities of at least 98 percent of the Modified Proctor maximum dry density (AASHTO T-180) have been achieved within the upper one foot below the exposed surface within the pipeline and manhole structures excavation.

If clayey soils are observed at the exposed surface, and the geotextile or flowable fill alternatives are chosen, then the bottom soils should be compacted to form a stable working surface. Otherwise, it is recommended the initial backfill layer be placed on top of the exposed (clayey soil) surface, then compacted.

Should the bearing level soils experience pumping and soil strength loss during the compaction operations, compaction work should be immediately terminated and (1) the disturbed soils removed and backfilled with dry structural fill soils which are then compacted, or (2) the excess moisture content within the disturbed soils allowed to dissipate before recompacting.

6.6 STRUCTURAL BACKFILL AND COMPACTION OF STRUCTURAL BACKFILL

Structural backfill within the pipeline excavation, and in areas in which over-excavation of unsuitable soils is required below the pipeline invert, should be placed in loose lifts not exceeding 6 inches in thickness and compacted by the use of hand-operated compaction equipment. However, structural backfill may be placed in loose lifts not exceeding 12 inches in thickness and compacted by the hand-operated compaction equipment at elevations greater than 12 inches above the top of pipe.

Structural backfill is defined as a non-plastic, inorganic, granular soil having less than 10 percent material passing the No. 200 mesh sieve and containing less than 4.0 percent organic material. The sandy soils (A-3, A-2-4) excavated for the structure may be used as backfill. Typically, the backfill material should exhibit moisture contents within ±2 percent of the Modified Proctor optimum moisture content (AASHTO T-180) during the compaction operations. Compaction should continue until densities of at least 98 percent of the Modified Proctor maximum dry density (AASHTO T-180) have been achieved within each 6- or 12-inch-thick lift of the compacted structural backfill.

Because the clayey soils (A-2-6) have excessive fines content, and a tendency to retain moisture which makes these soils may be very difficult to dry and compact, we recommend these soils not be used as structural backfill.

7.0 QUALITY CONTROL TESTING

ECS should be retained to perform the construction material testing and observations required for this project, to verify that our recommendations have been satisfied. We are the most qualified to address problems that may arise during construction, since we are familiar with the intent of our engineering design.

A representative number of field in-place density tests should be made in each lift of compacted backfill. Density tests are recommended to verify that satisfactory compaction operations have been performed. We recommend density testing be performed in accordance with JEA Standards and Specifications.

8.0 CLOSING

Our geotechnical exploration has been performed, our findings obtained, and our recommendations prepared, in accordance with generally accepted geotechnical engineering principles and practices. ECS is not responsible for any independent conclusions, interpretation, opinions, or recommendations made by others based on the data contained in this report.

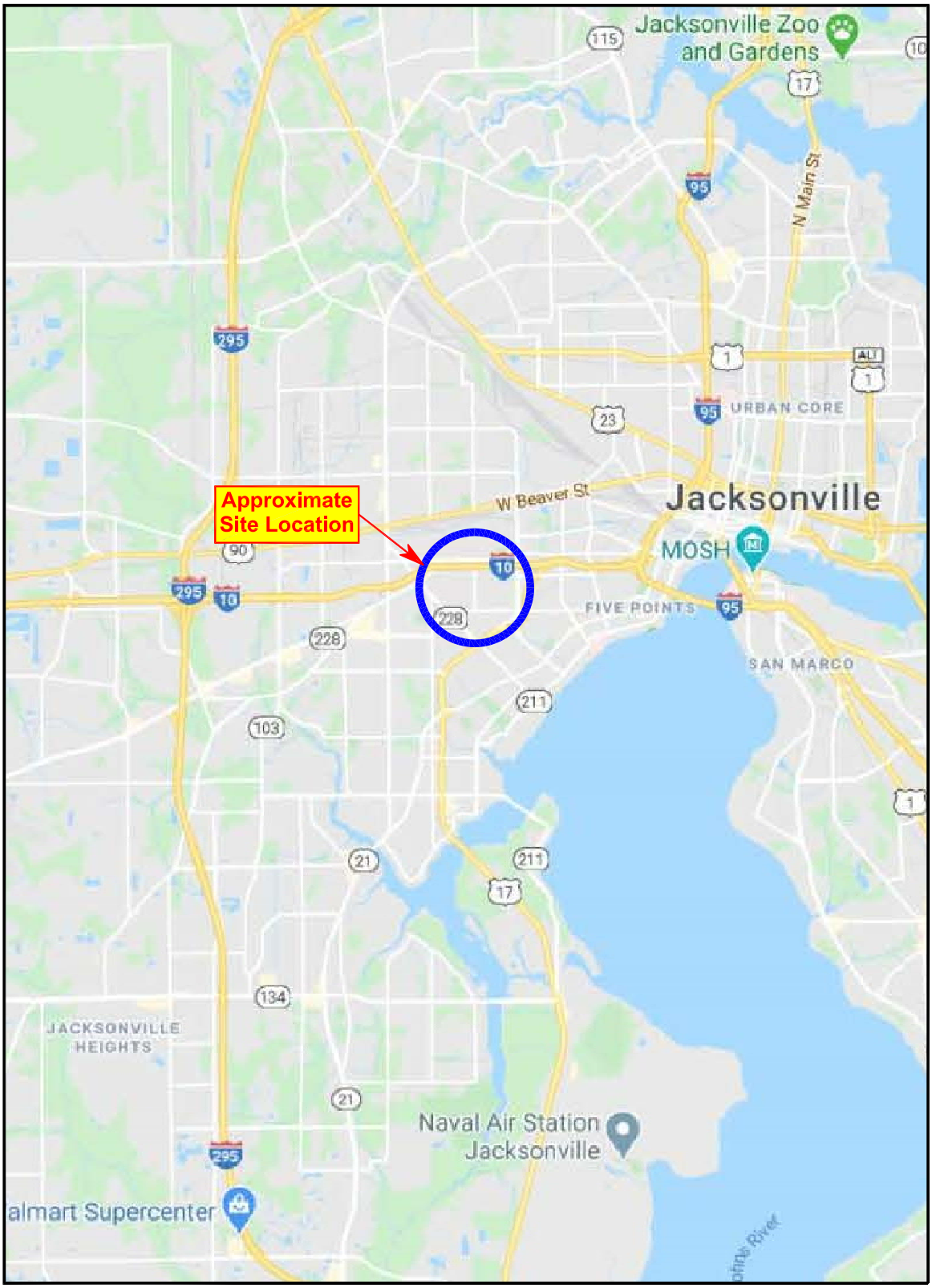
Our scope of services was intended to evaluate the soil conditions within the zone of soil influenced by the pipeline system. Our scope of services does not address geologic conditions, such as sinkholes or soil conditions existing below the depth of the soil borings.

If any of the project description information discussed in this report is inaccurate, either due to our interpretation of the documents provided or site or design changes that may occur later, ECS should be contacted immediately in order that we can review the report in light of the changes and provide additional or alternate recommendations as may be required to reflect the proposed construction.

We recommend that ECS be allowed to review the project's plans and specifications pertaining to our work so that we may ascertain consistency of those plans/specifications with the intent of the geotechnical report.

Field observations, monitoring, and quality assurance testing during earthwork and foundation installation are an extension of and integral to the geotechnical design recommendation. We recommend that the owner retain these quality assurance services and that ECS be allowed to continue our involvement throughout these critical phases of construction to provide general consultation as issues arise. ECS is not responsible for the conclusions, opinions, or recommendations of others based on the data in this report.

FIGURES



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Site Location Plan

JEA Galvanized Pipe

Jacksonville, Florida

Date: 05/28/20	Project No.: 35-30388	Figure 1

JAS - 35-30388

SOIL SURVEY FOR THE DESIGN OF ROADS

DATE OF SURVEY: May 2020
SURVEY MADE BY: ECS Florida, LLC
SUBMITTED BY: -

SURVEY BEGINS STA. : - SURVEY ENDS STA. : -

ROAD NO.: Varies
COUNTY: Duval

	ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS PERCENTAGE PASSING						ATTERBERG LIMITS (%)			SOIL CLASSIFICATION			
STRATUM NO.	NO. OF TESTS	% ORGANIC	NO. OF TESTS	% MOISTURE	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTICITY INDEX	AASHTO GROUP	NO. OF TESTS	AASHTO LBR	DESCRIPTION
1	-	-	-	-	-	-	-	-	-	-	-	-	-	A-3	-	-	Fine SAND, Fine SAND With Silt, and Fine SAND With Clay
2	-	-	3	17-34	3	100	99-100	99-100	68-81	13-34	-	-	-	A-2-4	-	-	Silty Fine SAND
3	-	-	3	13-23	3	99-100	97-100	96-100	75-84	23-28	-	-	-	A-2-6	-	-	Clayey Fine SAND
4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Asphalt/Limerock

EMBANKMENT AND SUBGRADE MATERIAL

STRATA BOUNDARIES ARE APPROXIMATE MAKE FINAL CHECK AFTER GRADING

▼ GROUNDWATER LEVEL ENCOUNTERED AT TIME OF DRILLING

▽ ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL

NOTES:

1. STRATA BOUNDARIES ARE APPROXIMATE AND REPRESENT ENCOUNTERED SOIL STRATA AT EACH TEST HOLE LOCATION ONLY. STRATUM CONNECTING LINES ARE SHOWN FOR ESTIMATING EARTHWORK ONLY AND DO NOT INDICATE ACTUAL STRATUM LIMITS. SUBSURFACE VARIATIONS BETWEEN BORINGS SHOULD BE ANTICIPATED AS INDICATED IN SECTION 3.0 OF OUR REPORT. FOR FURTHER DETAILS SEE FDOT STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION
2. STRATA 1 IS ACCEPTABLE SUBGRADE MATERIAL IN ACCORDANCE WITH SECTION 104.2 CITY OF JACKSONVILLE STANDARD SPECIFICATIONS FOR ROADWAY CONSTRUCTION.
3. STRATA 3 IS NOT SUITABLE FOR USE AS FILL MATERIAL IN ACCORDANCE WITH SECTION 103.4 CITY OF JACKSONVILLE STANDARD SPECIFICATIONS FOR ROADWAY CONSTRUCTION.
4. STRATA 3 ARE UNSUITABLE MATERIALS IN ACCORDANCE WITH SECTION 103.2 CITY OF JACKSONVILLE STANDARD SPECIFICATIONS FOR ROADWAY CONSTRUCTION. REMOVAL OF UNSUITABLE MATERIALS SHOULD BE PERFORMED IN ACCORDANCE WITH SECTIONS 103.2 AND 104.3.1 CITY OF JACKSONVILLE STANDARD SPECIFICATIONS FOR ROADWAY CONSTRUCTION.
5. THE SYMBOL "-" AN UNMEASURED PARAMETER.

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

DAVID W. SPANGLER, P.E.
P.E. LICENSE NUMBER 58770
ECS Florida, LLC
7064 DAVIS CREEK ROAD
JACKSONVILLE, FL 32256
CERTIFICATE OF AUTHORIZATION 26152

CITY OF JACKSONVILLE

ROAD NO.	COUNTY	ECS PROJECT NO.
Varies	DUVAL	35-30388

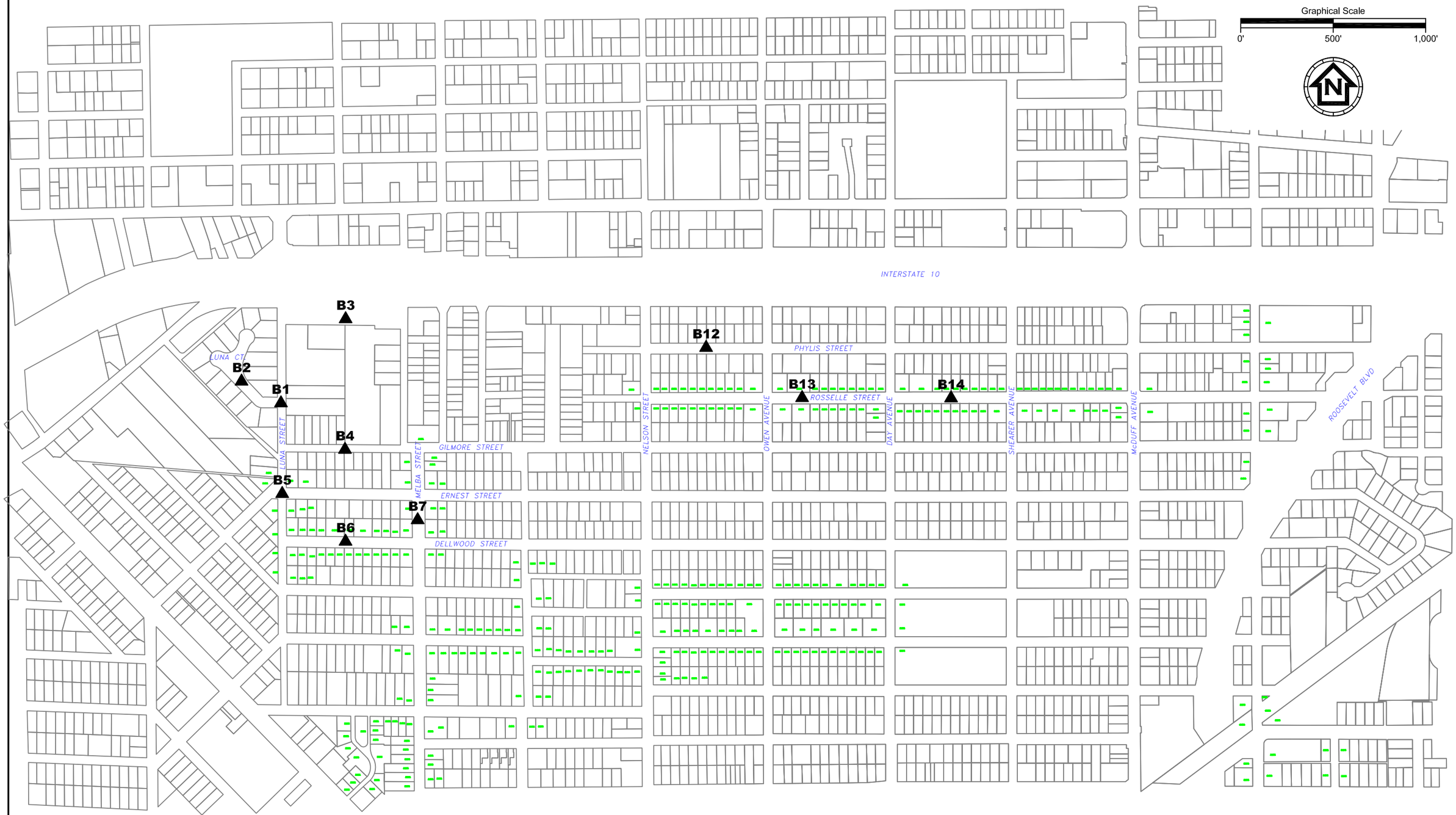
ROADWAY SOIL SURVEY SHEET

Sheet No. -

JAS - 35-30388

Jeff Slansky 5/22/2020 11:02:36 AM X:\caddfiles\CADD\Solomon Projects\35-30388.dwg

Figure 2



LEGEND

▲ Approximate Location of Auger Boring

JAS - 35-30388

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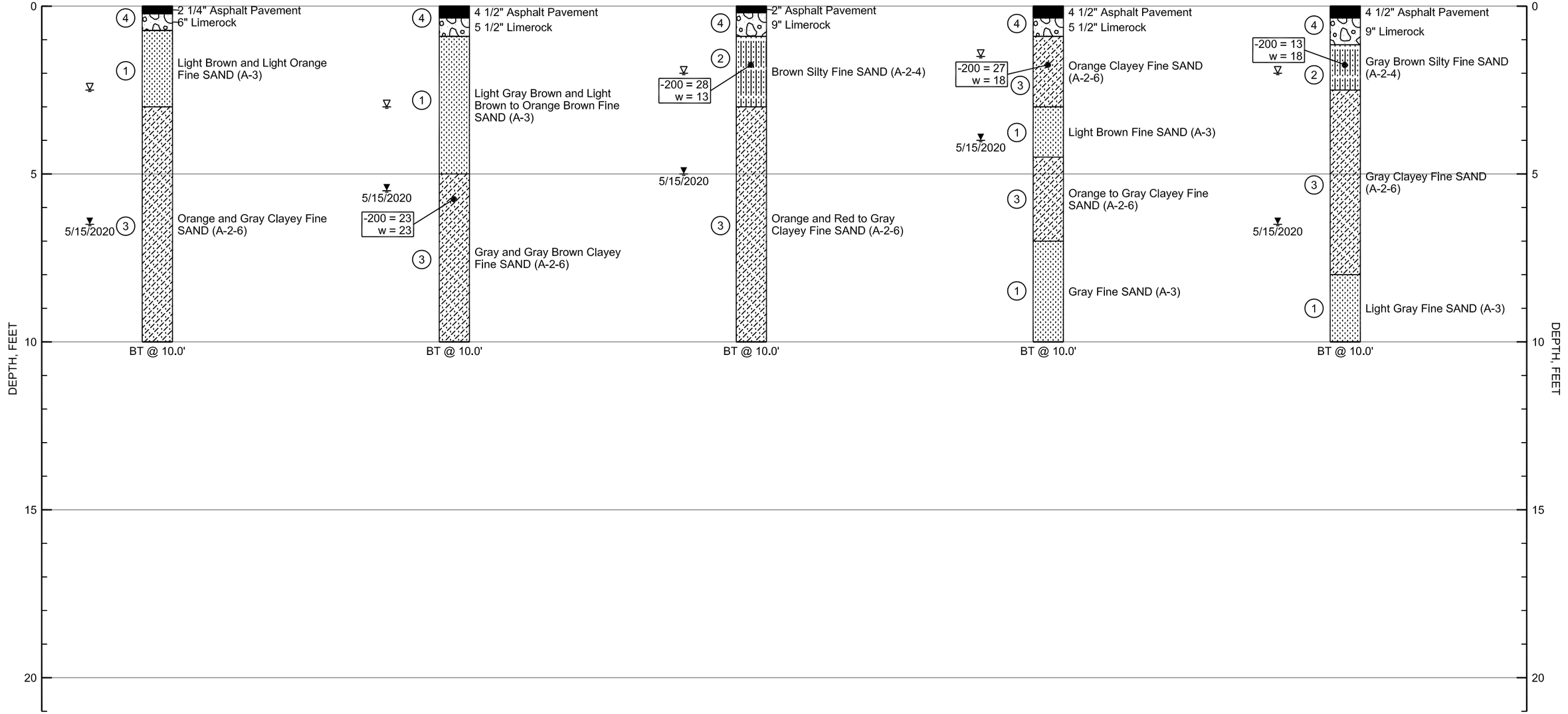
Field Exploration Plan

JEA Galvanized Pipe

Jacksonville, Florida

Date: 05/20/20	Project No.: 35-30388	Figure 3



LEGEND

(4)	Asphalt Pavement	(1)	Fine SAND, Fine SAND With Silt (A-3)
(4)	Limerock Base	(2)	Silty Fine SAND (A-2-4)
(3)	Clayey Fine SAND (A-2-6)	(1)	Stratum Number (See Roadway Soil Survey Sheet)
BT	Boring Terminated at Depth Below Grade		

A-3	AASHTO Soil Classification System
▼	Groundwater Level at Time of Drilling
▽	Estimated Normal Seasonal High Groundwater Level
-200	% Passing No. 200 U.S. Standard Sieve
w	Natural Moisture Content (%)

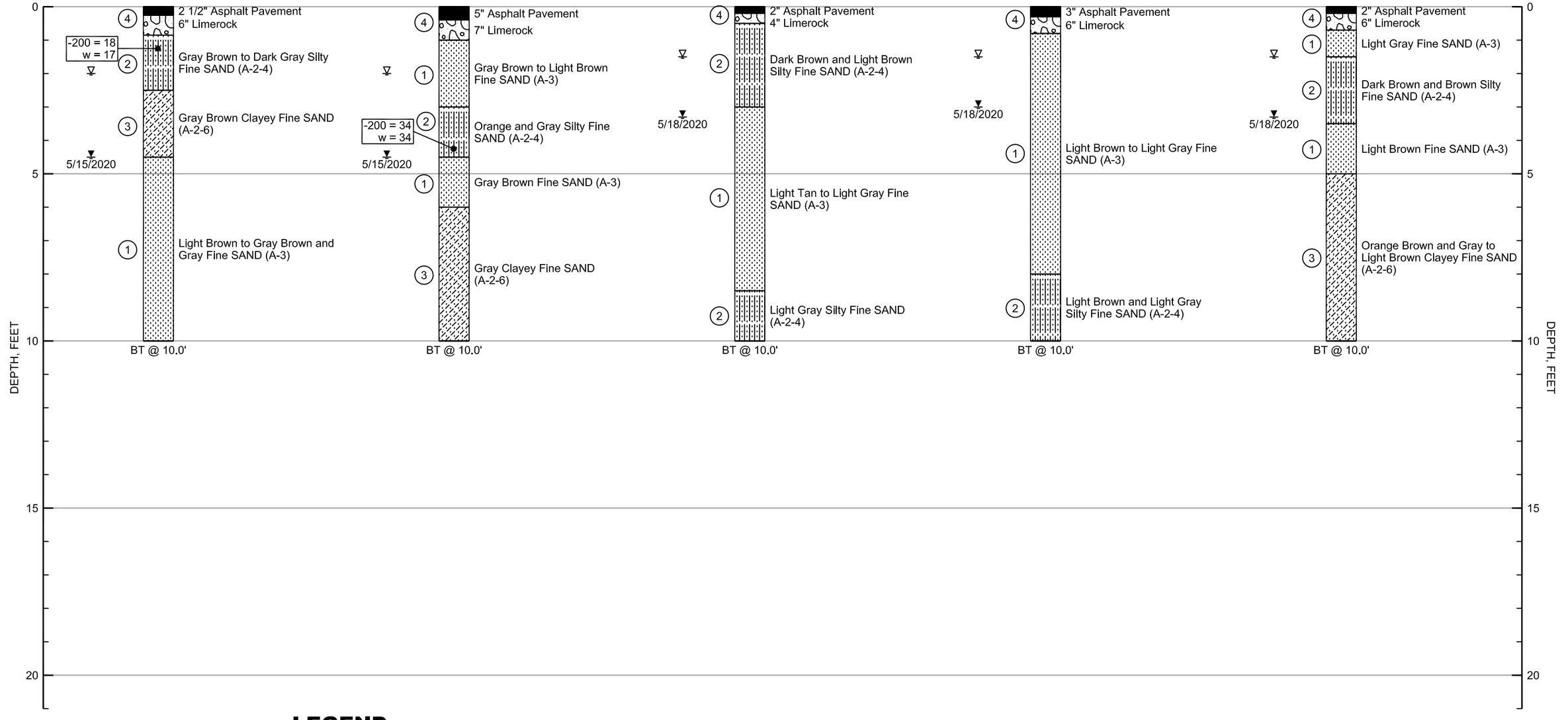
Generalized Subsurface Profiles

JEA Galvinized Pipe

Jacksonville, Florida

ECS

DATE: 5/21/20 | PROJ. NO.: 35-30388 | Figure 4



LEGEND

- (4) Asphalt Pavement
- (4) Limerock Base
- (3) Clayey Fine SAND (A-2-6)
- (1) Fine SAND, Fine SAND With Silt (A-3)
- (2) Silty Fine SAND (A-2-4)
- (1) Stratum Number (See Roadway Soil Survey Sheet)
- BT Boring Terminated at Depth Below Grade
- A-3 AASHTO Soil Classification System
- Groundwater Level at Time of Drilling
- Estimated Normal Seasonal High Groundwater Level
- -200 % Passing No. 200 U.S. Standard Sieve
- w Natural Moisture Content (%)

Generalized Subsurface Profiles

JEA Galvinized Pipe

Jacksonville, Florida

ECS

DATE: 5/21/20 | PROJ. NO.: 35-30388 | Figure 5

APPENDIX A – Field Operations

Soil Boring Logs
Field Exploration Procedures
Key to Soil Classification

Project No.: 35-30388
Boring No.: B1
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: Hand Auger
Driller: M. Foster
Boring Location: See Field Exploration Plan
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 6.5 ft Time: Drilling Date: 5/15/20
Boring Begun: 5/15/20
Boring Completed: 5/15/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT / MOISTURE CONTENT / LIQUID LIMIT (%)	SHEAR STRENGTH (ksf)
	0		2 1/4" Asphalt Pavement 6" Limerock Light Brown and Light Orange Fine SAND (A-3)						
1			Orange to Gray Clayey Fine SAND (A-2-6)						
2	5		Orange Clayey Fine SAND (A-2-6)						
3			Orange and Gray Clayey Fine SAND (A-2-6)						
4	10		Boring Terminated @ 10 ft.						
	15								
	20								

SHEAR STRENGTH (ksf)
- Pocket Penetrometer Undisturbed Sample
- Pocket Penetrometer Disturbed Sample
- Torvane
- Unconfined Compression
- Triaxial Compression

PLASTIC LIMIT / MOISTURE CONTENT / LIQUID LIMIT (%): 0 10 20 30 40
SHEAR STRENGTH (ksf): 0 1 2

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B2
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: Hand Auger
Driller: M. Foster
Boring Location: See Field Exploration Plan
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 5.5 ft Time: Drilling Date: 5/15/20
Boring Begun: 5/15/20
Boring Completed: 5/15/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
	0		4 1/2" Asphalt Pavement						
			5 1/2" Limerock						
1			Light Gray Brown Fine SAND (A-3)						
			Light Brown Fine SAND (A-3)						
2			Orange Brown Fine SAND (A-3)						
	5		Gray Clayey Fine SAND (A-2-6)						
3							23	+	
			Gray Brown Clayey Fine SAND (A-2-6)						
4									
			Gray Clayey Fine SAND (A-2-6)						
5									
	10		Boring Terminated @ 10 ft.						
	15								
	20								

○ PLASTIC LIMIT + MOISTURE CONTENT ◇ LIQUID LIMIT (%): 0 10 20 30 40

SHEAR STRENGTH (ksf): 0 1 2

- ⊙ Pocket Penetrometer Undisturbed Sample
- ◔ Pocket Penetrometer Disturbed Sample
- ▼ Torvane
- ● Unconfined Compression
- ⊠ Triaxial Compression

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B3
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: Hand Auger
Driller: M. Foster
Boring Location: See Field Exploration Plan
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 5 ft Time: Drilling Date: 5/15/20
Boring Begun: 5/15/20
Boring Completed: 5/15/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT / MOISTURE CONTENT / LIQUID LIMIT (%)	SHEAR STRENGTH (ksf)
	0		2" Asphalt Pavement 9" Limerock						
1			Brown Silty Fine SAND (A-2-4)				28	+	
			Orange Clayey Fine SAND (A-2-6)						
2	5								
			Red Clayey Fine SAND (A-2-6)						
3									
			Gray Clayey Fine SAND (A-2-6)						
4									
	10		Boring Terminated @ 10 ft.						
	15								
	20								

SHEAR STRENGTH (ksf)
- Pocket Penetrometer Undisturbed Sample
- Pocket Penetrometer Disturbed Sample
- Torvane
- Unconfined Compression
- Triaxial Compression

PLASTIC LIMIT / MOISTURE CONTENT / LIQUID LIMIT (%): 0 10 20 30 40
SHEAR STRENGTH (ksf): 0 1 2

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B4
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: Hand Auger
Driller: M. Foster
Boring Location: See Field Exploration Plan
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 4 ft Time: Drilling Date: 5/15/20
Boring Begun: 5/15/20
Boring Completed: 5/15/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
	0		4 1/2" Asphalt Pavement						
			5 1/2" Limerock						
1			Orange Clayey Fine SAND (A-2-6)				27	+	
2			Light Brown Fine SAND (A-3)						
3	5		Orange Clayey Fine SAND (A-2-6)						
4			Gray Clayey Fine SAND (A-2-6)						
5			Gray Fine SAND (A-3)						
	10		Boring Terminated @ 10 ft.						
	15								
	20								

SHEAR STRENGTH (ksf)
Pocket Penetrometer Undisturbed Sample
Pocket Penetrometer Disturbed Sample
Torvane
Unconfined Compression
Triaxial Compression

0 10 20 30 40 (%)
0 1 2

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B5
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: Hand Auger
Driller: M. Foster
Boring Location: See Field Exploration Plan
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 6.5 ft Time: Drilling Date: 5/15/20
Boring Begun: 5/15/20
Boring Completed: 5/15/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT / MOISTURE CONTENT / LIQUID LIMIT (%)	SHEAR STRENGTH (ksf)
	0		4 1/2" Asphalt Pavement 9" Limerock						
1			Gray Brown Silty Fine SAND (A-2-4)				13		
2			Gray Clayey Fine SAND (A-2-6)						
	5								
3									
			Light Gray Fine SAND (A-3)						
4	10		Boring Terminated @ 10 ft.						
	15								
	20								

SHEAR STRENGTH (ksf): Pocket Penetrometer Undisturbed Sample; Pocket Penetrometer Disturbed Sample; Torvane; Unconfined Compression; Triaxial Compression

PLASTIC LIMIT / MOISTURE CONTENT / LIQUID LIMIT (%): 0 10 20 30 40

SHEAR STRENGTH (ksf): 0 1 2

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B6
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: Hand Auger
Driller: M. Foster
Boring Location: See Field Exploration Plan
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 4.5 ft Time: Drilling Date: 5/15/20
Boring Begun: 5/15/20
Boring Completed: 5/15/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
	0		2 1/2" Asphalt Pavement 6" Limerock						
1			Gray Brown Silty Fine SAND (A-2-4)				18	+	
2			Dark Gray Silty Fine SAND (A-2-4)						
3			Gray Brown Clayey Fine SAND (A-2-6)						
	5		Light Brown Fine SAND (A-3)						
4									
5			Gray Brown Fine SAND (A-3)						
6			Gray Fine SAND (A-3)						
	10		Boring Terminated @ 10 ft.						
	15								
	20								

SHEAR STRENGTH (ksf)
- Pocket Penetrometer Undisturbed Sample
- Pocket Penetrometer Disturbed Sample
- Torvane
- Unconfined Compression
- Triaxial Compression

0 10 20 30 40 (%)
0 1 2

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B7
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: Hand Auger
Driller: M. Foster
Boring Location: See Field Exploration Plan
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 4.5 ft Time: Drilling Date: 5/15/20
Boring Begun: 5/15/20
Boring Completed: 5/15/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
	0		5" Asphalt Pavement						
			7" Limerock						
			Gray Brown Fine SAND (A-3)						
1									
2			Light Brown Fine SAND (A-3)						
			Orange and Gray Silty Fine SAND (A-2-4)						
3							34	+	
			Gray Brown Fine SAND (A-3)						
4	5								
			Gray Clayey Fine SAND (A-2-6)						
5									
	10		Boring Terminated @ 10 ft.						
	15								
	20								

SHEAR STRENGTH (ksf)
- Pocket Penetrometer Undisturbed Sample
- Pocket Penetrometer Disturbed Sample
- Torvane
- Unconfined Compression
- Triaxial Compression

0 10 20 30 40 (%)
0 1 2

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B12
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: 105T
Driller: S. Burns
Boring Location: See Field Exploration Plan
Drill Rod: AWJ
Drill Mud: Super Gel-X
Casing Size:
Length of Casing:
Groundwater Depth: 3.3 ft Time: Drilling Date: 5/18/20
Boring Begun: 5/18/20
Boring Completed: 5/18/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%)	SHEAR STRENGTH (ksf)
	0		2" Asphalt Pavement 4" Limerock					0 10 20 30 40	⊙ Pocket Penetrometer Undisturbed Sample ◔ Pocket Penetrometer Disturbed Sample ▼ Torvane ● Unconfined Compression ⊠ Triaxial Compression 0 1 2
1			Dark Brown and Light Brown Silty Fine SAND (A-2-4)						
2			Light Tan Fine SAND (A-3)						
3	5		Light Gray Fine SAND (A-3)						
4			Light Gray Silty Fine SAND (A-2-4)						
	10		Boring Terminated @ 10 ft.						
	15								
	20								

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B13
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: 105T
Driller: S. Burns
Boring Location: See Field Exploration Plan
Drill Rod: AWJ
Drill Mud: Super Gel-X
Casing Size:
Length of Casing:
Groundwater Depth: 3 ft Time: Drilling Date: 5/18/20
Boring Begun: 5/18/20
Boring Completed: 5/18/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%) 0 10 20 30 40	SHEAR STRENGTH (ksf) 0 1 2
	0		3" Asphalt Pavement						
			6" Limerock						
1			Light Brown Fine SAND (A-3)						
			Light Gray Brown Fine SAND (A-3)						
2	5								
			Light Gray Fine SAND (A-3)						
3									
			Light Brown and Light Gray Silty Fine SAND (A-2-4)						
4	10								
			Boring Terminated @ 10 ft.						
	15								
	20								

SHEAR STRENGTH (ksf)
- ⊙ Pocket Penetrometer Undisturbed Sample
- ◔ Pocket Penetrometer Disturbed Sample
- ▼ Torvane
- ● Unconfined Compression
- ⊠ Triaxial Compression

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

Project No.: 35-30388
Boring No.: B14
Sheet 1 of 1

LOG OF BORING

Project: JEA Galvinized Pipe
Client: ET&M, Inc.
Drill Rig: 105T
Driller: S. Burns
Boring Location: See Field Exploration Plan
Drill Rod: AWJ
Drill Mud: Super Gel-X
Casing Size:
Length of Casing:
Groundwater Depth: 3.3 ft Time: Drilling Date: 5/18/20
Boring Begun: 5/18/20
Boring Completed: 5/18/20

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION	BLOWS PER 6 IN.	N Value	PERCENT ORGANIC MATERIAL	PERCENT PASSING NO. 200 SIEVE	PLASTIC LIMIT / MOISTURE CONTENT / LIQUID LIMIT (%)	SHEAR STRENGTH (ksf)
	0		2" Asphalt Pavement						
1			6" Limerock						
			Light Gray Fine SAND (A-3)						
			Dark Brown and Brown Silty Fine SAND (A-2-4)						
2									
			Light Brown Fine SAND (A-3)						
3									
	5		Orange Brown Clayey Fine SAND (A-2-6)						
4									
			Gray and Light Brown Clayey Fine SAND (A-2-6)						
5									
	10		Boring Terminated @ 10 ft.						
	15								
	20								

SHEAR STRENGTH (ksf)
- Pocket Penetrometer Undisturbed Sample
- Pocket Penetrometer Disturbed Sample
- Torvane
- Unconfined Compression
- Triaxial Compression

PLASTIC LIMIT ○ / MOISTURE CONTENT + / LIQUID LIMIT ◇ (%): 0 10 20 30 40

SHEAR STRENGTH (ksf): 0 1 2

Remarks

LOG OF BORING 35-30388.GPJ ELLIS ASSOCIATES.GDT 5/22/20

FIELD EXPLORATION PROCEDURES

Standard Penetration Test (SPT) Borings

The Standard Penetration Test (SPT) borings were made in general accordance with the latest revision of ASTM D 1586, "Penetration Test and Split-Barrel Sampling of Soils". The borings were advanced by rotary (or "wash-n-chop") drilling techniques. At 2 ½ to 5 foot intervals, a split-barrel sampler inserted to the borehole bottom and driven 18 inches into the soil using a 140 pound hammer falling on the average 30 inches per hammer blow. The number of hammer blows for the final 12 inches of penetration is termed the "penetration resistance, blow count, or N-value". This value is an index to several in-place geotechnical properties of the material tested, such as relative density and Young's Modulus.

After driving the sampler 18 inches (or less if in hard rock-like material), the sampler was retrieved from the borehole and representative samples of the material within the split-barrel were containerized and sealed. After completing the drilling operations, the samples for each boring were transported to our laboratory where they were examined by our engineer in order to verify the driller's field classification. The retrieved samples will be kept in our facility for a period of sixty (60) calendar days unless directed otherwise.

Hand Auger Boring

The auger borings were performed manually by the use of a hand auger and in general accordance with the latest revision of ASTM D 1452, "Soil Investigation and Sampling by Auger Borings". Representative samples of the soils brought to the ground surface by the augering process were placed in sealed containers and transported to our laboratory where they were examined by our engineer to verify the driller's field classification.

ECS FLORIDA, LLC "Setting the Standard for Service"
Geotechnical • Construction Materials • Environmental • Facilities

KEY TO SOIL CLASSIFICATION

Description of Relative Density or Consistency in Relation To Standard Penetration Resistance

Granular Materials		
Relative Density	**Safety Hammer SPT N-Value (Blow/Foot)**	**Automatic Hammer SPT N-Value (Blow/Foot)**
Very Loose	Less than 4	Less than 3
Loose	4 – 10	3 – 8
Medium Dense	10 – 30	8 – 24
Dense	30 – 50	24 – 40
Very Dense	Greater than 50	Greater than 40

Silts and Clays		
Consistency	**Safety Hammer SPT N-Value (Blow/Foot)**	**Automatic Hammer SPT N-Value (Blow/Foot)**
Very Soft	Less than 2	Less than 1
Soft	2 – 4	1 – 3
Firm	4 – 8	3 – 6
Stiff	8 – 15	6 – 12
Very Stiff	15 – 30	12 – 24
Hard	Greater than 30	Greater than 24

FDOT Classification of Highway Subgrade Materials

(modified AASHTO classification)

General Classification	Granular Materials (35% or less passing No. 200)										Silt-clay materials (MORE THAN 35% PASSING NO. 200)							
Group Classification	A-3		A-2								A-4		A-5		A-6		A-7	
			A-2-4		A-2-5		A-2-6		A-2-7								A-7-5 A-7-6	
Sieve analysis, percent passing:																		
No. 10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No. 40	51 min.	51 min.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
No. 200	<5	5 – 10	<12	12 – 35	<12	12 – 35	<12	12 – 35	<12	12 – 35	36 – 50	>50	36 – 50	>50	36 – 50	>50	36 – 50	>50
Characteristics of fraction passing No. 40:																		
Liquid Limit	-	-	40 max.		41 min.		40 max.		41 min.		40 max.		41 min.		40 max.		41 min.	
Plasticity Index	NP	NP	10 max.		10 max.		11 min.		11 min.		10 max.		10 max.		11 min.		11 min.*	
Usual types of significant constituent materials	sand	sand w/silt or sand w/clay	sand w/silt	silty sand	sand w/silt or sand w/clay	silty sand or clayey sand	sand w/clay	clayey sand	sand w/clay	clayey sand	very silty sand	silt	very silty sand	silt	very clayey sand	clay	very clayey sand	clay

***** Plasticity Index of A-7-5 subgroup is equal to or less than LL minus 30. Plasticity index of A-7-6 subgroup is greater than LL minus 30.
NOTE: Highly organic soils classify as A-8.

ORGANIC MATERIAL MODIFIERS	
Modifier	**Organic Content**
Trace	1% to 2%
Few	2% to 5%
Some	5% to 8%
Many	>8%

APPENDIX B – Laboratory Testing

Laboratory Testing Summary
Particle Size Distribution Reports
Laboratory Test Procedures

Laboratory Testing Summary

Sample Source	Sample Number	Start Depth (feet)	End Depth (feet)	Sample Distance (feet)	MC[1] (%)	Soil Type[2]	Atterberg Limits[3]			Percent Passing No. 200 Sieve[4]	Moisture - Density (Corr.)[5]		CBR Value[6]	Other
							LL	PL	PI		Maximum Density (pcf)	Optimum Moisture (%)		
B2	3	5.5	6.0	0.5	22.9					22.5				
B3	1	1.5	2.0	0.5	13.2					27.8				
B4	1	1.5	2.0	0.5	18.3					27.3				
B5	1	1.5	2.0	0.5	17.6					13.1				
B6	1	0.5	1.0	0.5	16.6					17.8				
B7	3	3.5	4.0	0.5	33.8					34.3				

Notes: 1. ASTM D 2216, 2. ASTM D 2487, 3. ASTM D 4318, 4. ASTM D 1140, 5. See test reports for test method, 6. See test reports for test method

Definitions: MC: Moisture Content, Soil Type: USCS (Unified Soil Classification System), LL: Liquid Limit, PL: Plastic Limit, PI: Plasticity Index, CBR: California Bearing Ratio, OC: Organic Content (ASTM D 2974)

Project No.

Project Name: JEA Galvanized Pipe

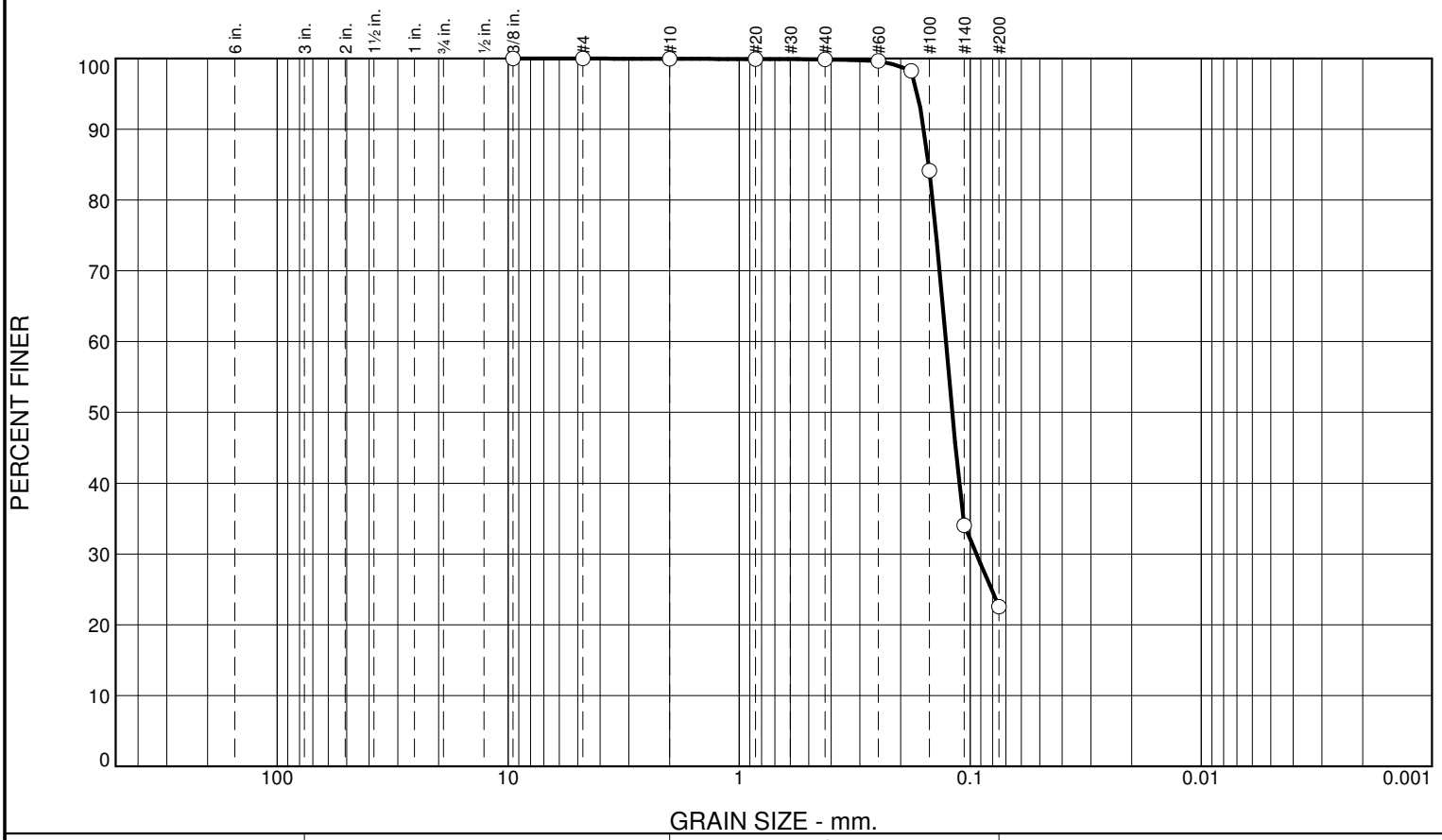
PM: Chris Egan

PE: David W. Spangler

Printed On: Thursday, May 28, 2020

ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	0.0	0.1	77.4	22.5	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.9		
#60	99.7		
#80	98.3		
#100	84.1		
#140	34.1		
#200	22.5		

* (no specification provided)

Material Description

Gray Clayey Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1585 D_{85}= 0.1511 D_{60}= 0.1274
D_{50}= 0.1196 D_{30}= 0.0938 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-6

Remarks

Source of Sample: B2 **Depth:** 5.5-6
Sample Number: 3

Date: 05-20-20

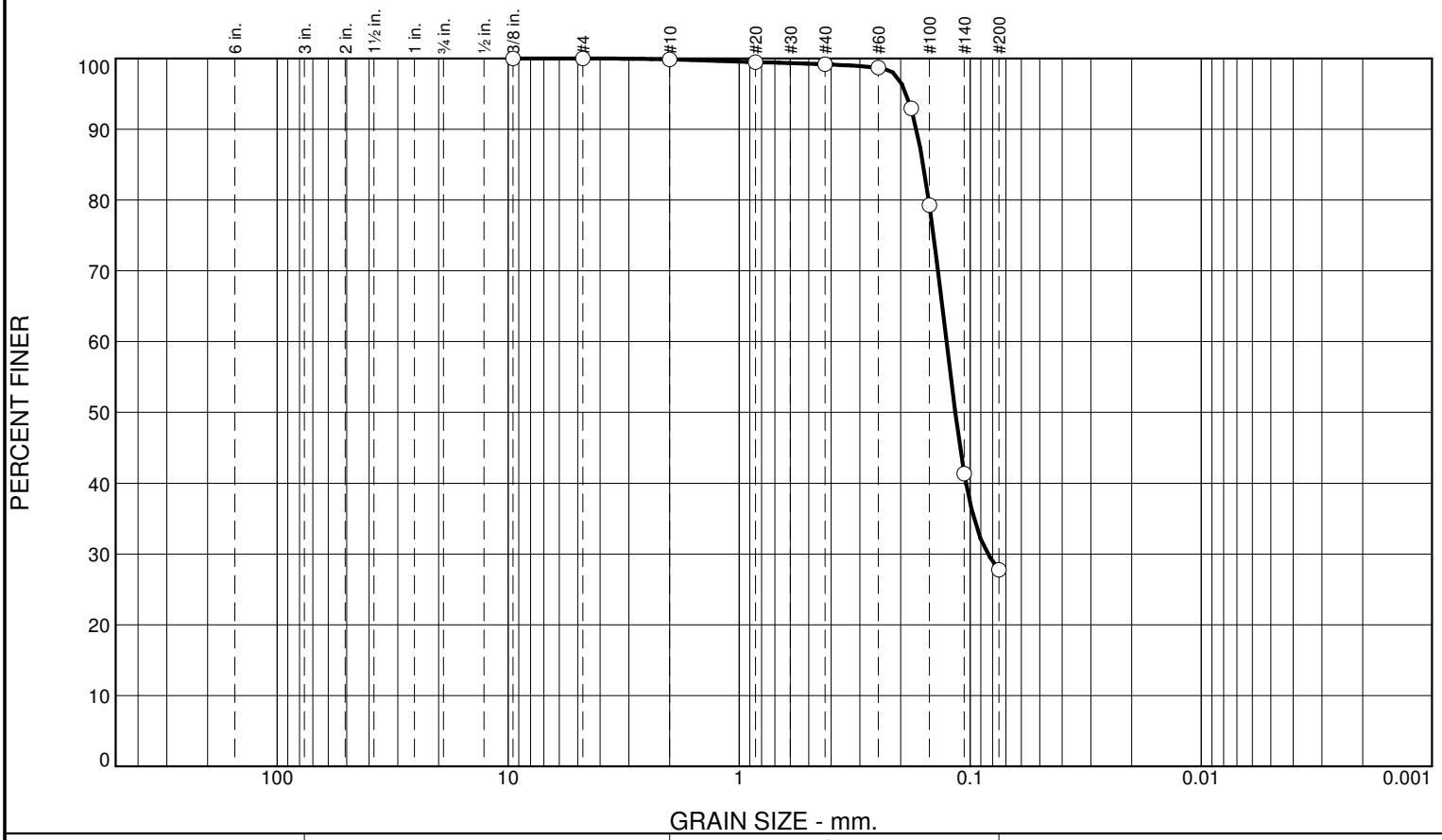
ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	0.1	0.7	71.4	27.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	100.0		
#10	99.9		
#20	99.5		
#40	99.2		
#60	98.7		
#80	93.0		
#100	79.3		
#140	41.3		
#200	27.8		

* (no specification provided)

Material Description

Brown Clayey Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1708 D_{85}= 0.1596 D_{60}= 0.1266
D_{50}= 0.1160 D_{30}= 0.0838 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-6

Remarks

Source of Sample: B3 **Depth:** 1.5-2
Sample Number: 1

Date: 05-20-20

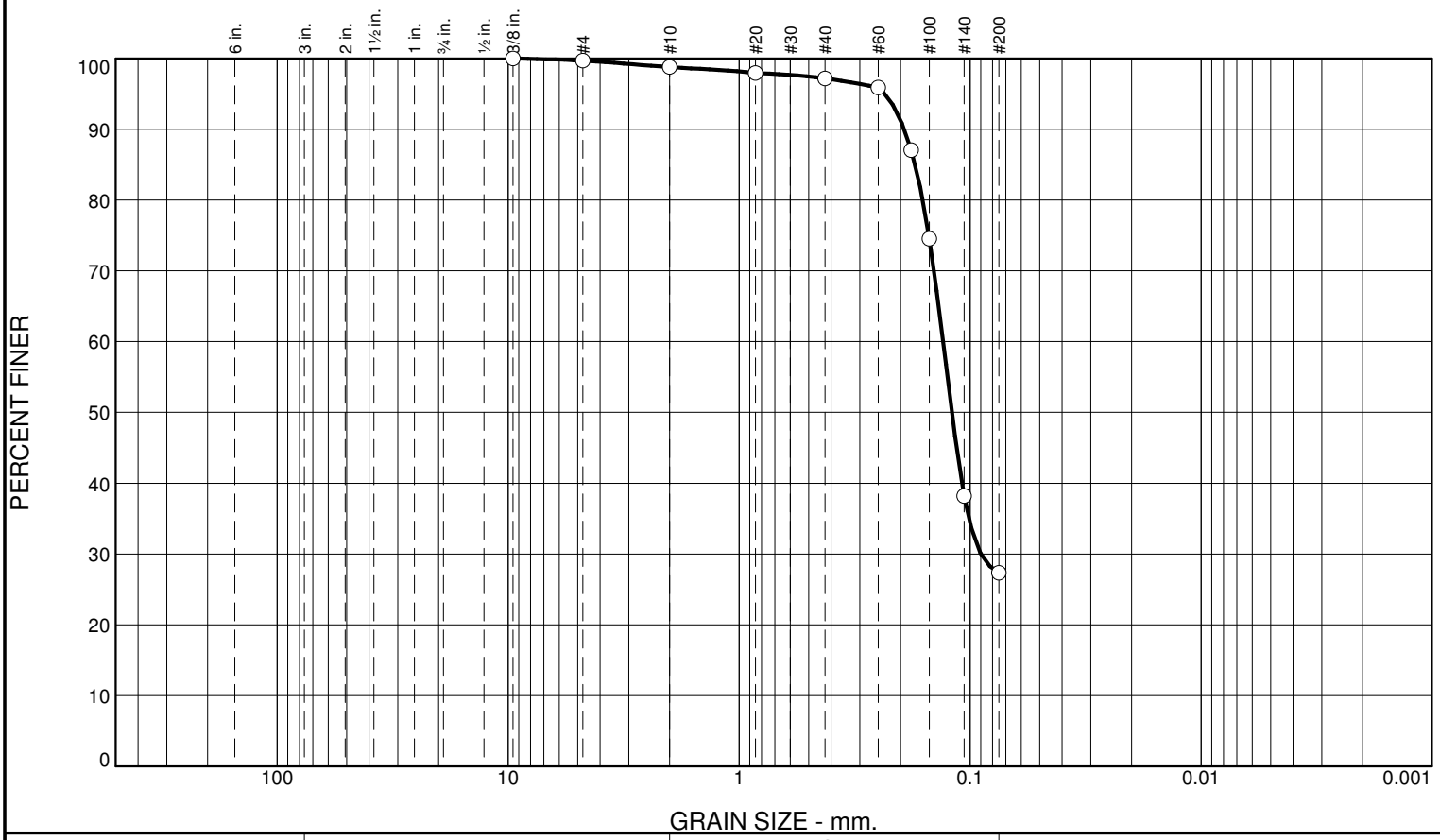
ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	1.2	1.6	69.9	27.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.7		
#10	98.8		
#20	97.9		
#40	97.2		
#60	95.9		
#80	87.0		
#100	74.6		
#140	38.2		
#200	27.3		

* (no specification provided)

Material Description

Orange Clayey Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1927 D_{85}= 0.1731 D_{60}= 0.1309
D_{50}= 0.1199 D_{30}= 0.0898 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-6

Remarks

Source of Sample: B4 **Depth:** 1.5-2
Sample Number: 1

Date: 05-20-20

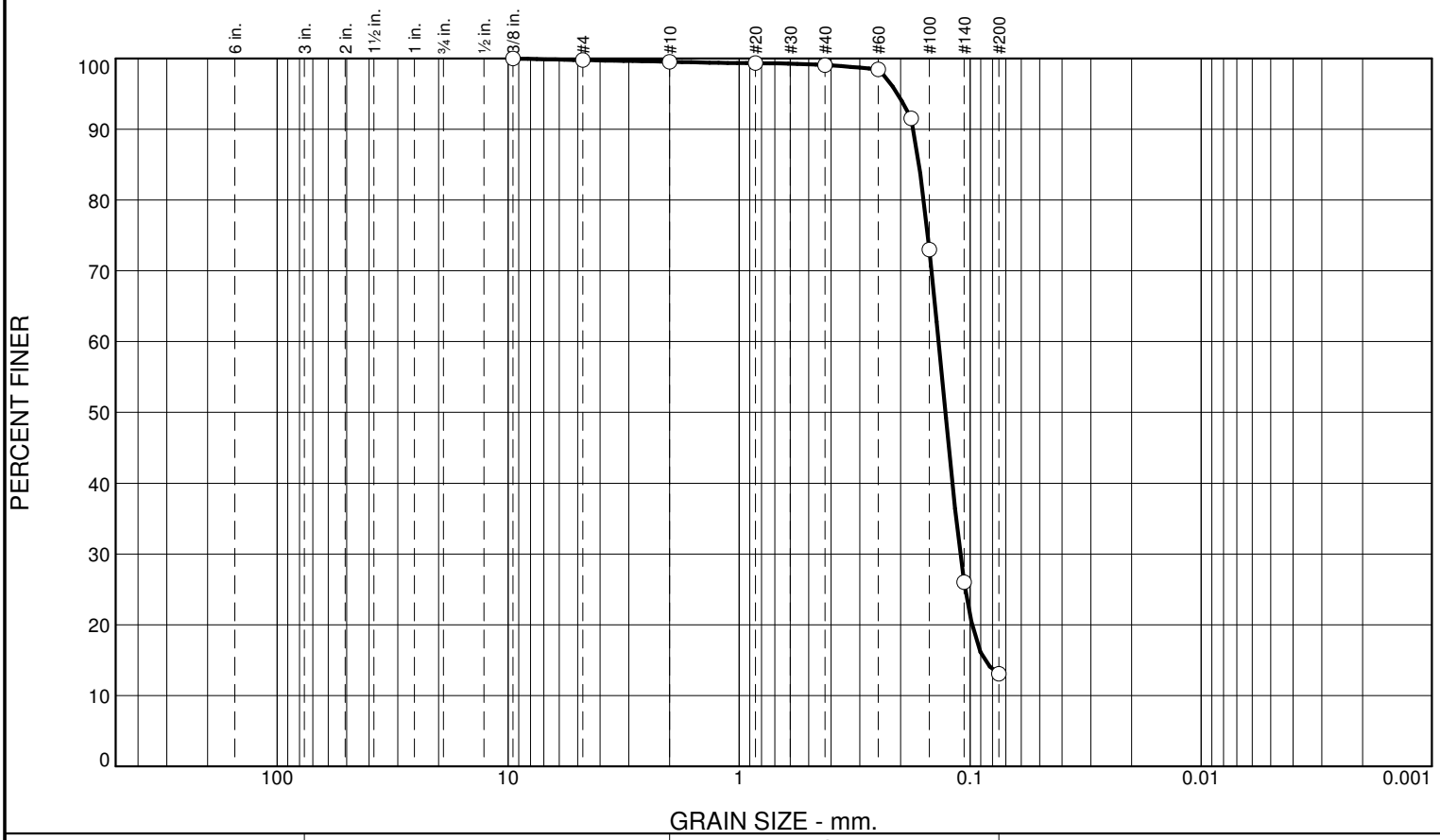
ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	0.4	0.5	86.0	13.1	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.8		
#10	99.6		
#20	99.3		
#40	99.1		
#60	98.5		
#80	91.5		
#100	73.0		
#140	26.0		
#200	13.1		

* (no specification provided)

Material Description

Gray Brown Silty Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1762 D_{85}= 0.1664 D_{60}= 0.1368
D_{50}= 0.1279 D_{30}= 0.1102 D_{15}= 0.0864
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4

Remarks

Source of Sample: B5 **Depth:** 1.5-2
Sample Number: 1

Date: 05-20-20

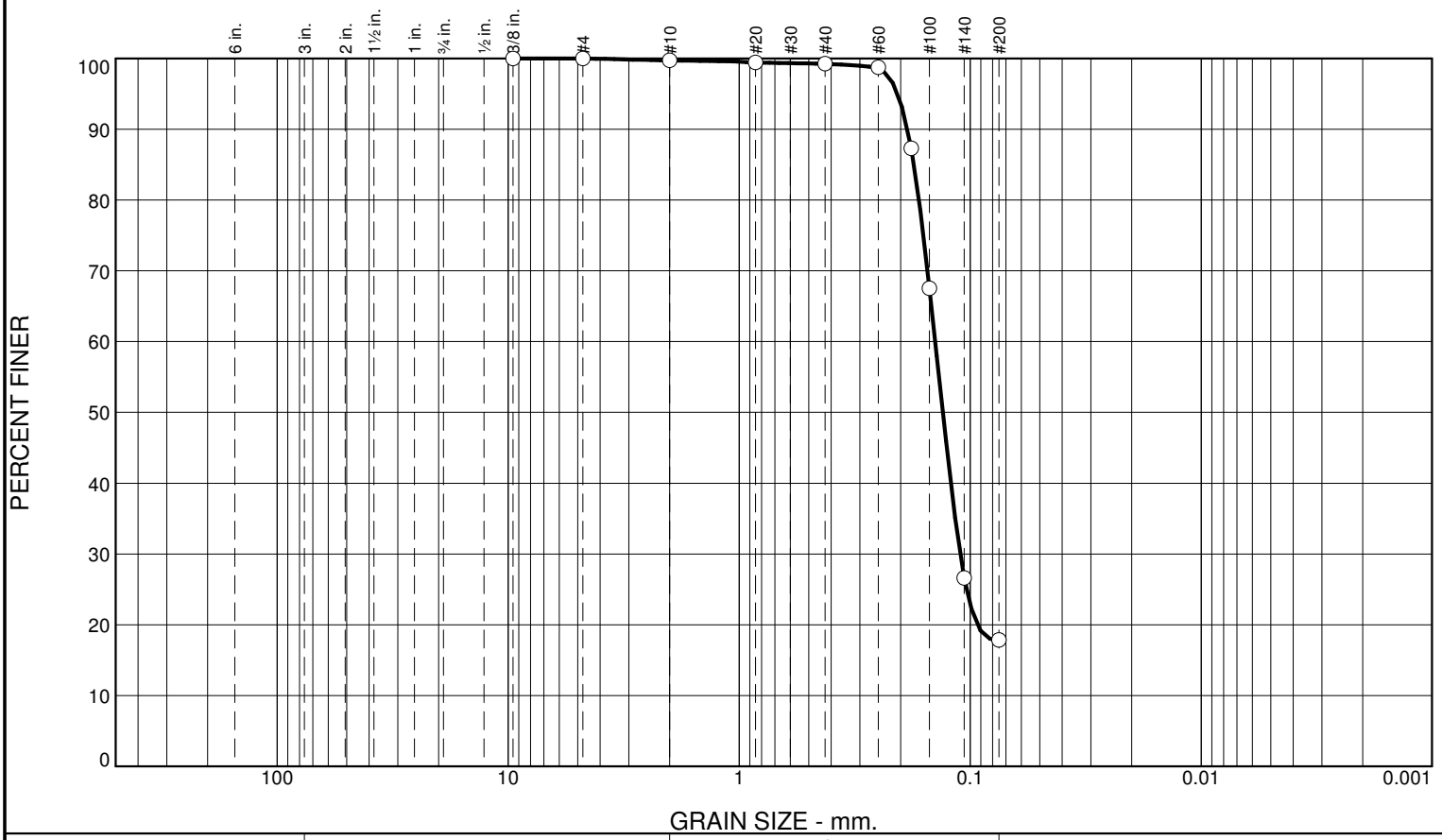
ECS FLORIDA, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	0.3	0.4	81.5	17.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	100.0		
#10	99.7		
#20	99.4		
#40	99.3		
#60	98.8		
#80	87.3		
#100	67.5		
#140	26.6		
#200	17.8		

* (no specification provided)

Material Description

Gray Brown Silty Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1867 D_{85}= 0.1752 D_{60}= 0.1416
D_{50}= 0.1313 D_{30}= 0.1104 D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4

Remarks

Source of Sample: B6 **Depth:** 0.5-1
Sample Number: 1

Date: 05-20-20

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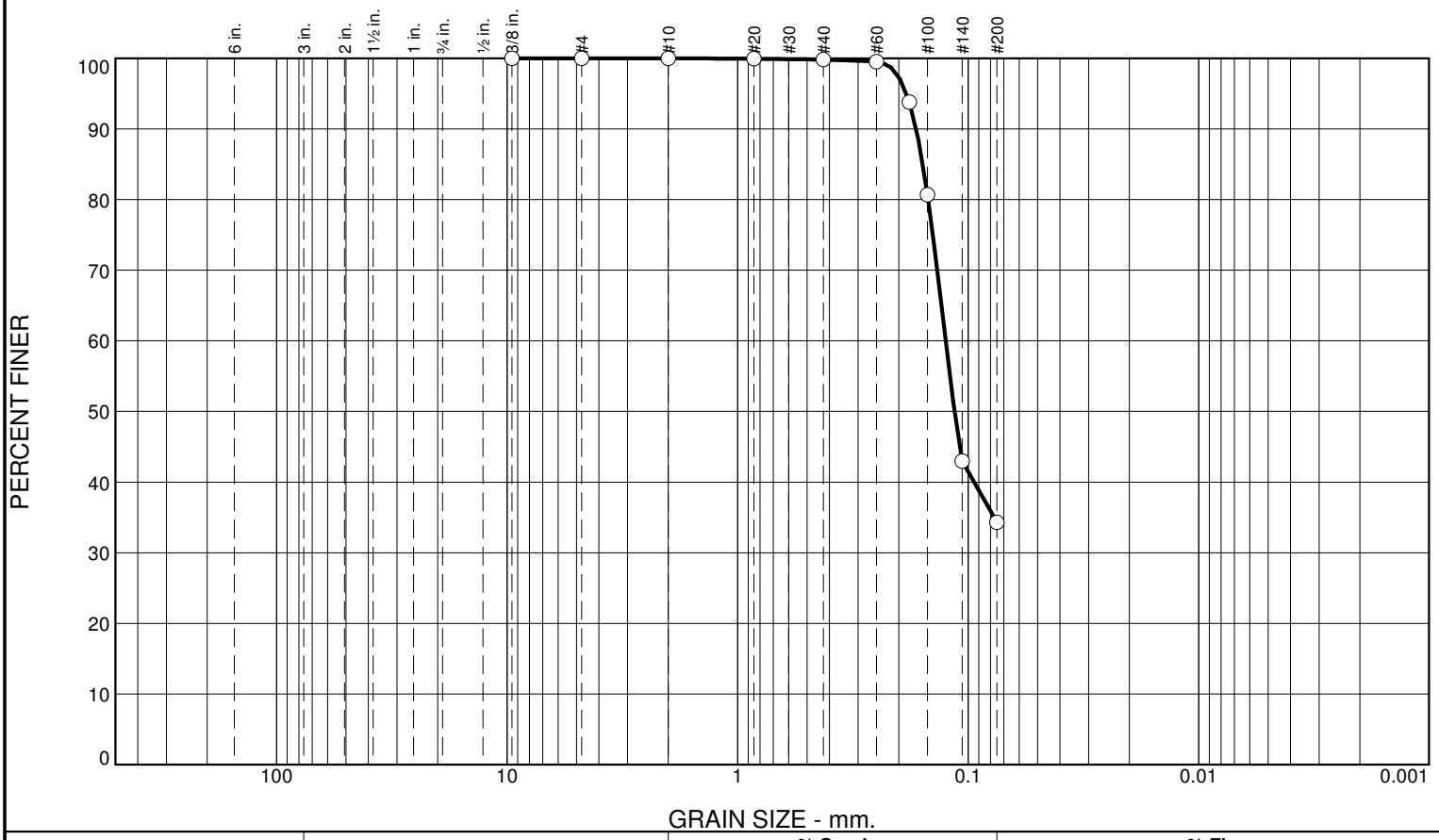
Fax: (904) 880-0970

Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	0.0	0.2	65.5	34.3	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	100.0		
#10	100.0		
#20	99.9		
#40	99.8		
#60	99.5		
#80	93.8		
#100	80.7		
#140	43.0		
#200	34.3		

* (no specification provided)

Material Description

Orange Gray Silty Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1681 D_{85}= 0.1572 D_{60}= 0.1252
D_{50}= 0.1145 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4

Remarks

Source of Sample: B7 **Depth:** 3.5-4
Sample Number: 3

Date: 05-20-20

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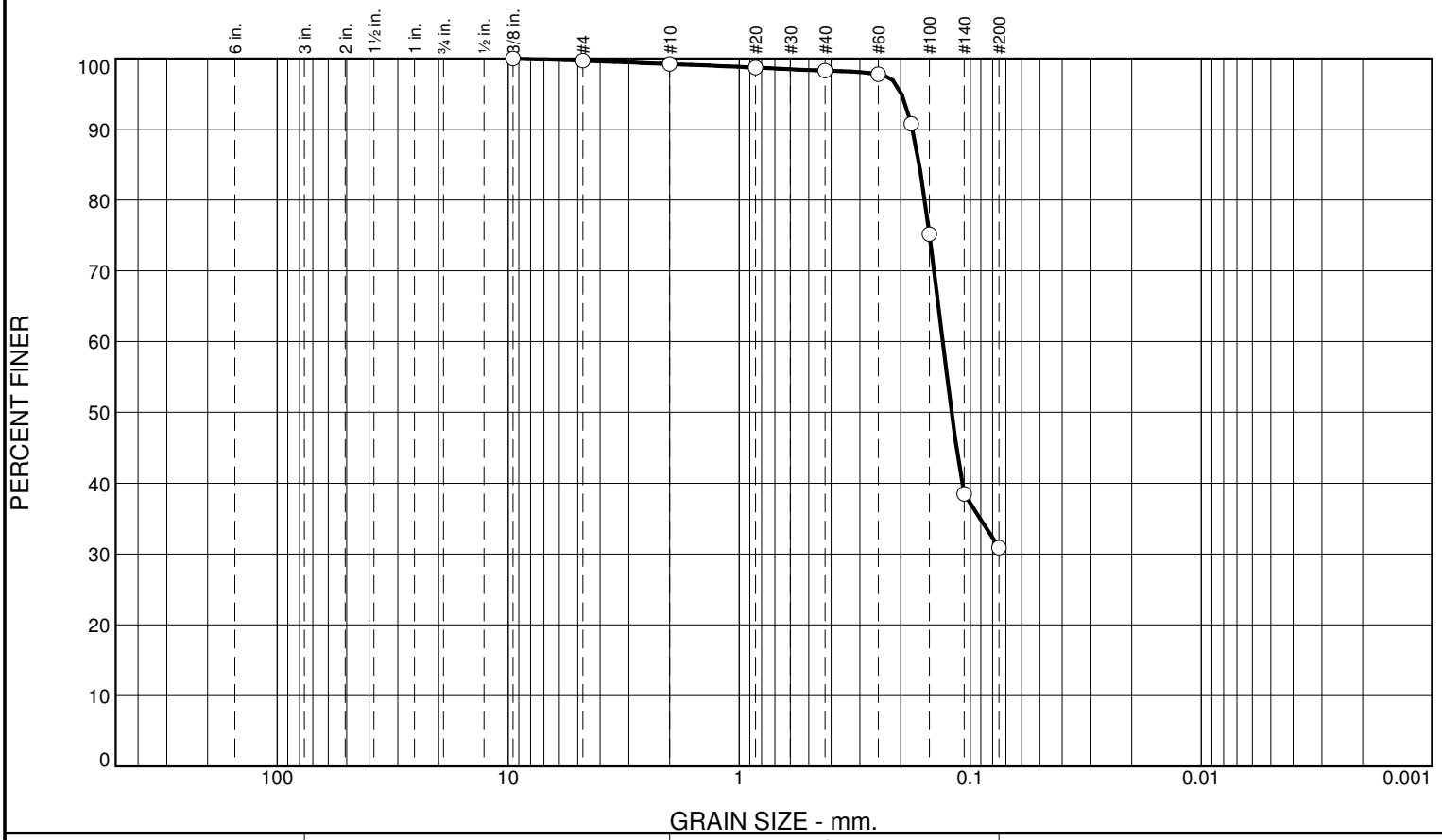
Jacksonville, Florida 32256
Phone: (904) 880-0960
Fax: (904) 880-0970

Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	0.8	0.9	67.4	30.9	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.7		
#10	99.2		
#20	98.7		
#40	98.3		
#60	97.8		
#80	90.8		
#100	75.2		
#140	38.5		
#200	30.9		

* (no specification provided)

Material Description

Orange and Gray Clayey Sand

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1777 D_{85}= 0.1661 D_{60}= 0.1314
D_{50}= 0.1204 D_{30}= D_{15}=
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-6

Remarks

Source of Sample: B8 **Depth:** 3.5-4
Sample Number: 2

Date: 05-20-20

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Jacksonville, Florida 32256
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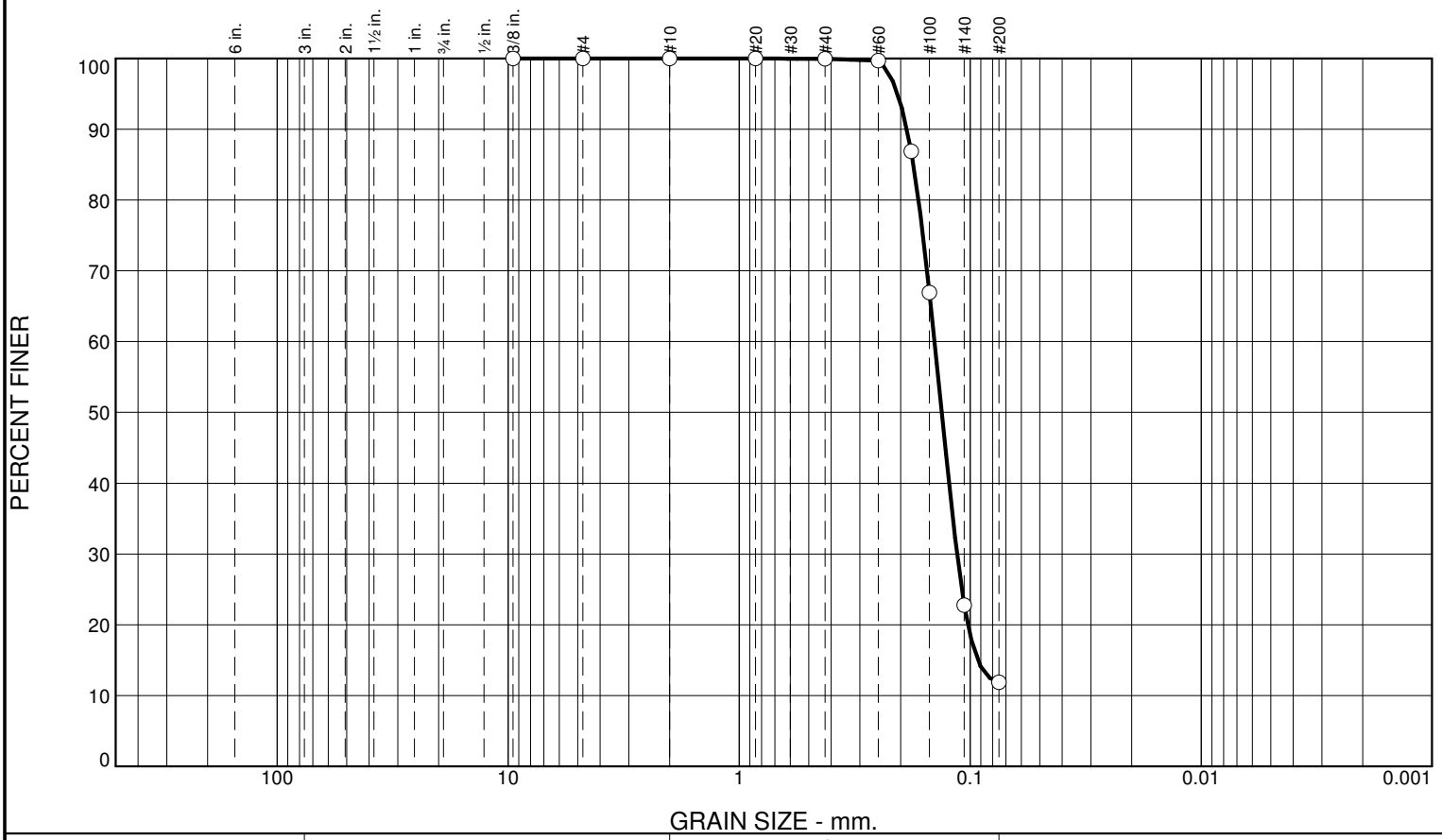
Fax: (904) 880-0970

Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	0.0	0.0	88.2	11.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	100.0		
#10	100.0		
#20	100.0		
#40	100.0		
#60	99.7		
#80	86.9		
#100	66.9		
#140	22.8		
#200	11.8		

* (no specification provided)

Material Description

Gray Brown Sand with Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1876 D_{85}= 0.1761 D_{60}= 0.1425
D_{50}= 0.1328 D_{30}= 0.1140 D_{15}= 0.0927
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4

Remarks

Source of Sample: B9 **Depth:** 3.5-4
Sample Number: 3

Date: 05-20-20

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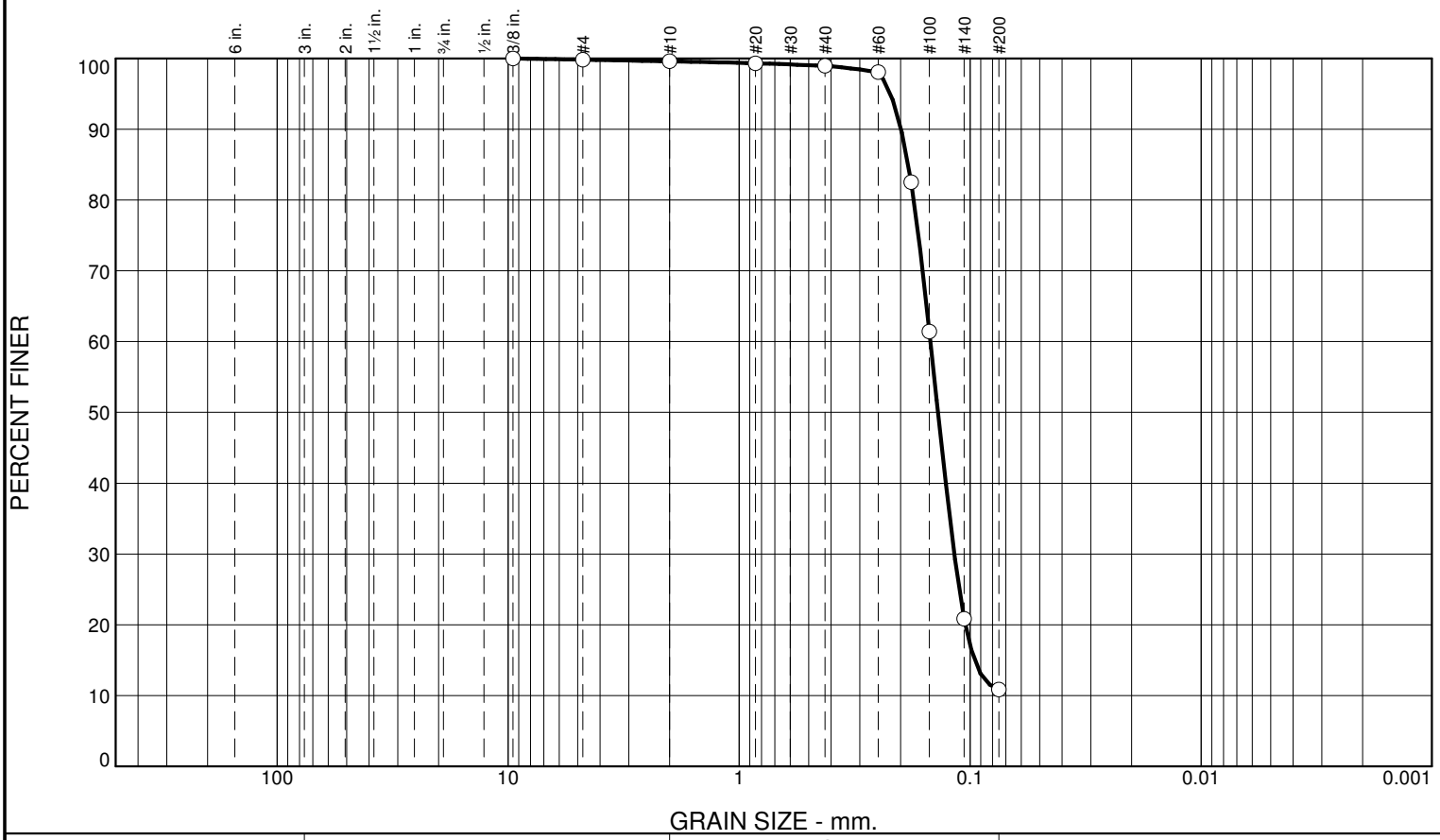
Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

Particle Size Distribution Report



% +3"	% Gravel	% Sand		% Fines	
		Coarse	Fine	Silt	Clay
0.0	0.4	0.6	88.2	10.8	

SIEVE SIZE	PERCENT FINER	SPEC.* PERCENT	PASS? (X=NO)
3/8"	100.0		
#4	99.8		
#10	99.6		
#20	99.3		
#40	99.0		
#60	98.1		
#80	82.6		
#100	61.4		
#140	20.8		
#200	10.8		

* (no specification provided)

Material Description

Brown and Gray Sand with Silt

Atterberg Limits

PL= LL= PI=

Coefficients

D_{90}= 0.1987 D_{85}= 0.1851 D_{60}= 0.1484
D_{50}= 0.1376 D_{30}= 0.1170 D_{15}= 0.0956
D_{10}= C_u= C_c=

Classification

USCS= AASHTO= A-2-4

Remarks

Source of Sample: B10 **Depth:** 1-1.5
Sample Number: 1

Date: 05-20-20

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Jacksonville, Florida 32256
Phone: (904) 880-0960
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Client: ETM (England-Thims & Miller Inc)
Project: JEA Galvanized Pipe

Project No: 30388 **Figure**

Tested By: SC **Checked By:** JS

LABORATORY TEST PROCEDURES

Percent Fines Content

The percent fines or material passing the No. 200 mesh sieve of the sample tested was determined in general accordance with the latest revision of ASTM D 1140. The percent fines are the soil particles in the silt and clay size range.

Natural Moisture Content

The water content of the sample tests was determined in general accordance with the latest revision of ASTM D 2216. The water content is defined as the ratio of "pore" or "free" water in a given mass of material to the mass of solid material particles.