ECS FLORIDA, LLC

"Setting the Standard for Service"

Geotechnical • Construction Materials • Environmental • Facilities

REPORT OF GEOTECHNICAL EXPLORATION TROUT RIVER WATER MAIN JACKSONVILLE, FLORIDA ECS PROJECT NO. 35-27112 CLIENT ID: L271

Prepared for:

Corner Lot Development Group
3721 Dupont Station Court South
Jacksonville, Florida 32217

Prepared by:

ECS Florida, LLC
7064 Davis Creek Road
Jacksonville, Florida 32256

May 15, 2018

ECS FLORIDA, LLC *"Setting the Standard for Service"*
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May 15, 2018

Corner Lot Development Group
3721 Dupont Station Court South
Jacksonville, Florida 32217

Attention: Mr. George Leone

Reference: Report of Geotechnical Exploration
Trout River Water Main
Jacksonville, Florida
ECS Project No. 35-27112
Client ID: L271

Dear Mr. Leone:

ECS Florida, LLC (ECS) has completed the requested geotechnical exploration in general accordance with our proposal dated April 19, 2018. The exploration was performed to evaluate the general subsurface conditions within the proposed water main and HDD crossing area and to provide recommendations for site preparation and pipeline support.

We appreciate the opportunity to be your geotechnical consultant on this phase of the project and look forward to providing the materials testing and observation that will be required during the construction phase. If you have any questions, or if we may be of any further service, please contact us.

Very truly yours,
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, PE. On
Printed Copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.
2018.05.15 10:47:06 -04'00'

Colin A. Shaw, E.I.
Staff Engineer

David W. Spangler, P.E.
Geotechnical Department Manager
Registered, Florida No. 58770

Distribution: Mr. George Leone – Corner Lot Development Group 1 pdf

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1.0 PROJECT INFORMATION

1.1 Site Location and Project Description

The project site is located on the south side of Trout River Boulevard, between the proposed Trout River Parcel, east of Wagner Road, to the west of the I-295 crossing under Trout River Boulevard in Jacksonville, Florida. The general site location is shown on Figure 1.

The site area is developed as an existing roadway and roadway right-of-way with adjacent properties including residential areas with associated roadways. Trout River Boulevard is a two lane asphalt roadway with shallow drainage ditches on each side of the roadway with a bridge over I-295. I-295 at the site area is a four-lane divided highway with a grass median. Vegetation within the Trout River Boulevard generally consisted of grasses and trees. Surface water was not observed near planned structural areas at the time of our exploration.

We were provided project information via several discussions and an email dated April 18, 2018. We were provided with a copy of a site plan for the subject project. This plan indicates the boundary limits for the property, the existing roadways adjacent to the site, the layout of the proposed construction, and the requested boring locations.

We understand that a new water main is proposed along the south side of Trout River Boulevard. The proposed water main will be installed using open cut methods along the Trout River Boulevard alignment and using Horizontal Directional Drill (HDD) methods below I-295.

If the project information above is incorrect, then the recommendations in this report may need to be re-evaluated. Any changes in these conditions should be provided so the need for re-evaluation of our recommendations can be assessed.

2.0 FIELD EXPLORATION

We performed a field exploration on April 26, 2018 and May 7, 2018. The approximate boring locations are indicated on the attached Field Exploration Plan (Figure 2). Our personnel determined the boring locations using our handheld GPS equipment. The boring locations on the referenced Field Exploration Plan should be considered accurate only to the degree implied by the method of measurement used.

2.1 SPT and Auger Borings

We located and performed three Standard Penetration Test (SPT) borings, drilled to depths of approximately 15 feet below the existing ground surface, in general accordance with the methodology outlined in ASTM D 1586 to explore the subsurface conditions within the area of the proposed water main to be installed using HDD methods. Split-spoon soil samples recovered during performance of the borings were visually classified in the field and representative portions of the samples were transported to our laboratory for further evaluation.

We located and performed seven auger borings, drilled to depths of approximately six 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 water main alignment along Trout River Boulevard to be installed using open cut methods. 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.

3.0 LABORATORY TESTING

A geotechnical engineer classified representative soil samples obtained during our field exploration using the Unified Soil Classification System (USCS) 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 percent fines and moisture contents of selected soil samples. The results of the laboratory testing are shown in the Summary of Laboratory Test Data included in Appendix B. Also, these results are shown on the Generalized Subsurface Profiles on Figures 3 through 4 and on the Log of Boring records at the respective depths from which the tested samples were recovered.

4.0 GENERAL SUBSURFACE CONDITIONS

4.1 General Soil Profile

A graphical presentation of the generalized subsurface conditions is presented on Figures 3 and 4. Detailed boring records are included in Appendix A. It should be understood that the soil conditions will vary between the boring locations. The following paragraphs summarize the soil conditions encountered.

In general, the auger borings encountered a surficial layer of topsoil, underlain by layers of fine sand (SP) and fine sand with silt (SP-SM), further underlain by layers of silty fine sand and silty fine sand with clay (SM) and to a lesser extent, clayey fine sand (SC) to the boring termination depths of 6 feet below the existing ground surface.

In general, the SPT borings for the HDD crossing encountered a surficial layer of topsoil, underlain by loose to medium dense fine sand (SP), fine sand with clay (SP-SC), clayey fine sand (SC), and in one boring stiff sandy clay (CH) to the boring termination depths of 15 feet below the existing ground surface.

4.2 Groundwater Level

Groundwater was encountered at each boring location and recorded at the time of drilling at depths varying from 1 to 5.9 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.

4.3 Normal Seasonal High Groundwater Level

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 Duval County Soil Survey, we estimate the normal seasonal high groundwater level at the boring locations to approximately at the levels indicated on the attached 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 with respect to the planned construction and our recommendations for site preparation and pipeline support are based on (1) our site observations, (2) the field and laboratory test data obtained, and (3) our understanding of the project information as presented in this report.

Should the location of the water main be significantly changed, please contact us so that we can review our recommendations. Also, the discovery of any site or subsurface conditions during construction which

deviate from the data obtained during this geotechnical exploration should also be reported to us for our evaluation.

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

5.2 Pipeline Support Recommendations

We consider the subsurface conditions at the site capable of supporting the proposed pipeline structure when constructed upon properly prepared subgrade soils. 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.

5.3 Horizontal Directional Drilling Recommendations

We understand the proposed water main will be installed using HDD techniques under I-295. The borings performed within this area generally encountered sandy soils and throughout the subsurface profiles. As an exception, Boring B1 encountered stiff sandy clay between the depths of 8 to 12 feet below the existing ground surface. It is our opinion these soil types will be conducive to the HDD operations.

Additionally, the HDD operations should be performed in accordance with Section 555 of the Florida Department of Transportation (FDOT) *Standard Specifications for Road and Bridge Construction*, (latest edition) and section 755 of the *JEA Water and Wastewater Standards*, (latest edition). Any soil conditions encountered that are not consistent with those contained within this report should be reported to ECS for our evaluation.

6.0 SITE PREPARATION AND EARTHWORK RECOMMENDATIONS

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

6.1 Existing Utilities

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 at the boring locations between the depths of 1 to 5.9 feet below the existing ground surface at the time of our exploration. Because of the need for excavation to the pipeline bearing levels and the densification of backfill, it may 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 backfilling has reached a height of 2 feet above the groundwater level at the time of construction.

Note that discharge of produced groundwater to surface waters of the state from dewatering operations or other site activities is regulated and requires a permit from the State of Florida Department of Environmental Protection (FDEP). This permit is termed a *Generic Permit for the Discharge of Produced Groundwater From Any Non-Contaminated Site Activity*. If discharge of produced groundwater is anticipated, we recommend sampling and testing of the groundwater early in the site design phase to

prevent project delays during construction. ECS can provide the sampling, testing, and professional consulting required to evaluate compliance with the regulations.

6.3 Excavation Protection

Excavation work will be required to meet OSHA Excavation Standard Subpart P regulations, Type C Soils. A trench box or braced sheet pile structure may be needed for excavation support. The support structure should be designed according to OSHA sheeting and bracing requirements. We recommend a Florida registered Professional Engineer design the sheeting/bracing system.

6.4 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. If organic soils are present at the bottom of the completed excavation, it is recommended that they be removed in their entirety and replaced with suitable backfill in controlled lifts. Typically, the material should exhibit moisture contents within ±2 percentage points of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Compaction should continue until densities of at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within the upper one foot below the exposed surface within the pipeline excavation and in each lift of backfill.

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.

6.5 Structural Backfill and Compaction of Structural Backfill

Structural backfill within the pipeline excavations should be placed in loose lifts not exceeding six inches in thickness and compacted by the use of hand-operated compaction equipment. 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. Typically, the backfill material should exhibit moisture contents within ±2 percentage points of the modified Proctor optimum moisture content (ASTM D 1557) during the compaction operations. Compaction should continue until densities of at least 95 percent of the modified Proctor maximum dry density (ASTM D 1557) have been achieved within each 6-inch thick lift of the compacted structural backfill.

The fine sands (SP) and fine sands with silt (SP-SM) encountered in our borings should be considered suitable for use as fill soil. The silty fine sands (SM) encountered at the boring locations may also be used as structural fill; however, we note that these soils will be more difficult to compact due to their tendency to retain soil moisture and will require drying. Depending on the anticipated time for completing the site work portion of the project and the drying time required to reduce the potential for pumping and yielding of these soils during placement and compaction operations, these soils may not be feasible for use as fill material.

If the silty fine sands (SM) cannot be compacted to the required density, and if clayey soils (SC) are encountered at the excavation bottom, then we recommend these soils be overexcavated a minimum of 12 inches below the pipe bottom and replaced with compacted structural fill.

Alternatively, a medium-duty woven geotextile, such as Mirafi 600X or equivalent, may be used as a separation barrier between the compacted backfill and the silty/clayey soils. If a woven geotextile is used, then no overexcavation is necessary for the pipeline. The geotextile should be placed in the excavation bottom and along the sides above the silty/clayey soils creating a barrier between these soils and the sand backfill to preclude contamination of the 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 and fill. Density tests are recommended to verify that satisfactory compaction operations have been performed. We recommend density testing be performed (1) one location for every 300 feet of pipeline.

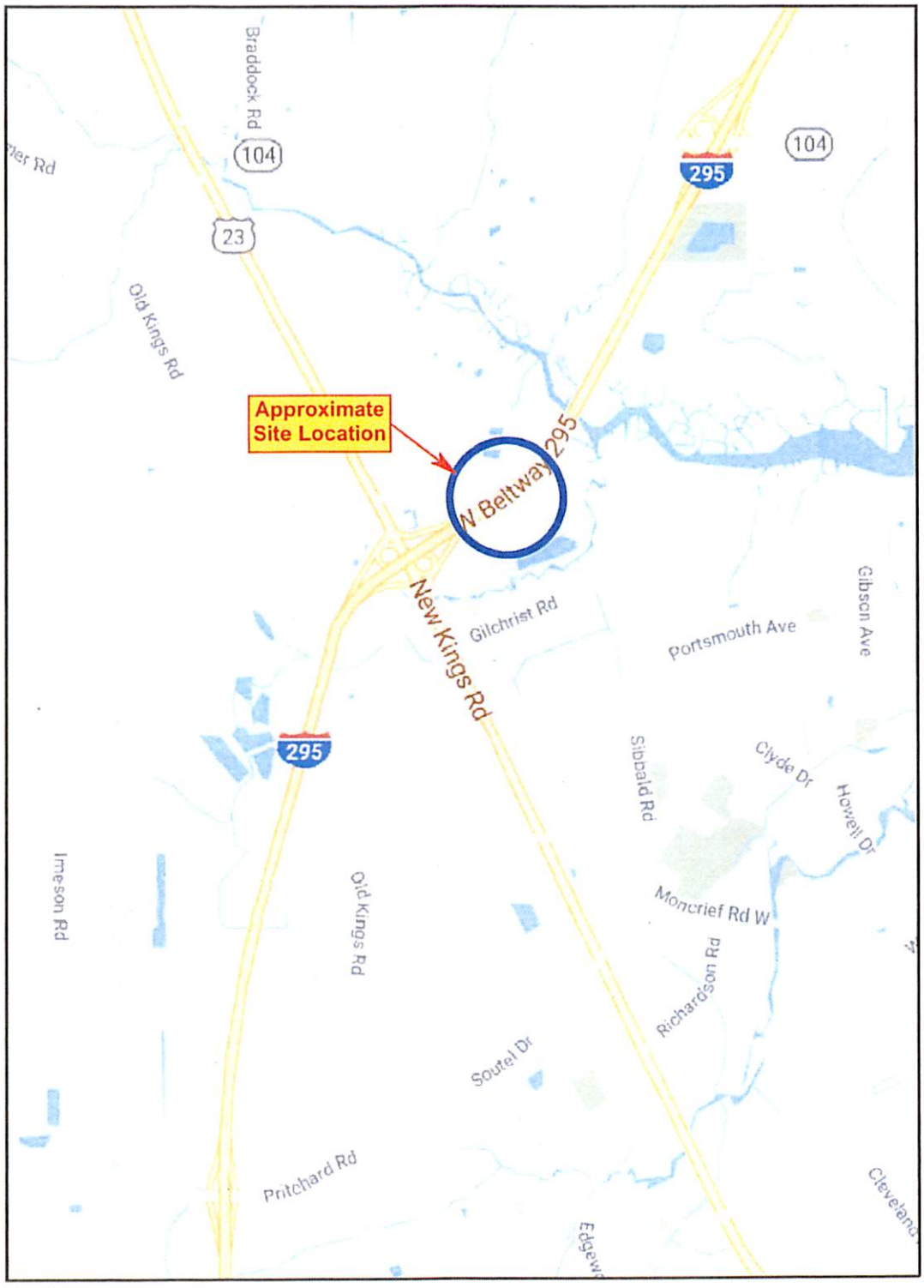
8.0 REPORT LIMITATIONS

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. Our scope of services does not address geologic conditions, such as sinkholes or soil conditions existing below the depth of the soil borings.

This report does not reflect any variations that may occur adjacent to or between soil borings. The discovery of any site or subsurface condition during construction that deviates from the data obtained during this geotechnical exploration should be reported to us for our evaluation. Also, in the event of any change to the supplied/assumed project information or the locations of the pipeline or HDD crossing, please contact us so that we can review our recommendations. We recommend that we be provided the opportunity to review the foundation plans and earthwork specifications to verify that our recommendations have been properly interpreted and implemented.

FIGURES



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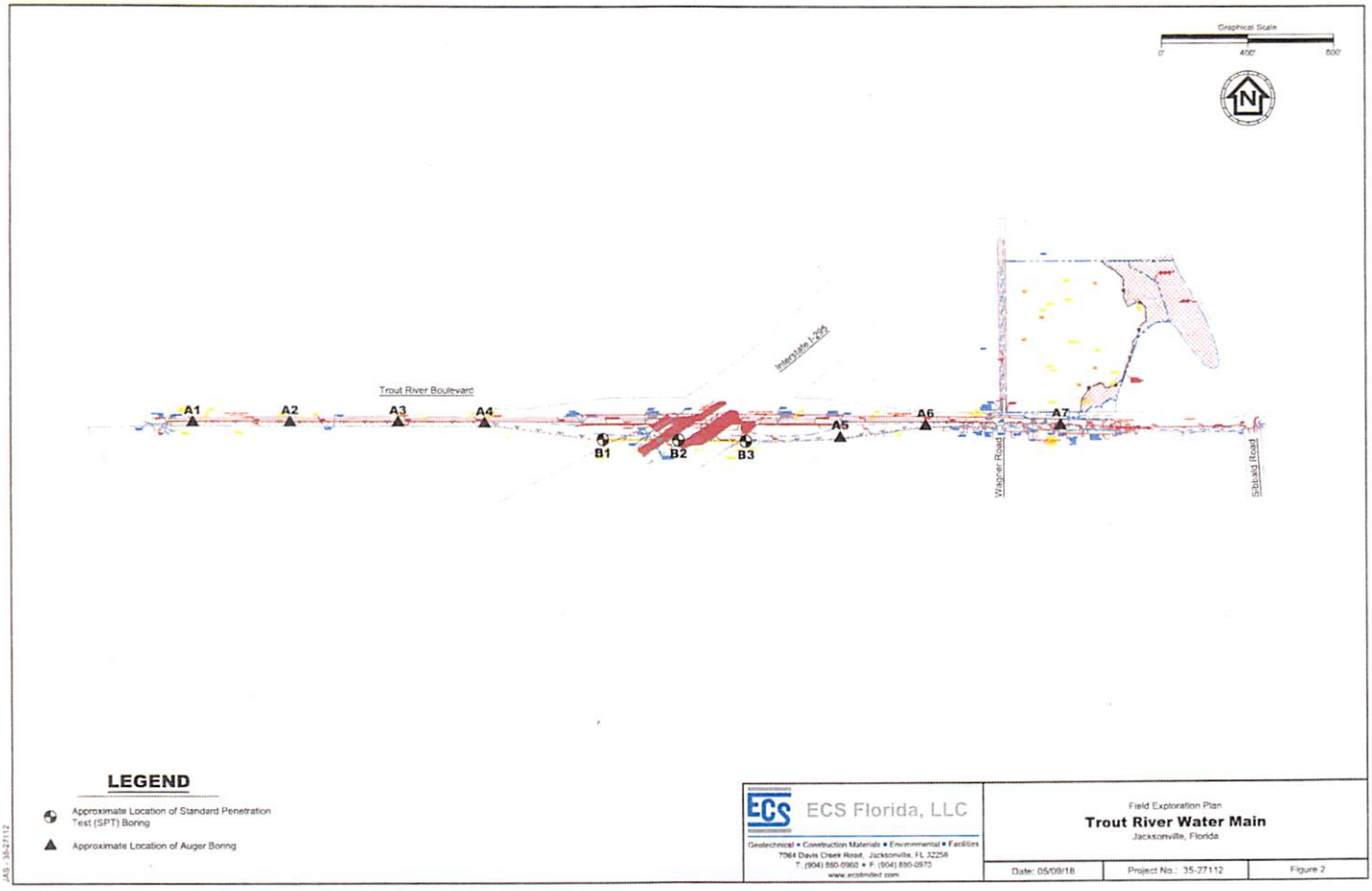
Site Location Plan

Trout River Water Main

Jacksonville, Florida

Date: 05/09/18	Project No.: 35-27112	Figure 1

JAS - 35-27112


Graphical Scale
0'
400'
800'
N
Trout River Boulevard
Interstate I-295
A1
A2
A3
A4
A5
A6
A7
B1
B2
B3
Wagner Road
Shipyard Road
LEGEND
Approximate Location of Standard Penetration Test (SPT) Boring
Approximate Location of Auger Boring
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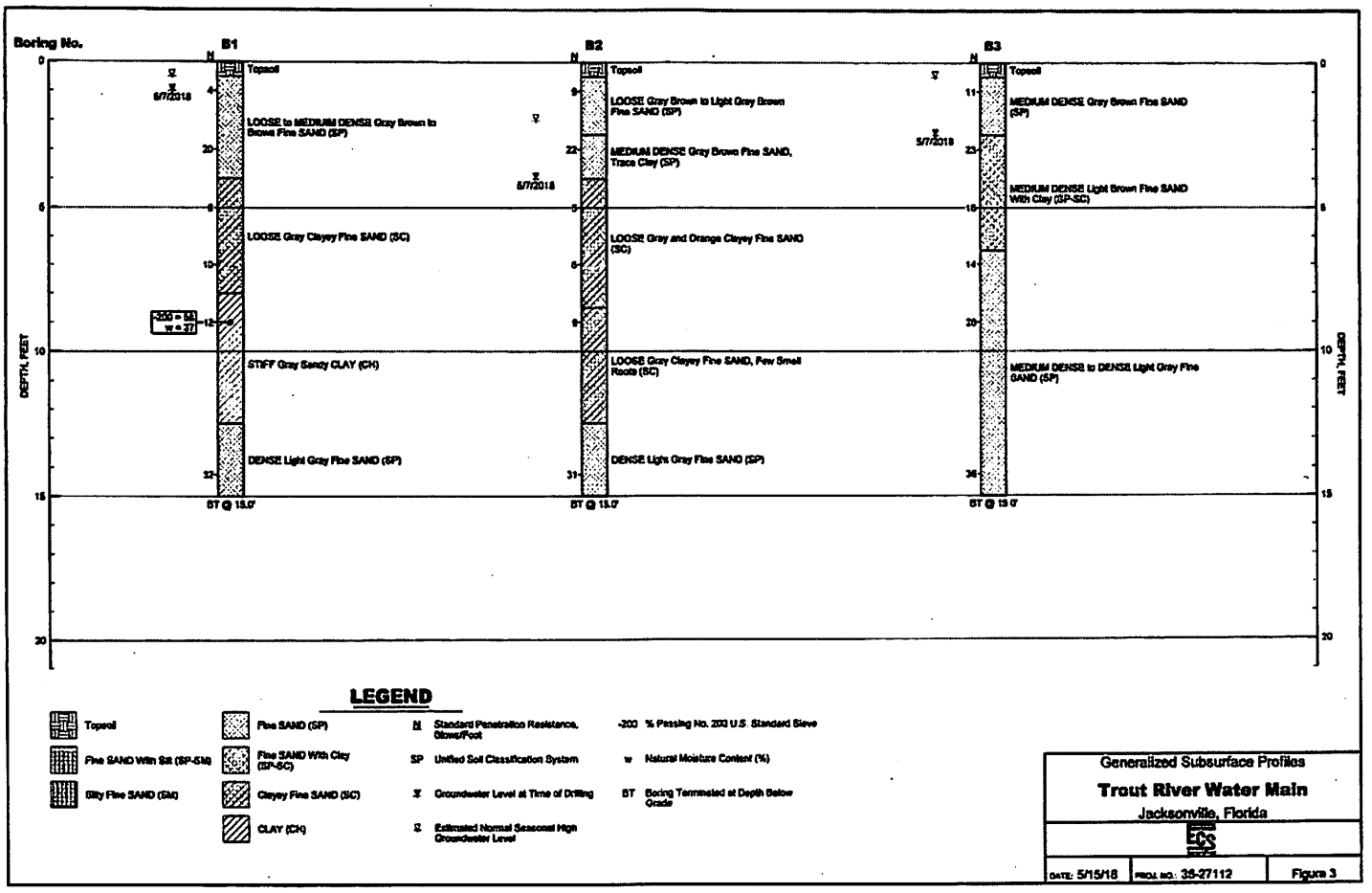
Field Exploration Plan
Trout River Water Main
Jacksonville, Florida
Date: 05/08/18
Project No.: 35-27112
Figure 2
JAS - 35-27112



LEGEND

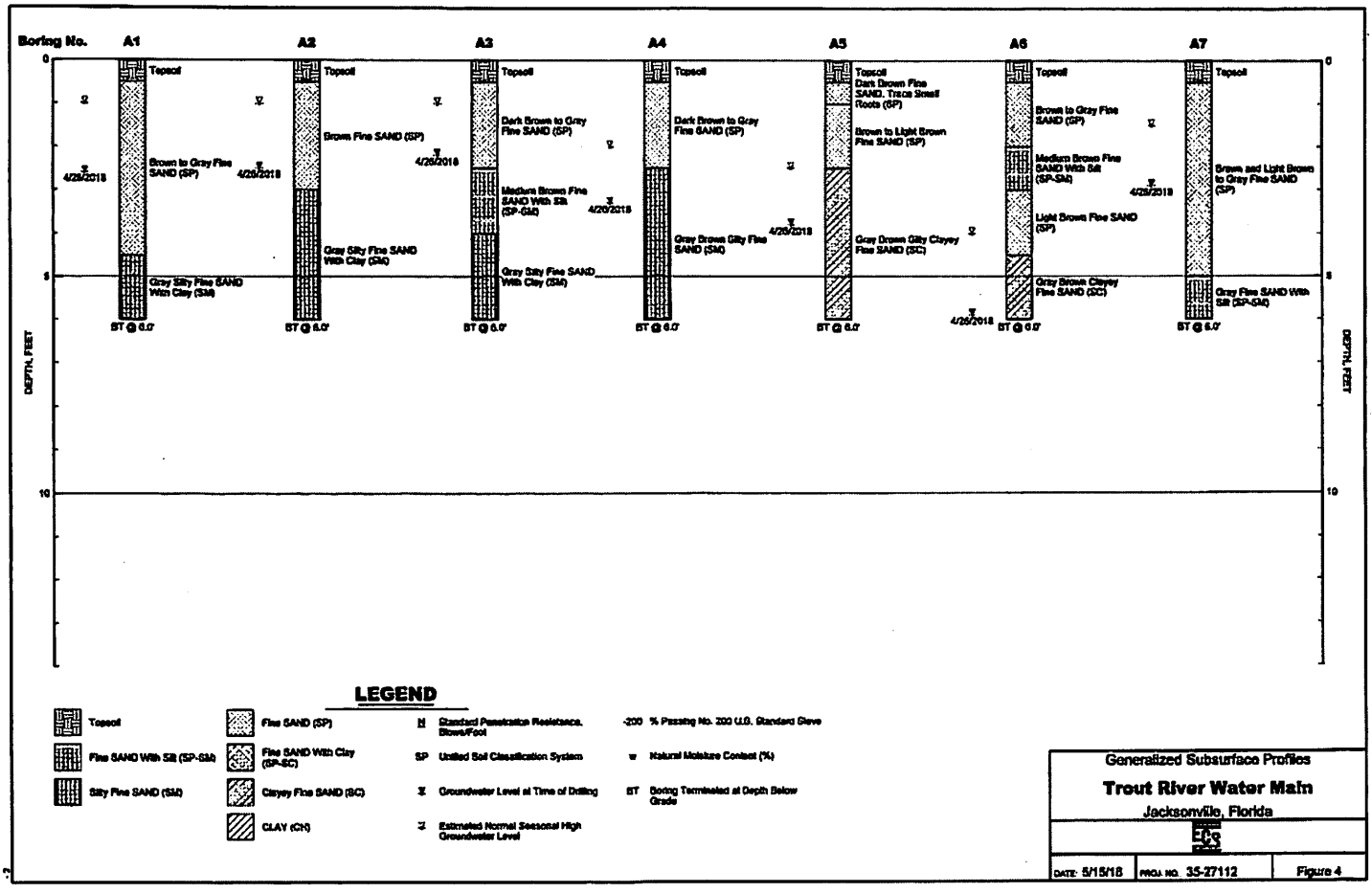
Topsoil
Fine SAND With Silt (SP-SM)
Silty Fine SAND (SM)
Fine SAND (SP)
Fine SAND With Clay (SP-SC)
Clayey Fine SAND (SC)
CLAY (CH)

N — Standard Penetration Resistance, Blows/Foot
SP — Unified 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 (%)
BT — Boring Terminated at Depth Below Grade

Generalized Subsurface Profiles
Trout River Water Main
Jacksonville, Florida

DATE: 5/15/18 | PROJ. NO.: 35-27112 | Figure 3


Boring No.
A1
A2
A3
A4
A5
A6
A7
DEPTH, FEET
Topsoil
Brown to Gray Fine SAND (SP)
Gray Silty Fine SAND With Clay (SM)
Brown Fine SAND (SP)
Dark Brown to Gray Fine SAND (SP)
Medium Brown Fine SAND With Silt (SP-SM)
Dark Brown to Gray Fine SAND (SP)
Gray Brown Silty Fine SAND (SM)
Dark Brown Fine SAND, Trace Small Roots (SP)
Brown to Light Brown Fine SAND (SP)
Gray Brown Silty Clayey Fine SAND (SC)
Brown to Gray Fine SAND (SP)
Medium Brown Fine SAND With Silt (SP-SM)
Light Brown Fine SAND (SP)
Gray Brown Clayey Fine SAND (SC)
Brown and Light Brown to Gray Fine SAND (SP)
Gray Fine SAND With Silt (SP-SM)
4/25/2018
4/20/2018
ST @ 6.0'
LEGEND
Topsoil
Fine SAND With Silt (SP-SM)
Silty Fine SAND (SM)
Fine SAND (SP)
Fine SAND With Clay (SP-SC)
Clayey Fine SAND (SC)
CLAY (CH)
N Standard Penetration Resistance, Blows/Foot
SP Unified 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 (%)
ST Boring Terminated at Depth Below Grade
Generalized Subsurface Profiles
Trout River Water Main
Jacksonville, Florida
DATE: 5/15/18
PROJ. NO. 35-27112
Figure 4

APPENDIX A

SOIL BORING LOGS
FIELD EXPLORATION PROCEDURES
KEY TO SOIL CLASSIFICATION

Project No.: 35-27112
Boring No.: B1
Sheet 1 of 1

LOG OF BORING

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: ATV
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Super Gel-X
Casing Size:
Length of Casing:
Groundwater Depth: 1 ft Time: Drilling Date: 5/7/18
Boring Begun: 5/7/18
Boring Completed: 5/7/18

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		Topsoil	1					
1			LOOSE Gray Brown to Light Gray Brown Fine SAND (SP)	1 3 7 7	4				
2			MEDIUM DENSE Brown Fine SAND (SP)	10 10 4	20				
3	5		LOOSE Gray Clayey Fine SAND (SC)	2 4 4 5	8				
4				2 4 6 7	10				
5			STIFF Gray Sandy CLAY (CH)	4 6 6 7	12		58	+	
6	10		DENSE Light Gray Fine SAND (SP)	13 16 16	32				
	15		Boring Terminated @ 15 ft.						
	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 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

Project No.: 35-27112
Boring No.: B2
Sheet 1 of 1

LOG OF BORING

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: ATV
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Super Gel-X
Casing Size:
Length of Casing:
Groundwater Depth: 4 ft Time: Drilling Date: 5/7/18
Boring Begun: 5/7/18
Boring Completed: 5/7/18

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		Topsoil	1					
1			LOOSE Gray Brown Fine SAND (SP)	3 6	9				
			LOOSE Light Gray Brown Fine SAND (SP)	7 7					
2			MEDIUM DENSE Gray Brown Fine SAND, Trace Clay (SP)	11 11 11	22				
			LOOSE Gray and Orange Clayey Fine SAND (SC)	4 2					
3	5			3 4	5				
				3 3					
4			LOOSE Gray Clayey Fine SAND (SC)	3 4	6				
				4					
5			LOOSE Gray Clayey Fine SAND, Few Small Roots (SC)	5 4	9				
	10			5					
			DENSE Light Gray Fine SAND (SP)						
6				13 15					
	15			16	31				
			Boring Terminated @ 15 ft.						
	20								

Remarks

SHEAR STRENGTH (ksf): ⊙ Pocket Penetrometer Undisturbed Sample; ◐ Pocket Penetrometer Disturbed Sample; ▼ Torvane; ● Unconfined Compression; ⊠ Triaxial Compression

LOG OF BORING 35-27112.GPJ ELLIS ASSOCIATES.GDT 6/15/18

Project No.: 35-27112
Boring No.: B3
Sheet 1 of 1

LOG OF BORING

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: ATV
Driller: M. Foster
Drill Rod: AWJ
Drill Mud: Super Gel-X
Casing Size:
Length of Casing:
Groundwater Depth: 2.5 ft Time: Drilling Date: 5/7/18
Boring Begun: 5/7/18
Boring Completed: 5/7/18

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		Topsoil	1					
1			MEDIUM DENSE Gray Brown Fine SAND (SP)	4 7 7 9	11				
2			MEDIUM DENSE Light Brown Fine SAND With Clay (SP-SC)	10 13 9 6	23				
3	5			7 9 9 5	16				
4			MEDIUM DENSE to DENSE Light Gray Fine SAND (SP)	6 8 10 5	14				
5	10			11 17 19	28				
6	15		Boring Terminated @ 15 ft.	11 17 19	36				
	20								

SHEAR STRENGTH (ksf): ⊙ Pocket Penetrometer Undisturbed Sample; ◐ Pocket Penetrometer Disturbed Sample; ▼ Torvane; ● Unconfined Compression; ⊠ Triaxial Compression

Remarks

LOG OF BORING 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

Project No.: 35-27112
Boring No.: A1
Sheet 1 of 1

LOG OF BORING

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: Hand Auger
Driller: A. Elkaz
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 2.6 ft Time: Drilling Date: 4/26/18
Boring Begun: 4/26/18
Boring Completed: 4/26/18

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		Topsoil						
1			Brown Fine SAND (SP)						
2			Gray Fine SAND (SP)						
3	5		Gray Silty Fine SAND With Clay (SM)						
			Boring Terminated @ 6 ft.						
	10								
	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 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

LOG OF BORING

Project No.: 35-27112
Boring No.: A2
Sheet 1 of 1

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: Hand Auger
Driller: A. Elkaz
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 2.5 ft Time: Drilling Date: 4/26/18
Boring Begun: 4/26/18
Boring Completed: 4/26/18

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		Topsoil					0 10 20 30 40	⊙ Pocket Penetrometer Undisturbed Sample ◔ Pocket Penetrometer Disturbed Sample ▼ Torvane ● Unconfined Compression ⊠ Triaxial Compression 0 1 2
1			Brown Fine SAND (SP)						
2	5		Gray Silty Fine SAND With Clay (SM)						
			Boring Terminated @ 6 ft.						
	10								
	15								
	20								

Remarks

LOG OF BORING 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

Project No.: 35-27112
Boring No.: A3
Sheet 1 of 1

LOG OF BORING

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: Hand Auger
Driller: A. Elkaz
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 2.2 ft Time: Drilling Date: 4/26/18
Boring Begun: 4/26/18
Boring Completed: 4/26/18

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION
	0		Topsoil
1			Dark Brown Fine SAND (SP)
2			Gray Fine SAND (SP)
3			Medium Brown Fine SAND With Silt (SP-SM)
4	5		Gray Silty Fine SAND With Clay (SM)
			Boring Terminated @ 6 ft.
	10		
	15		
	20		

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)
⊙ Pocket Penetrometer Undisturbed Sample
◕ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
⊠ Triaxial Compression
0 1 2

Remarks

LOG OF BORING 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

LOG OF BORING

Project No.: 35-27112
Boring No.: A4
Sheet 1 of 1

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: Hand Auger
Driller: A. Elkaz
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 3.3 ft Time: Drilling Date: 4/26/18
Boring Begun: 4/26/18
Boring Completed: 4/26/18

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION
	0		Topsoil
1			Dark Brown Fine SAND (SP)
2			Gray Fine SAND (SP)
			Gray Brown Silty Fine SAND (SM)
3			
	5		
			Boring Terminated @ 6 ft.
	10		
	15		
	20		

BLOWS PER 6 IN. | N Value | PERCENT ORGANIC MATERIAL | PERCENT PASSING NO. 200 SIEVE | ○PLASTIC LIMIT | MOISTURE CONTENT + (%) 0 10 20 30 40 | ◇LIQUID LIMIT

SHEAR STRENGTH (ksf)
⊙ Pocket Penetrometer Undisturbed Sample
◒ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
⊠ Triaxial Compression
0 1 2

Remarks

LOG OF BORING 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

Project No.: 35-27112
Boring No.: A5
Sheet 1 of 1

LOG OF BORING

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: Hand Auger
Driller: A. Elkaz
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 3.8 ft Time: Drilling Date: 4/26/18
Boring Begun: 4/26/18
Boring Completed: 4/26/18

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) ⊙ Pocket Penetrometer Undisturbed Sample ⊕ Pocket Penetrometer Disturbed Sample ▼ Torvane ● Unconfined Compression ⊠ Triaxial Compression 0 1 2
	0		Topsoil						
1			Dark Brown Fine SAND, Trace Small Roots (SP)						
			Brown Fine SAND (SP)						
2									
3			Light Brown Fine SAND (SP)						
			Gray Brown Silty Clayey Fine SAND (SC)						
4									
	5								
			Boring Terminated @ 6 ft.						
	10								
	15								
	20								

Remarks

LOG OF BORING 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

Project No.: 35-27112
Boring No.: A6
Sheet 1 of 1

LOG OF BORING

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: Hand Auger
Driller: A. Elkaz
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 5.9 ft Time: Drilling Date: 4/26/18
Boring Begun: 4/26/18
Boring Completed: 4/26/18

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION
	0		Topsoil
1			Brown Fine SAND (SP)
2			Gray Fine SAND (SP)
3			Medium Brown Fine SAND With Silt (SP-SM)
4			Light Brown Fine SAND (SP)
5	5		Gray Brown Clayey Fine SAND (SC)
			Boring Terminated @ 6 ft.
	10		
	15		
	20		

BLOWS PER 6 IN. | N Value | PERCENT ORGANIC MATERIAL | PERCENT PASSING NO. 200 SIEVE | ○PLASTIC LIMIT | MOISTURE CONTENT + (%) 0 10 20 30 40 | ◇LIQUID LIMIT

SHEAR STRENGTH (ksf)
⊙ Pocket Penetrometer Undisturbed Sample
⊕ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
☒ Triaxial Compression
0 1 2

Remarks

LOG OF BORING 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

Project No.: 35-27112
Boring No.: A7
Sheet 1 of 1

LOG OF BORING

Project: Trout River Water Main
Client: Corner Lot Development Group
Boring Location: See Field Exploration Plan
Drill Rig: Hand Auger
Driller: A. Elkaz
Drill Rod:
Drill Mud:
Casing Size:
Length of Casing:
Groundwater Depth: 2.9 ft Time: Drilling Date: 4/26/18
Boring Begun: 4/26/18
Boring Completed: 4/26/18

SAMPLE NO.	DEPTH, FEET	SAMPLE TYPE	DESCRIPTION
	0		Topsoil
1			Brown and Light Brown Fine SAND (SP)
2			
			Gray Fine SAND (SP)
3			
4			Light Brown and Gray Fine SAND (SP)
5	5		Gray Fine SAND With Silt (SP-SM)
			Boring Terminated @ 6 ft.
	10		
	15		
	20		

BLOWS PER 6 IN. | N Value | PERCENT ORGANIC MATERIAL | PERCENT PASSING NO. 200 SIEVE | ○PLASTIC LIMIT | MOISTURE CONTENT + (%) 0 10 20 30 40 | ◇LIQUID LIMIT

SHEAR STRENGTH (ksf)
⊙ Pocket Penetrometer Undisturbed Sample
◔ Pocket Penetrometer Disturbed Sample
▼ Torvane
● Unconfined Compression
⊠ Triaxial Compression
0 1 2

Remarks

LOG OF BORING 35-27112.GPJ ELLIS ASSOCIATES.GDT 5/15/18

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 six (6) months 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.

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KEY TO SOIL CLASSIFICATION

Description of Compactness 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

DESCRIPTION OF SOIL COMPOSITION**

(Unified Soil Classification System)

MAJOR DIVISION		Group Symbol	LABORATORY CLASSIFICATION CRITERIA		SOIL DESCRIPTION
			FINER THAN 200 SIEVE %	SUPPLEMENTARY REQUIREMENTS	
Coarse grained (over 50% by weight coarser than No. 200 sieve)	Gravelly soils (over half of coarse fraction larger than No. 4)	GW	<5*	D_{60}/D_{10} greater than 4, $D_{30}^2/(D_{60} \times D_{10})$ between 1 & 3	Well graded gravels, sandy gravels
		GP	<5*	Not meeting above gradation for GW	Gap graded or uniform gravels, sandy gravels
		GM	>12*	PI less than 4 or below A-line	Silty gravels, silty sandy gravels
		GC	>12*	PI over 7 above A-line	Clayey gravels, clayey sandy gravels
	Sandy soils (over half of coarse fraction finer than No. 4)	SW	<5*	D_{60}/D_{10} greater than 6, $D_{30}^2/(D_{60} \times D_{10})$ between 1 & 3	Well graded sands, gravelly sands
		SP	<5*	Not meeting above gradation requirements	
		SM	>12*	PI less than 4 or below A-line	Silty sands, silty gravelly sands
		SC	>12*	PI over 7 and above A-line	Clayey sands, clayey gravelly sands
Fine grained (over 50% by weight finer than No. 200 sieve)	Low compressibility (liquid limit less than 50)	ML	Plasticity chart		Silts, very fine sands, silty or clayey fine sands, micaceous silts
		CL	Plasticity chart		Low plasticity clays, sandy or silty clays
		OL	Plasticity chart, organic odor or color		Organic silts and clays of low plasticity
	High compressibility (liquid limit more than 50)	MH	Plasticity chart		Micaceous silts, diatomaceous silts, volcanic ash
		CH	Plasticity chart		Highly plastic clays and sandy clays
		OH	Plasticity chart, organic odor or color		Organic silts and clays of high plasticity
Soils with fibrous organic matter		PT	Fibrous organic matter; will char, burn or glow		Peat, sandy peats, and clayey peat

* For soils having 5 to 12 percent passing the No. 200 sieve, use a dual symbol such as SP-SM.
** Standard Classification of Soils for Engineering Purposes (ASTM D 2487)

SAND/GRAVEL DESCRIPTION MODIFIERS	
Modifier	**Sand/Gravel Content**
Trace	<15%
With	15% to 29%
Sandy/Gravelly	>29%

ORGANIC MATERIAL MODIFIERS	
Modifier	**Organic Content**
Trace	1% to 2%
Few	2% to 4%
Some	4% to 8%
Many	>8%

SILT/CLAY DESCRIPTION MODIFIERS	
Modifier	**Silt/Clay Content**
Trace	<5%
With	5% to12%
Silty/Clayey	13% to 35%
Very	>35%

APPENDIX B

LABORATORY DATA
LABORATORY TEST PROCEDURES

SUMMARY OF LABORATORY TEST RESULTS

Project: Trout River Water Main
Client: Corner Lot Development Group
Project No.: 27112

Boring/ Sample No.	Sample Depth (ft.)	Organic Content %	Fines Content %	Natural Moisture Content %	Atterberg Limits			Pocket Pen. (tsf)
					Liquid Limit %	Plastic Limit %	Plasticity Index	
B1-5	8.0-10.0		58.4	37				

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.