GEOTECHNICAL REPORT

Valdosta Water Treatment Plant

Valdosta, Lowndes County, Georgia

Prepared for:
CDM Smith
Atlanta, Georgia

Prepared by:
TTL, Inc.
Valdosta, Georgia

Project No. 23-07-02183.00 (R1)

June 5, 2024

TTL
4589 Val North Drive
Valdosta, GA 31602
229-244-8619
www.TTLUSA.com

June 5, 2024

CDM Smith
Attn.: Mr. Yanni Polematidis
4651 Salisbury Road, Suite 420
Jacksonville, Florida 32256

T: 904.731.7109
E: PolematidisIM@cdmsmith.com

RE: Geotechnical Report
Valdosta Water Treatment Plant
Valdosta, Lowndes County, Georgia
TTL Project No. 000230702183.00(R1)

Dear Mr. Polematidis:

TTL, Inc. (TTL) is pleased to submit this geotechnical report for the above-referenced project. If you have questions regarding our report, or if additional services are needed, please do not hesitate to contact us.

The enclosed report contains a brief description of the site conditions and our understanding of the project. The geotechnical recommendations contained within this report are based on our understanding of the project, the results of our field exploration and laboratory tests, and our experience with similar projects.

We appreciate the opportunity to be of professional service during this phase of the project and look forward to working with you in the future.

Respectfully submitted,
TTL, Inc.

6-5-24
No. 034150

Matthew Gaston

Matthew L. Gaston, P.E.
Sr. Project Engineer

Richard D Heckel LJ

Richard D. Heckel, P.E., D.GE
Chief Geotechnical Engineer

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EXECUTIVE SUMMARY

This geotechnical report has been prepared for the proposed Valdosta Water Treatment Plant, hereinafter referred to as the "project." This project is located in an open agricultural field west of GA State Highway 31 and north of Race Track Road SE in Valdosta, Lowndes County, Georgia.

Below is a summary of geotechnical-related items to be considered for this project:

- Twenty-one soil test borings were drilled at the site to approximate depths of 7.5 to 100 feet below ground surface (bgs).
- Soils within the upper 3 feet were generally loose or very loose. Most of the soils within 55 feet of the ground surface consisted of clayey and silty sands with intervals of clay. Below 55 feet bgs, the soils were primarily clay.
- Groundwater was typically encountered at an approximate depth of 10 to 25 feet bgs in the borings. However, in borings SW-1, B-4, and B-5 groundwater was observed at approximately 4 feet bgs and in boring TB-2 groundwater was observed at a depth greater than 25 feet bgs. Groundwater was not encountered in borings RB-1, RB-2, RB-3, RB-4, RB-5, SW-2, TB-5 and W-1.
- Initial site preparation is expected to require stripping and removal of existing topsoil. Stripping depths of about 3 inches should be expected.
- Soils from on-site cuts or excavations should generally be acceptable for re-use as compacted fill across the site, assuming the soils are properly moisture-conditioned and free of debris and organics. However, fat clays should not be used as fill, if encountered.
- Initial site preparation should also include the densification of the near surface soils within the proposed construction footprint areas. The stability of the soils should then be examined via a proofroll. Based on the proofroll results, localized undercutting and replacement of the near surface soils may be necessary.
- The proposed 1,000,000-gallon water tank can be supported on a typical ring wall foundation. Based on our settlement analysis we expect the tank foundation will experience up to 3 inches of total settlement and up to 1 inch of differential settlement. We estimate that about 50 percent of the settlement will occur during the initial loading period. To mitigate the post-construction settlement, the tank should be loaded/filled incrementally over 6 to 10 weeks to surcharge the in-place soils. Settlement points should be surveyed during the surcharge period to monitor settlement of the tank foundation. After the surcharge period is completed, TTL should review the survey data to confirm that future settlement will be in the range of 1 inch. At that point, permanent utility connections can be made.
- The proposed auxiliary buildings, production wells, and treatment structures can be supported on typical shallow foundations and slab-on-grade floors bearing on stable in-

place soils or compacted fill. Footings can be designed for a net allowable bearing pressure of up to 2,000 pounds per square foot.

- We understand the proposed chemical canopy, clearwell, and high service pump cans structures have been designed to be supported on a mat foundation. A net allowable bearing pressure of up to 2,000 pounds per square foot is acceptable. For the high service pump cans structure, the mat foundation can be designed for a net allowable bearing pressure of up to 2,700 pounds per square foot.
- The unpaved gravel access drive should include at least 6 inches of compacted crushed aggregate base material placed atop compacted fill or stable in-place soils, confirmed by proofrolling. Performance of the gravel road could be improved by placing a filter fabric between the gravel and the soil subgrade.

This summary is provided for convenience only. Users should read the entire report to fully understand the information and recommendations provided.

1.0 PROJECT INFORMATION

1.1 Project Description

Item	Description
Project Location	This project is located in an open agricultural field west of GA State Highway 31 and north of Race Track Road SE in Lowndes County, Georgia. The water treatment plant is proposed to be just west of the Valdosta Regional Airport southern fence.
Proposed Construction	Based on the site plans provided, the project will consist of constructing a 1,000,000-gallon water storage tank with a diameter of 70 feet. We understand that the new tank will be supported by a ring wall foundation near or slightly below the ground surface. The project also includes the construction of multiple auxiliary buildings, production wells, and treatment structures (such as a CO2 tank pad, generator pad, etc.). The site plans indicate that there will also be space on the western portion of the site for potential future tanks and treatment structures. The site will be connected to GA State Highway 31 by an approximately 2,000-foot-long unpaved gravel access road. Anticipated traffic on this roadway includes mainly passenger vehicles with occasional garbage and delivery trucks. A water retention pond is also included in this project. The pond will be approximately 400 feet long by 100 feet wide and will be located to the north of the 1,000,000-gallon tank. TTL was informed that the pond will be about 3 to 4 feet in depth.
Structural Loads	We assume the proposed tank will have a maximum distributed load of about 2,400 pounds per square foot (psf). CDM Smith informed TTL that the auxiliary buildings will have maximum wall loads of about 2,000 pounds per linear foot and the treatment structures will have maximum distributed loads ranging from 1,000 to 2700 psf.
Allowable Settlement	We understand allowable total settlement will be 1 inch, except for the water tank foundation. Based on our review of ACI 372, a total allowable settlement up to 6 inches and differential settlement up to 1 inch is acceptable for the water tank foundation.
Grading	The site appears to be relatively flat with about 6 feet in total elevation change. Typically, the ground surface slopes southeast to northwest. Based on the existing topography, TTL assumes less than 3 feet of cut/fill will typically be required, except in the retention pond area where up to about 5 feet of cut may be required. The high service pump cans will have a base elevation about 14 feet below ground level.

If the above information is not correct, please contact us so that we can make the necessary modifications to our recommendations, if needed.

1.2 Authorization

This geotechnical exploration was authorized by Mr. Shane Wood, Vice President of CDM Smith, on August 25, 2023. The scope of services provided by TTL is based on our Proposal No. 000230702183.00 (dated June 23, 2023).

1.3 Scope of Services

The planned scope of this exploration included 21 borings, at the requested locations provided by CDM Smith. The approximate boring locations are shown on the Boring Location Plans in Appendix A. Laboratory testing was also performed. Based on the collected data, we have developed geotechnical recommendations for site grading, gravel roadways, and shallow foundations.

2.0 EXPLORATION FINDINGS

2.1 Site Conditions

Item	Description
Site Conditions	The site is currently a relatively flat grass covered field. The site has previously been used as an agricultural field. Wooded land and Fern Pond is to the north of the site, the Valdosta Regional Airport is to the east, and more grass covered fields are to the south and west.
Current Ground Cover	The site typically exhibits a surface cover of grass and small brush.

2.2 Site Geology

According to the *Geologic Map of the Valdosta Area,* by Paul F. Huddlestun (1992), the proposed site is mapped as being underlain by the Pliocene-aged Miccosukee Formation. The Miccosukee Formation is described as mostly fine to medium bedded, well-sorted (poorly graded) sands with some scattered clay beds or lenses. In some areas, the Miccosukee Formation consists of massively bedded sandy clays to clayey sands and well-sorted, fine to coarse grained sands. The maximum thickness of this soil unit ranges from 50 to 100 feet. According to the USDA Web Soil Survey, the near-surface soils are poorly drained and the seasonal high-water table can be as shallow as 6 to 18 inches below ground surface (bgs).

2.3 Subsurface Stratigraphy

Subsurface conditions within the project limits were evaluated by performing 21 soil test borings. The approximate location of the borings is shown on the Boring Location Plans in Appendix A. Information from the borings is summarized below.

Borings were performed with a truck or ATV-mounted drilling rig and included standard penetration testing (SPT) to evaluate soil density/consistency and to collect samples for classification and testing. Penetration resistance values (N-values) were recorded in blows per foot (bpf). Soil samples were taken from the split spoon sampler, field classified, and transported to our laboratory for further testing. Samples were collected and classified by TTL personnel.

The site generally exhibits about 2 or 3 inches of topsoil underlain by low consistency (N-value of 10 bpf or less) sands, silts, and clays extending to about 3 feet bgs. These materials are typically underlain by medium dense clayey sands and stiff to very stiff lean and fat clays extending to approximately 32 feet bgs. Silty sands are sometimes interbedded with these clayey sands and lean and fat clays. Below approximately 32 feet bgs, firm to stiff fat clays were encountered to approximately 45 feet bgs. These softer materials are underlain by medium dense silty sands to approximately 57 feet bgs. Below 57 feet bgs, firm to very stiff fat clays are present for the remainder of the borings, becoming hard about 85 feet bgs.

The boring logs presented in Appendix A represent our interpretation of the subsurface conditions at each test boring location based on tests and observations performed during the drilling operations, visual examination of the soil samples by a geotechnical professional, and laboratory tests conducted on selected soil samples. The lines designating the interfaces between various strata on the boring logs represent the approximate strata boundaries. Transitions between strata may be more gradual than depicted on the boring logs. Subsurface conditions between borings may vary from the conditions represented on the boring logs.

2.4 Groundwater Conditions

Based upon where free water was observed within the split spoon samples, groundwater was generally estimated to be present in the borings at depths of about 10 to 25 feet bgs. However, in borings SW-1, B-4, and B-5 groundwater was observed at approximately 4 feet bgs and in boring TB-2 groundwater was observed at a depth greater than 25 feet bgs. Groundwater was not encountered in borings RB-1, RB-2, RB-3, RB-4, RB-5, SW-2, TB-5 and W-1. Wet soils were encountered throughout the site, and it is possible that zones of “perched” groundwater could be present depending on prevailing weather conditions.

Groundwater may represent a continuous surface which is present year-round or a laterally discontinuous, isolated, “perched”, or temporary water surface. Both types of groundwater may be influenced by seasonal changes in precipitation, vegetation, surface runoff, water levels in nearby water bodies, construction activity, and other factors. The groundwater level below the site may fluctuate up or down in response to such changes and may be at different levels than indicated on the boring logs at times after the exploration.

2.5 Laboratory Testing

Laboratory testing for this project included the determination of soil moisture contents for selected samples with the results shown on the individual boring logs. Selected samples were also chosen for classification testing including Atterberg limits and soil grain size distribution. The soil classification test results are summarized in the table below.

Soil Classification Test Results

Boring Number	Sample Depth (feet)	Liquid Limit	Plastic Limit	Plasticity Index	% Passing No. 200	Moisture Content %	USCS Classification	Soil Description
B-1	1 – 2.5	NP	NP	NP	27.6	15	SM	Silty Sand
B-4	23.5 – 25	38	16	22	39.5	24	SC	Clayey Sand
B-7	13.5 – 15	36	19	17	61.4	21	CL	Sandy Lean Clay
RB-1	3.5 – 5	45	29	16	65.0	22	ML	Sandy Silt
RB-3	1 – 2.5	23	13	10	31.8	15	SC	Clayey Sand
RB-4	3.5 – 5	48	21	27	47.3	20	SC	Clayey Sand
RB-5	1 – 2.5	49	30	19	81.5	32	ML	Silt with Sand
TB-1	3.5 – 5	29	15	14	47.3	18	SC	Clayey Sand
TB-1	13 – 15	25	14	11	23.0	17	SC	Clayey Sand
TB-1	38.5 – 40	81	28	53	89.1	56	CH	Fat Clay
TB-1	58.5 – 60	71	29	42	78.3	55	CH	Fat Clay with Sand
TB-3	28.5 – 30	63	26	37	81.2	37	CH	Fat Clay with Sand
TB-4	41 – 43	114	30	84	88.2	61	CH	Fat Clay
TB-5	3.5 – 5	22	12	10	36.6	16	SC	Clayey Sand
W-2	6 – 7.5	45	24	21	64.1	21	CL	Sandy Lean Clay
NP = non-plastic								

We note the Liquid Limit for the sample from 41 to 43 feet in Boring TB-4 was 114. In the Coastal Plain region of South Georgia, clayey soils deep below ground level occasionally exhibit Liquid Limits greater than 100. The plasticity of these soils is not expected to affect the performance of the shallow foundations recommended for this project, as discussed later.

Three soil samples were submitted to an analytical laboratory for determination of the pH, resistivity, and ion (sulfate and chloride) content. Laboratory reports for these tests are included in Appendix A. These corrosion indicator test results are summarized in the table below.

Corrosion Indicator Test Results

Boring Number	Sample Depth (ft)	Sulfate (ppm)	Chloride (ppm)	pH	Resistivity (ohm-cm)
TB-1	48.5 - 50	341	100	9.1	10,800
TB-3	13.5 – 15	6.82	60	8.4	7,300
TB-5	28.5 – 30	341	100	8.2	20,500

Additionally, two relatively undisturbed Shelby tube samples were tested for one-dimensional consolidation in general accordance with ASTM D2435. Results of the tests are presented on the One-Dimensional Consolidation Test sheets in Appendix A. Both consolidation tests exhibited a significant amount of disturbance from the sampling process, which makes interpretation of the pre-consolidation pressure and other consolidation parameters problematic. Given the significant amount of sands present in the borings and apparent pre-consolidation of the clays, we elected to perform our settlement analyses using the Schmertmann method. Settlement analyses are discussed in Section 3.3.

3.0 GEOTECHNICAL CONSIDERATIONS

The following geotechnical considerations have been prepared based on the data collected during this project, our experience with similar projects, and our knowledge of sites with similar surface and subsurface conditions.

3.1 In-Place Low Consistency Soils

Low consistency soils (N-value of 10 bpf or less) were encountered near the ground surface throughout the site. Densification of these low consistency soils will likely be necessary to establish a stable subgrade. We also recommend having the construction documents include contingencies (allowances and unit costs) for potential localized undercutting of these soils, based on proofrolling results.

3.2 Shallow Foundations

Shallow foundations bearing on stable in-place soils (confirmed by proofrolling) or properly compacted fill are considered appropriate for this project. Densification of the bearing soils should be expected to address low consistency zones near the ground surface. Based on proofroll results, after densification is completed localized undercutting and replacement of the near surface soils may be necessary.

For the auxiliary buildings, production wells, and treatment structures, typical shallow and mat foundations bearing on stable in-place soils or properly compacted fill are considered appropriate.

For the 1,000,000-gallon tank, typical ring wall foundations are considered appropriate. The interior of the ring wall foundation should have an aggregate base layer placed with a 12-inch compacted thickness for support of the tank floor. This layer should consist of a GDOT Section 815 Graded Aggregate or 8910 stone, and bear on stable in-place soils or properly compacted fill, confirmed by proofrolling or penetrometer testing. Tank design details may require a sand bedding layer directly beneath the floor.

3.3 Settlement Considerations

Based on our settlement analysis the water tank foundation should be anticipated to experience up to 3 inches of total settlement and up to 1 inch of differential settlement from the tank center to the edge. Settlement of the sandy soils will occur upon or shortly after loading. We estimate that about 50 percent of the settlement will occur during the initial loading period. In order to mitigate post-construction settlement, the tank should be loaded/filled incrementally over 6 to 10 weeks to surcharge the in-place soils. Settlement points (one in each quadrant of the tank) should be surveyed at least once per week during the surcharge period to monitor the settlement of the tank foundation. After the surcharge period is completed, TTL should review the survey data to confirm that future settlement will be in the range of 1 inch. At that point permanent utility connections can be made. Shallow foundation recommendations are provided later in this report.

3.4 Unpaved Gravel Roadways

Based on the provided site plans, the project includes the construction of an approximately 2,000-foot-long access road. This access road is anticipated to have an unpaved gravel surface and be subjected to primarily passenger vehicles with occasional garbage and delivery trucks (5 or less per week). In our opinion, placement of a geotextile filter fabric beneath the gravel will improve performance by keeping the compacted gravel separate from the underlying subgrade soils.

4.0 EARTHWORK RECOMMENDATIONS

4.1 Subgrade Preparation and Stabilization

4.1.1 Stripping

Subgrade preparation should begin with stripping to remove topsoil across the planned construction area. Subgrade preparation should also include the complete removal of soils containing organics, if encountered.

- Stripping should extend 10 feet beyond the construction footprints, where possible.
- Topsoil should be removed from the site or stockpiled for reuse in landscape and lawn areas, if the materials are acceptable for that purpose.
- Boring data indicates topsoil stripping depths should average about 3 inches below existing site grades, but could be thicker in some areas.

4.1.2 Subgrade Stabilization

Based on the boring data, after the stripping and initial cutting to grade is completed, the near surface soils will need to be densified within the construction footprints in order to establish a stable subgrade (including the access road footprint). Densification of the exposed materials should be performed using the appropriate compaction roller without the vibrator to the extent no additional compaction by visual observation is achieved. After densification is completed, localized undercutting may still be necessary based on proofrolling results, because of soil instability below the ground surface. A contingency should be included in the contract documents (unit costs per cubic yard in place) for undercutting and replacement of subgrade materials.

4.1.3 Proofrolling

After stripping and densification of the near surface soils is completed, but prior to foundation construction, the stability of the exposed subgrade soils should be evaluated by means of proofrolling.

- Perform proofrolling with a rubber-tired vehicle having a gross vehicle weight of at least 20 tons (such as a loaded, tandem-axle dump truck).
- Proofrolling equipment should make multiple closely-spaced overlapping passes over the subgrade at a walking pace.
- The subgrade should be relatively smooth and free of wheel ruts, sheepsfoot roller dimples, loose clods of soil, or loose gravel. The subgrade should not be desiccated, cracked, wet, or frozen at the time of proofrolling.
- A TTL representative should observe the proofrolling to identify, document, and mark areas of unstable subgrade response, such as pumping, rutting, or shoving, if any, and provide recommendations for subgrade repair.

4.2 Compacted Fill

Soils from on-site cuts or excavations can likely be used as fill (except for fat clays), assuming they are free of debris and organics and are moisture-conditioned as required prior to placement. If needed, compacted fill material for this project may originate from an off-site borrow source. Proposed fill material should be tested by TTL prior to fill placement to evaluate whether the soils meet specifications (allow 3 to 4 days for sampling and testing soil). Borrow materials should exhibit properties provided in the table below.

MATERIAL TYPE	CHARACTERISTICS	COMPACTION PROCEDURES	COMPACTION CONTROL [1, 2]
SOIL BORROW	Soil Classification: SM, SC, or CL Maximum particle size: 3 inches Maximum gravel and oversize particle content: 30 percent retained on a ¾-inch sieve Maximum allowable organic content: 3 percent by weight, but large roots are not allowed Liquid Limit (LL): Less than 45	Maximum loose lift thickness: 8 inches for ride-on equipment; 6 inches for hand-held or walk-behind/remote controlled equipment Compaction Requirement: Compaction should be to at least 98 percent of the standard Proctor maximum dry density (ASTM D 698) Moisture content at time of compaction: Within plus to minus 3 percent of the material's optimum moisture content	General Fill Areas: One field density test every 5,000 square feet per lift, with a minimum of two tests per lift Utility Trenches: One field density test per structure or one test per every 100 linear feet, per lift
GRADED AGGREGATE BASE	GDOT Section 815 Graded Aggregate	Maximum loose lift thickness: 8 inches Compaction Requirement: Compaction should be to at least 98 percent of the standard Proctor maximum dry density (ASTM D 698) Moisture content at time of compaction: Within plus to minus 2 percent of the material's optimum moisture content	

[1] For preliminary planning only. Our engineer should determine the actual test frequency, based on field conditions.

[2] In addition, the fill must be stable under the influence of compaction equipment. Heavy construction traffic should not be allowed to travel on compacted fill areas.

Compacted fill material should not be placed on surfaces that are muddy, frozen, contain frost, or are otherwise deemed unsuitable by TTL's geotechnical representative. Proper compaction of compacted fill material should be achieved by using sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, or other equipment suitable for the soils being compacted. Fill should be compacted beneath and beyond structure footprints 5 feet or more.

4.3 Drainage Considerations

It will be important for the contractor to maintain the construction site in a positively drained condition both during and after construction. Storm runoff should not be allowed to pond on the site. Ponding water can lead to the deterioration of the subgrade surface necessitating over-excavation of the softened soil. Project specifications should clearly detail the contractor's responsibility to maintain site drainage and to notify the designers and the geotechnical engineer if conditions are encountered at the site that would require remedial treatment.

Weather conditions at the time of site preparation will directly impact excavation and potential backfill activities. The in-place soils (and anticipated compacted fill) can be expected to degrade during seasonal wet weather conditions typical of the winter and early spring months (typically November through April) when there is limited drying potential and seasonal high rainfall.

Additional soil processing and drying efforts are typically required during wet weather conditions. Commencing site preparation during wet weather conditions could potentially result in construction delays and possible additional site work costs. The performance of soil supported structural elements is dependent in part on stability of moisture conditions of the underlying soils. Poor site drainage could result in delays in construction because soft soils will need to be removed and treated or replaced. It is the contractor's responsibility to grade the site in a manner that promotes positive drainage away from the construction area.

4.4 Groundwater Control

It is anticipated that groundwater control measures will be minor for this project other than certain footings, some deeper utility lines, and the high service pump cans pit. However, depending on the final site layout, some locations may encounter groundwater at shallower elevations. Therefore, prior to mass grading, the contractor should evaluate groundwater conditions by excavating test pits and/or by performing hand auger borings while a TTL representative is present. As needed, temporary dewatering measures should be implemented to lower water levels and reduce potential subgrade disturbance during site work and to provide more time for dewatering measures to work prior to pad grading and foundation construction.

Temporary dewatering measures may include open ditches, or buried drains where vehicle access must be maintained. An efficient place to install both temporary and permanent drains may be in the storm water trenches. This could be accomplished by installing a 4-inch diameter perforated HDPE pipe with a sock covering at the base of the trench and backfilling up to about the top of the pipe with a clean sand such as ASTM C-33 concrete sand. We anticipate that 4 to 6 inches of bedding stone will also be needed for the storm sewer pipe. We request that TTL be provided a copy of the final grading plan for review as related to potential dewatering measures.

Positive surface drainage should be maintained during construction to prevent water from ponding on the surface. Surface water run-off from off-site areas should be diverted around the site using berms or ditches. The surface can be rolled smooth to enhance drainage if precipitation is expected but should then be scarified prior to resuming fill placement operations. Subgrades damaged by construction equipment should be promptly repaired to reduce the potential for further degradation in adjacent areas and avoid ponding on the subgrade. Our geoprofessional should provide recommendations for treatment if the subgrade material becomes wet, dry, or frozen. When work activities are interrupted by heavy rainfall, fill operations should not be resumed until the moisture content and density of the previously placed fill materials are as recommended in this report.

5.0 INFRASTRUCTURE RECOMMENDATIONS

5.1 Utilities

Typically, the bedding and initial backfill around buried utilities are placed to support and protect the piping. The material above this initial backfill (secondary backfill) also helps protect the piping and supports the overlying slabs and/or pavements. Inadequate compaction of this material can lead to excessive settlement of the backfill and premature distress in foundations, slabs, or pavements. Therefore, we recommend the following:

- Whenever possible, trench and install utilities prior to other work (such as before foundation excavations, paving, etc. are performed).
- Place, moisture-condition, and compact the secondary backfill in accordance with the applicable project requirements.

In deeper excavations (greater than 5 feet) of limited width, the use of flowable fill should be considered as backfill. When properly designed (50 psi to 100 psi compressive strength), this material can be easily excavated later if required. While the material costs may be higher than for backfill soils, the use of flowable fill is usually faster and requires no compaction and no testing when used for this purpose. General criteria for flowable fill can be found in ACI 229R.

Backfilling of utility trench backfill should meet the compaction recommendations outlined in section 4.2 of this report.

5.2 Below Grade Walls

Based on the information provided TTL anticipates this project will have below grade walls associated with several of the structures (i.e. high service pump cans). These structures are anticipated to require excavations of up to 14 below existing ground surface. We understand below grade walls will consist of cast-in-place concrete.

Cast-in-place concrete below grade walls can be used for the project and should be designed using the earth pressure recommendations below.

Backfill Material	**Total Unit Weight, pcf**	**At-Rest Earth Pressure Coefficient, k_o**	**Active Earth Pressure Coefficient, k_a**	**Effective Friction Angle (phi), degrees**	**Effective Cohesion, psf**
Compacted Silty Sand (SM) or Clayey Sand (SC)	120	0.53	0.36	28	0
GDOT No. 57 or 67 Stone	105	0.40	0.25	37	0

The parameters above are subject to the following requirements:

- Use the at-rest earth pressure condition if the top of the wall is restrained against rotation or if rotation of the wall is not desired.
- Use the active earth pressure condition if the wall is free to rotate outward at least 1 percent of the height of the wall.
- The zone of backfill behind the wall extends upward from the back of the retaining wall foundation at a slope of 1H:1V, or flatter.
- The grade behind the top of the wall will be horizontal. Different geometry behind the wall will produce different earth pressures, and sloping backfill will generally increase the earth pressures applied to retaining walls.
- The earth pressure coefficients can also be used to estimate the increased earth pressure from uniform surcharge loads on the backfill behind the walls.
- Hydrostatic pressures are not included in the earth pressure coefficient or unit weights.
- Seismic forces are not included in the earth pressure coefficients or unit weights.
- Lateral and overturning stability of the retaining wall should include a factor of safety at least 1.5 or as required by the building code or local codes.

We recommend providing a drainage zone behind the wall to collect and drain groundwater or surface water infiltration from behind the wall. The drainage zone should meet the following requirements:

- Drainage aggregate should consist of GDOT No. 57 or No. 67 clean crushed stone at least 2 feet wide behind the wall, extending from about 1 foot below the top of the wall down to the top of the wall footing.
- Drainage aggregate should be separated from the retaining wall backfill material by a non-woven needle-punched geotextile filter fabric (Mirafi 140N, or equal). Ends and edges of the geotextile sheets should overlap at least 1 foot to help prevent gapping open at joints. If clean crushed stone is used as backfill behind the wall, the filter fabric should be placed between the backfill and the sloping soil subgrade instead of 2 feet behind the wall stem within the crushed stone.
- A perforated PVC collector pipe (at least 4 inches diameter) should be provided at the base of the drainage zone to collect water from the zone and drain it from behind the wall via gravity to a suitable daylight outlet. We recommend all daylight outlets of drains include rodent guards to prevent animals from nesting in the pipes and clogging them.

Foundations for concrete below grade walls less than 14 feet tall should be designed and constructed using the recommendations given in Section 6.2.

5.3 Corrosion

Soil samples were submitted to an analytical laboratory for determination of pH, resistivity, and ion (sulfate and chloride) content. These laboratory tests were conducted to assess the corrosivity risk of the soils at the boring locations, for the potential that deep foundations were necessary for this project. However, we believe deep foundations will not be necessary for this project. Refer to Section 2.5 in this report for a summary of the test results.

According to the 2018 IBC, concrete that will be exposed to sulfate-containing solutions should be designed in accordance with ACI 318. The sulfate test results indicate that the sulfate exposure levels classify as S0 and S1. S1 soils occur at significant depths below ground level and therefore, are not expected to affect the concrete design on this project.

If deep foundations were necessary for this project, the steel reinforcing should be protected to prevent/reduce corrosion. Corrosion of steel buried in soil or embedded in concrete below grade can reduce the service life of the element by reducing the steel cross-section or reducing the bond between steel reinforcement and concrete. Corrosion is caused by migration of electrons from the steel into the surrounding soil. Three measurable soil properties that indicate the corrosion potential of steel in contact with soil are: chloride ion concentration, pH, and electrical resistivity. Subsurface conditions that contain chloride ions, even in low concentrations, or that have low pH or low electrical resistivity can cause corrosion. Where two, or all three, of these conditions exist, the soil is considered especially aggressive toward buried steel. The table below provides guidelines to assess the corrosion potential for buried steel exposed to soil. The corrosion potential should be determined independently for each of the parameters. In the event that two or more corrosive conditions exist, the highest or most aggressive corrosion potential should be considered for design. Minimum clear covers per the requirements of ACI-318 should be provided for below grade foundation rebar arrangements to reduce exposure to the soils encountered.

CORROSION POTENTIAL OF BURIED STEEL			
Corrosion Potential	**Electrical Resistivity, ohm-cm**	**Chloride Ion Content, ppm**	**pH**
Very High	0 to 1,000	>500	0 to 4.5
High	1,000 to 2,000		4.5 to 5.5
Moderate	2,000 to 5,000	<500	5.5 to 6.5
Low	>5,000		>6.5
From Palmer, J.F. (1974), “Soil Resistivity Measurements and Analysis,” Material Performance, Vol.13			

The soil samples selected for corrosion testing were observed to have an electrical-resistivity of at least 7,300 ohm-cm, a chloride content of 100 ppm or less, and a pH at least 8.2. Therefore, these soils would be categorized as having a low corrosion potential.

5.4 Access Road

The provided site plans indicate that an approximately 2,000-foot-long access road will be included in the project. TTL assumes that the expected traffic for this roadway will include mostly passenger vehicles with occasional (5 or less per week) garbage and delivery trucks. The provided information indicates that the access road will be finished with a gravel surface.

Gravel surfacing should be placed over compacted fill or stable in-place soil, confirmed by proofrolling. The gravel surface should consist of a crushed aggregate base material typical of a GDOT Section 815 Graded Aggregate Base. We recommend that the crushed aggregate base for the access road exhibit a compacted thickness of at least 6 inches and should be compacted to 100% standard Proctor density. A minimum 6-ounce non-woven geotextile fabric should be placed between the graded aggregate base and the soil subgrade to reduce mixing of the two materials.

6.0 STRUCTURAL RECOMMENDATIONS

6.1 Seismic Site Classification

Presented below are the seismic design criteria for the project site and immediate area.

Description	**Value**
2018 International Building Code Site Classification (IBC)[1]	D[2]
Site Latitude	30.762042
Site Longitude	-83.275782
Maximum Considered Earthquake 0.2 second Design Spectral Response Acceleration (S_{DS})	0.096
Maximum Considered Earthquake 1.0 second Design Spectral Response Acceleration (S_{D1})	0.087

[1] As per the requirements of Section 1613.3.2 in the 2018 IBC, the site class definition was determined using Table 20.3-1 of Chapter 20 of American Society of Civil Engineers (ASCE) 7. The Spectral Acceleration values were determined using publicly available information provided on the Structural Engineer Association of California (SEAOC) website.

[2] Note: Chapter 20 of ASCE 7 requires a site soil profile determination extending to a depth of 100 feet for seismic site classification.

If seismic design parameters based on the recommended site class produces excessive forces or unfavorable Design Category, it may be possible to reduce the seismic design parameters by performing additional testing and analysis. We can assist you with shear wave velocity testing and a site-specific seismic study as additional services, if requested.

Given the presence of sandy soils below the water table, we performed a liquefaction analysis based on Boring TB-1 (depth 100 feet). Our analysis indicates the soils have an adequate factor of safety against liquefaction for a Magnitude 6.5 earthquake.

6.2 Shallow Foundations

A ring wall foundation can be used to support the proposed one-million-gallon water tank. Shallow footings can be used to support the proposed auxiliary buildings, production wells, and treatment structures. Shallow foundations should be supported by stable in-place soils or newly placed and properly compacted fill. Foundation design recommendations are provided in the table below.

Design Considerations	Value
Suitable bearing soil	Stable in-place soil or compacted fill meeting requirements in Section 4.2
Bearing depth below exterior grade for perimeter foundations	12 inches or more
Spread Footing Size	24 inches or more
Strip Footing Size	18 inches or more
Allowable net bearing pressure for sustained loads	2,000 psf
Ultimate coefficient of friction between concrete and bearing soil for lateral load resistance	0.35
Required factor of safety for lateral resistance from friction	1.5 or more
Estimated Frost Depth	5 inches
Ultimate passive pressure from soil against vertical face of footing for lateral load resistance (Do Not Use if footing is formed)	200 psf per vertical foot Neglect resistance in top 1 foot unless ground surface is protected by concrete slabs or pavement
Factor of safety for lateral resistance from passive soil pressure	2.0 or more

A TTL geotechnical engineer or designated representative should observe the foundation excavations in order to assess the condition of the bearing surfaces. Prior to the placement of steel reinforcement and concrete, the TTL representative should determine if the bearing materials are satisfactory for supporting foundations by performing shallow hand auger borings and using a dynamic cone penetrometer. Localized foundation undercutting of loose, in-place soils may be required in some areas. The necessary depth of localized undercutting should be based upon the penetrometer results at the bearing elevation.

The interior of the ring wall should have an aggregate base layer placed with a 12-inch compacted thickness for support of the tank floor. This aggregate base layer should consist of GDOT Section 815 Graded Aggregate or GDOT 8910 stone. The aggregate base layer should bear on stable in-place soils or properly compacted fill, confirmed by proofrolling or penetrometer testing. Tank design details may require a sand bedding layer directly beneath the floor.

We understand several structures (i.e. chemical canopy, clearwell, high service pump cans) are being designed to be supported on mat foundations. A mat foundation, where appropriate, may be designed based on a modulus of subgrade reaction (“k” value) or a net allowable bearing pressure. We recommend a mat foundation be placed on a uniform blanket (minimum of 12 inches in thickness) of GDOT Section 815 Graded Aggregate, or equivalent, to provide drainage and stability during construction. The modulus of subgrade reaction depends on the dimensions of the mat and the applied loading. Based on our estimates, we recommend a modulus of subgrade reaction of 50 pci be used for the design of mats beneath these structures, assuming the sustained allowable net bearing pressure of the mat is 2,000 psf or less. The recommended modulus of subgrade reaction is for a 1-foot square area and should be adjusted to account for the shape and size of the loaded slab area.

During construction, care should be taken to avoid the collection of surface runoff on the site. Surface runoff should be drained away from excavations and not allowed to pond. Soils exposed at the bottom of footing excavations should be protected from disturbance, excessive drying, freezing, or rain. If the placement of structural concrete is delayed for an extended period, a 2 to 3 inch lean concrete “mud footing” should be placed in the foundation excavation. Prior to the placement of “mud footings” or structural concrete, the exposed soils in the bottom of the foundation should be re-tamped to densify any loosened bearing material with an appropriate compactor. Soil or other loose material should be removed from the “mud footing” surface before reinforcement steel and concrete are placed.

6.3 Settlement Monitoring

Due to the relatively high distributed load of the 1,000,000-gallon water tank, we anticipate total settlements induced in the materials below the foundation of up to 3 inches and differential settlement between the center and edge of the tank of up to 1 inch. Based on our experience, we expect most of the settlement should be complete in about 6 to 10 weeks after the start of the surcharge period. However, the time rate of settlement can vary considerably based on the unique and variable conditions in the field (particularly soil layering, sand content, and natural drainage features), so we recommend monitoring the settlements induced by surcharging to be confident that the majority of the expected settlements are complete before permanently connecting the tank to utilities. Also, delays in the surcharge period will extend the time for completion of settlement by a time period equivalent to the delay.

Settlement should be monitored by installing four settlement hubs before loading/filling the tank begins. One hub should be established for each quadrant of the ring wall foundation. The elevation of the top of the hub should be measured on the day it is placed and then again periodically after the start of the surcharge period to record the settlement of the hub over time. The elevation readings taken should be taken shortly before and after each loading increment to preserve the continuity of the settlement history for each hub. The process should continue until the majority of the anticipated settlement has occurred and the surcharge period is completed. Readings should be taken on a weekly basis, if not more often.

Elevation readings should be measured by a licensed professional surveyor and should be recorded to the nearest hundredth of a foot. The elevation readings can be referenced to a temporary benchmark established near the site, but the temporary benchmark should be located well away (at least 200 feet laterally) from the limits of construction operations to avoid movements of the benchmark due to other potential earthwork activities.

It is important to collect frequent elevation readings of each settlement hub immediately after each incremental load is installed. It is equally important to know the incremental load added at the time each settlement hub reading is collected. The settlement hub readings should be provided to TTL for review and estimation of apparent rates of settlement.

6.4 Floor Slabs

Concrete slab-on-grade floors supported on stable in-place soils or compacted fill are considered appropriate for the auxiliary buildings. Slab-on-grade floors should be placed on a minimum 4-inch layer of GDOT Section 815 Graded Aggregate or GDOT concrete sand. A modulus of subgrade reaction, k, of 100 pci may be used for design of floor slabs with sustained loads of 400 psf or less. The floor slab should be jointed from wall and column footings.

7.0 LIMITATIONS

TTL understands that this geotechnical report will be used by CDM Smith (client), and various designers and contractors involved with the design of the project. TTL should be invited to attend project meetings (in person or teleconferencing) or be contacted in writing to address applicable issues relating to the geotechnical engineering aspects of the project. TTL should also be retained to review the final construction plans and specifications to evaluate if the information and recommendations in this geotechnical report have been properly interpreted and implemented in the design and specifications. The contractor and applicable subcontractors should familiarize themselves with this report prior to the start of their construction activities, contact TTL for interpretation or clarification of the report, retain the services of their own consultants to interpret this report, or perform additional geotechnical testing prior to bidding and construction.

This geotechnical report is based upon the information provided to us by the client and the design professionals associated with the project, exploratory borings drilled within the project limits, laboratory testing of selected soil samples recovered during drilling of the exploratory borings, and our engineering analyses and evaluation. The client and readers of this geotechnical report should realize that subsurface variations and anomalies may exist across the site and between the exploratory boring locations. The client and readers should realize that site conditions can change due to the modifying effects of seasonal and climatic conditions and conditions at times after the exploration may be different than reported herein.

Unless stated otherwise in this report or in the contract between TTL and client, our scope of services for this project did not include, either specifically or by implication, environmental or biological assessment of the site or buildings, or identification or prevention of pollutants, hazardous materials or conditions at the site or within buildings. If the client is concerned about the potential for such contamination or pollution, TTL should be contacted to provide a scope of additional services to address the environmental concerns. Also, permitting, site safety, excavation support, and dewatering requirements are the responsibility of others.

This geotechnical report has been prepared for the exclusive use of the client for specific application to this project. This geotechnical report has been prepared in accordance with generally accepted geotechnical engineering practices using that level of care and skill ordinarily exercised by licensed members of the engineering profession currently practicing under similar conditions in the same locale. No warranties, express or implied, are intended or made. Additional information about the use and limitations of a geotechnical report is provided within the Geoprofessional Business Association document included at the end of this report.

Important Information about This

Geotechnical-Engineering Report

Subsurface problems are a principal cause of construction delays, cost overruns, claims, and disputes.

While you cannot eliminate all such risks, you can manage them. The following information is provided to help.

The Geoprofessional Business Association (GBA) has prepared this advisory to help you – assumedly a client representative – interpret and apply this geotechnical-engineering report as effectively as possible. In that way, you can benefit from a lowered exposure to problems associated with subsurface conditions at project sites and development of them that, for decades, have been a principal cause of construction delays, cost overruns, claims, and disputes. If you have questions or want more information about any of the issues discussed herein, contact your GBA-member geotechnical engineer. Active engagement in GBA exposes geotechnical engineers to a wide array of risk-confrontation techniques that can be of genuine benefit for everyone involved with a construction project.

Understand the Geotechnical-Engineering Services Provided for this Report

Geotechnical-engineering services typically include the planning, collection, interpretation, and analysis of exploratory data from widely spaced borings and/or test pits. Field data are combined with results from laboratory tests of soil and rock samples obtained from field exploration (if applicable), observations made during site reconnaissance, and historical information to form one or more models of the expected subsurface conditions beneath the site. Local geology and alterations of the site surface and subsurface by previous and proposed construction are also important considerations. Geotechnical engineers apply their engineering training, experience, and judgment to adapt the requirements of the prospective project to the subsurface model(s). Estimates are made of the subsurface conditions that will likely be exposed during construction as well as the expected performance of foundations and other structures being planned and/or affected by construction activities.

The culmination of these geotechnical-engineering services is typically a geotechnical-engineering report providing the data obtained, a discussion of the subsurface model(s), the engineering and geologic engineering assessments and analyses made, and the recommendations developed to satisfy the given requirements of the project. These reports may be titled investigations, explorations, studies, assessments, or evaluations. Regardless of the title used, the geotechnical-engineering report is an engineering interpretation of the subsurface conditions within the context of the project and does not represent a close examination, systematic inquiry, or thorough investigation of all site and subsurface conditions.

Geotechnical-Engineering Services are Performed for Specific Purposes, Persons, and Projects, and At Specific Times

Geotechnical engineers structure their services to meet the specific needs, goals, and risk management preferences of their clients. A geotechnical-engineering study conducted for a given civil engineer will not likely meet the needs of a civil-works constructor or even a different civil engineer. Because each geotechnical-engineering study is unique, each geotechnical-engineering report is unique, prepared *solely* for the client.

Likewise, geotechnical-engineering services are performed for a specific project and purpose. For example, it is unlikely that a geotechnical-engineering study for a refrigerated warehouse will be the same as one prepared for a parking garage; and a few borings drilled during a preliminary study to evaluate site feasibility will not be adequate to develop geotechnical design recommendations for the project.

Do not rely on this report if your geotechnical engineer prepared it:

- for a different client;
- for a different project or purpose;
- for a different site (that may or may not include all or a portion of the original site); or
- before important events occurred at the site or adjacent to it; e.g., man-made events like construction or environmental remediation, or natural events like floods, droughts, earthquakes, or groundwater fluctuations.

Note, too, the reliability of a geotechnical-engineering report can be affected by the passage of time, because of factors like changed subsurface conditions; new or modified codes, standards, or regulations; or new techniques or tools. *If you are the least bit uncertain* about the continued reliability of this report, contact your geotechnical engineer before applying the recommendations in it. A minor amount of additional testing or analysis after the passage of time – if any is required at all – could prevent major problems.

Read this Report in Full

Costly problems have occurred because those relying on a geotechnical-engineering report did not read the report in its entirety. Do not rely on an executive summary. Do not read selective elements only. *Read and refer to the report in full.*

You Need to Inform Your Geotechnical Engineer About Change

Your geotechnical engineer considered unique, project-specific factors when developing the scope of study behind this report and developing the confirmation-dependent recommendations the report conveys. Typical changes that could erode the reliability of this report include those that affect:

- the site's size or shape;
- the elevation, configuration, location, orientation, function or weight of the proposed structure and the desired performance criteria;
- the composition of the design team; or
- project ownership.

As a general rule, *always* inform your geotechnical engineer of project or site changes – even minor ones – and request an assessment of their impact. *The geotechnical engineer who prepared this report cannot accept* *responsibility or liability for problems that arise because the geotechnical engineer was not informed about developments the engineer otherwise would have considered.*

Most of the "Findings" Related in This Report Are Professional Opinions

Before construction begins, geotechnical engineers explore a site's subsurface using various sampling and testing procedures. *Geotechnical engineers can observe actual subsurface conditions only at those specific locations where sampling and testing is performed.* The data derived from that sampling and testing were reviewed by your geotechnical engineer, who then applied professional judgement to form opinions about subsurface conditions throughout the site. Actual sitewide-subsurface conditions may differ – maybe significantly – from those indicated in this report. Confront that risk by retaining your geotechnical engineer to serve on the design team through project completion to obtain informed guidance quickly, whenever needed.

This Report's Recommendations Are Confirmation-Dependent

The recommendations included in this report – including any options or alternatives – are confirmation-dependent. In other words, they are <u>not</u> final, because the geotechnical engineer who developed them relied heavily on judgement and opinion to do so. Your geotechnical engineer can finalize the recommendations *only after observing actual subsurface conditions* exposed during construction. If through observation your geotechnical engineer confirms that the conditions assumed to exist actually do exist, the recommendations can be relied upon, assuming no other changes have occurred. *The geotechnical engineer who prepared this report cannot assume responsibility or liability for confirmation-dependent recommendations if you fail to retain that engineer to perform construction observation.*

This Report Could Be Misinterpreted

Other design professionals' misinterpretation of geotechnical-engineering reports has resulted in costly problems. Confront that risk by having your geotechnical engineer serve as a continuing member of the design team, to:

- confer with other design-team members;
- help develop specifications;
- review pertinent elements of other design professionals' plans and specifications; and
- be available whenever geotechnical-engineering guidance is needed.

You should also confront the risk of constructors misinterpreting this report. Do so by retaining your geotechnical engineer to participate in prebid and preconstruction conferences and to perform construction-phase observations.

Give Constructors a Complete Report and Guidance

Some owners and design professionals mistakenly believe they can shift unanticipated-subsurface-conditions liability to constructors by limiting the information they provide for bid preparation. To help prevent the costly, contentious problems this practice has caused, include the complete geotechnical-engineering report, along with any attachments or appendices, with your contract documents, *but be certain to note conspicuously that you've included the material for information purposes only.* To avoid misunderstanding, you may also want to note that "informational purposes" means constructors have no right to rely on the interpretations, opinions, conclusions, or recommendations in the report. Be certain that constructors know they may learn about specific project requirements, including options selected from the report, *only* from the design drawings and specifications. Remind constructors that they may perform their own studies if they want to, and *be sure to allow enough time* to permit them to do so. Only then might you be in a position to give constructors the information available to you, while requiring them to at least share some of the financial responsibilities stemming from unanticipated conditions. Conducting prebid and preconstruction conferences can also be valuable in this respect.

Read Responsibility Provisions Closely

Some client representatives, design professionals, and constructors do not realize that geotechnical engineering is far less exact than other engineering disciplines. This happens in part because soil and rock on project sites are typically heterogeneous and not manufactured materials with well-defined engineering properties like steel and concrete. That lack of understanding has nurtured unrealistic expectations that have resulted in disappointments, delays, cost overruns, claims, and disputes. To confront that risk, geotechnical engineers commonly include explanatory provisions in their reports. Sometimes labeled "limitations," many of these provisions indicate where geotechnical engineers' responsibilities begin and end, to help others recognize their own responsibilities and risks. *Read these provisions closely.* Ask questions. Your geotechnical engineer should respond fully and frankly.

Geoenvironmental Concerns Are <u>Not</u> Covered

The personnel, equipment, and techniques used to perform an environmental study – e.g., a "phase-one" or "phase-two" environmental site assessment – differ significantly from those used to perform a geotechnical-engineering study. For that reason, a geotechnical-engineering report does not usually provide environmental findings, conclusions, or recommendations; e.g., about the likelihood of encountering underground storage tanks or regulated contaminants. *Unanticipated subsurface environmental problems have led to project failures.* If you have not obtained your own environmental information about the project site, ask your geotechnical consultant for a recommendation on how to find environmental risk-management guidance.

Obtain Professional Assistance to Deal with Moisture Infiltration and Mold

While your geotechnical engineer may have addressed groundwater, water infiltration, or similar issues in this report, the engineer's services were not designed, conducted, or intended to prevent migration of moisture – including water vapor – from the soil through building slabs and walls and into the building interior, where it can cause mold growth and material-performance deficiencies. Accordingly, ***proper implementation of the geotechnical engineer's recommendations will <u>not</u> of itself be sufficient to prevent moisture infiltration. Confront the risk of moisture infiltration*** by including building-envelope or mold specialists on the design team. ***Geotechnical engineers are <u>not</u> building-envelope or mold specialists.***

GEOPROFESSIONAL
BUSINESS
ASSOCIATION

Telephone: 301/565-2733
e-mail: info@geoprofessional.org www.geoprofessional.org

APPENDIX A

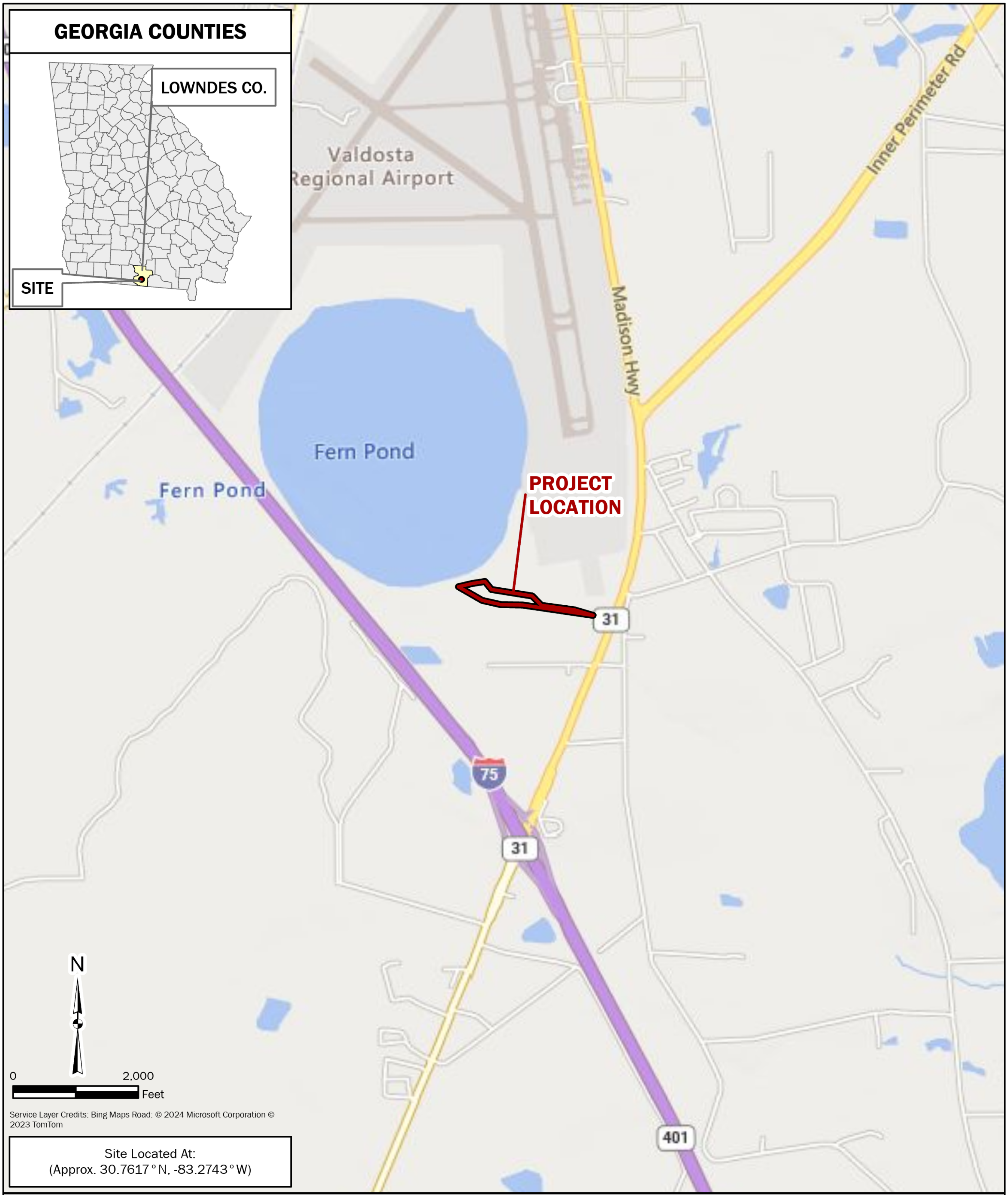
Site Location Map

Boring Location Plans

Legend Sheets – Soil

Boring Logs

Laboratory Test Data



Service Layer Credits: Bing Maps Road: © 2024 Microsoft Corporation © 2023 TomTom

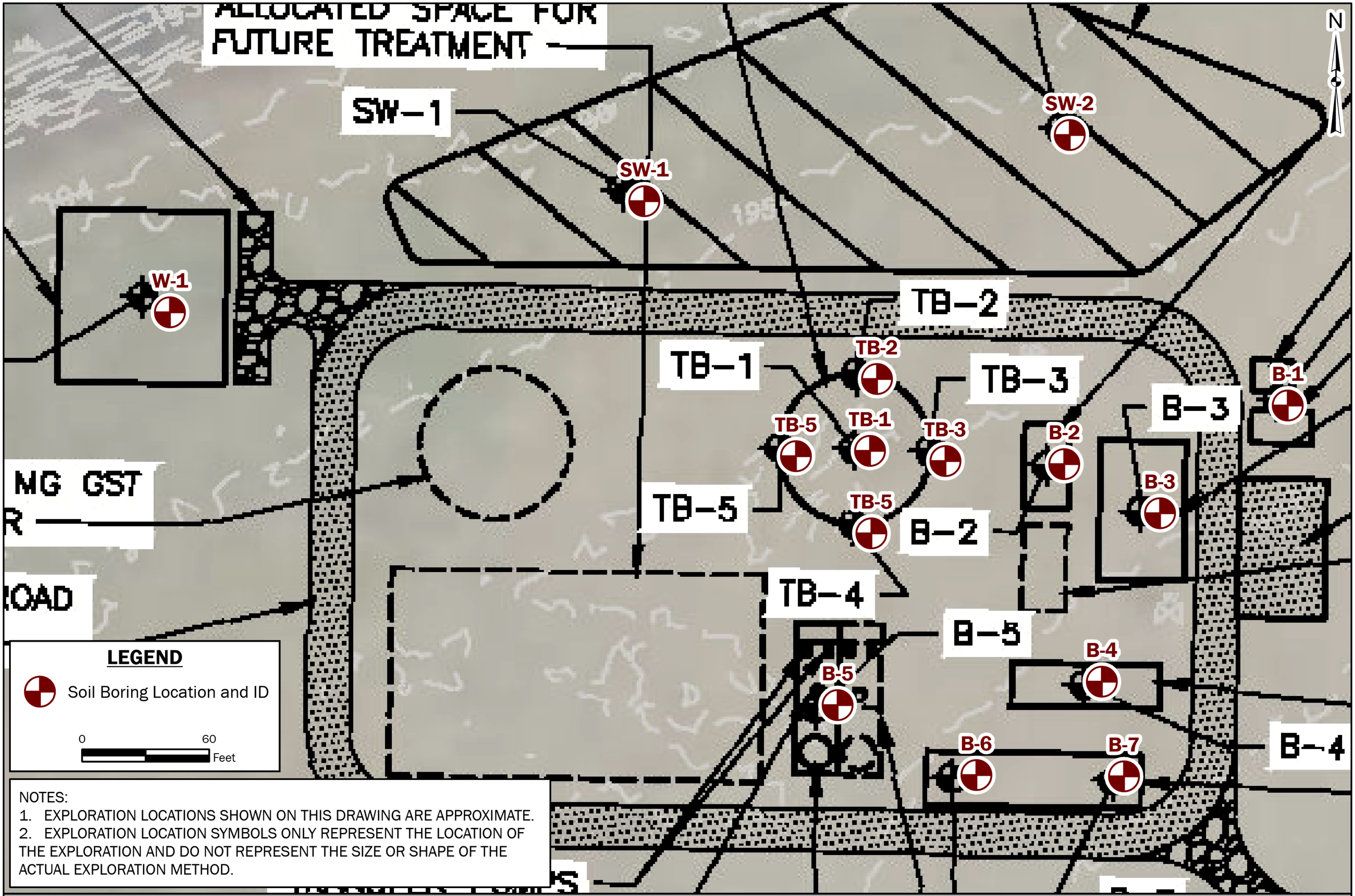
Site Located At:
(Approx. 30.7617° N, -83.2743° W)

TTL

SITE LOCATION MAP

CDM SMITH
VALDOSTA WATER TREATMENT PLANT
VALDOSTA, LOWNDES COUNTY, GEORGIA
BASEMAP: Microsoft Bing Street Map (See Service Layer Credits).

DRAWN BY: JDM
CHECKED BY: CH
DRAWING DATE: 1/15/2024
REVISION DATE: N/A
TTL JOB NO.: 23-07-02183.00
APPROX. SCALE: 1 in = 2,000 ft



LEGEND

● Soil Boring Location and ID

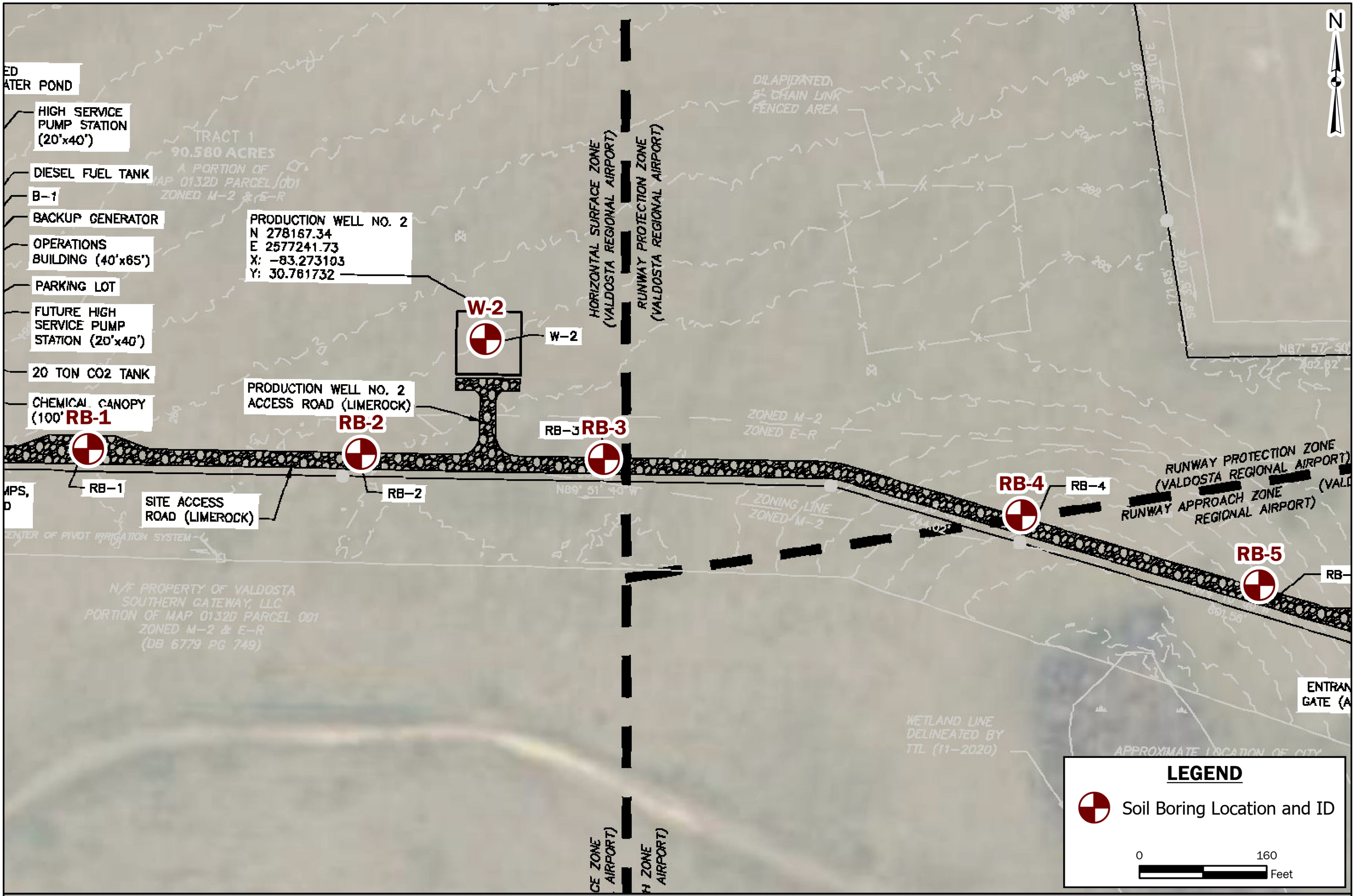
0 60 Feet

NOTES:
1. EXPLORATION LOCATIONS SHOWN ON THIS DRAWING ARE APPROXIMATE.
2. EXPLORATION LOCATION SYMBOLS ONLY REPRESENT THE LOCATION OF THE EXPLORATION AND DO NOT REPRESENT THE SIZE OR SHAPE OF THE ACTUAL EXPLORATION METHOD.

BORING LOCATION PLAN (WEST)

CDM SMITH
VALDOSTA WATER TREATMENT PLANT
VALDOSTA, LOWNDES COUNTY, GEORGIA
BASEMAP: Maxar Technologies, Vivid Imagery, 3/18/2022 (0.5 m Resolution).

DRAWN BY: JDM
CHECKED BY: CH
DRAWING DATE: 1/15/2024
REVISION DATE: N/A
TTL JOB NO.: 23-07-02183.00
APPROX. SCALE: 1 in = 60 ft



TTL

BORING LOCATION PLAN (EAST)

CDM SMITH
VALDOSTA WATER TREATMENT PLANT
VALDOSTA, LOWNDES COUNTY, GEORGIA
BASEMAP: Maxar Technologies, Vivid Imagery, 3/18/2022 (0.5 m Resolution).

DRAWN BY: JDM
CHECKED BY: CH
DRAWING DATE: 1/15/2024
REVISION DATE: N/A
TTL JOB NO.: 23-07-02183.00
APPROX. SCALE: 1 in = 200 ft

SOIL LEGEND

FINE- AND COARSE-GRAINED SOIL INFORMATION

FINE-GRAINED SOILS (SILTS AND CLAYS)

SPT N-Value	Consistency	Estimated Q_u (TSF)
0 - 1	Very Soft	0 - 0.25
2 - 4	Soft	0.25 - 0.5
5 - 8	Firm	0.5 - 1.0
9 - 15	Stiff	1.0 - 2.0
16 - 30	Very Stiff	2.0 - 4.0
31+	Hard	4.0+

Q_u = Unconfined Compression Strength

COARSE-GRAINED SOILS (SANDS AND GRAVELS)

SPT N-Value	Relative Density
0 - 4	Very Loose
5 - 10	Loose
11 - 30	Medium Dense
31 - 50	Dense
51+	Very Dense

PARTICLE SIZE

Name	Size (US Std. Sieve)
Boulders	>300 mm (>12 in.)
Cobbles	75 mm to 300 mm (3 - 12 in.)
Coarse Gravel	19 mm to 75 mm (3/4 - 3 in.)
Fine Gravel	4.75 mm to 19 mm (#4 - 3/4 in.)
Coarse Sand	2 mm to 4.75 mm (#10 - #4)
Medium Sand	0.425 mm to 2 mm (#40 - #10)
Fine Sand	0.075 mm to 0.425 mm (#200 - #40)
Silts and Clays	< 0.075 mm (< #200)

RELATIVE PROPORTIONS OF SAND AND GRAVEL

Descriptive Terms	Percent of Dry Weight
"Trace"	< 15
"With"	15 - 30
Modifier	> 30

RELATIVE PROPORTIONS OF CLAYS AND SILTS

Descriptive Terms	Percent of Dry Weight
"Trace"	< 5
"With"	5 - 12
Modifier	> 12

CRITERIA FOR DESCRIBING MOISTURE CONDITION

Description	Criteria
Dry	Absence of moisture, dusty, dry to the touch
Moist	Damp, but no visible water
Wet	Visible free water, usually soil is below water table

CRITERIA FOR DESCRIBING CEMENTATION

Description	Criteria
Weak	Crumbles or breaks with handling or little finger pressure
Moderate	Crumbles or breaks with considerable finger pressure
Strong	Will not crumble or break with finger pressure

CRITERIA FOR DESCRIBING STRUCTURE

Description	Criteria
Stratified	Alternating layers of varying material or color with layers at least 6 mm thick; note the thickness
Laminated	Alternating layers of varying material or color with the layers less than 6 mm thick; note thickness
Fissured	Breaks along definite planes of fracture with little resistance to fracturing
Slickensided	Fracture planes appear polished or glossy, sometimes striated
Blocky	Cohesive soil that can be broken down into small angular lumps which resist further breakdown
Lensed	Inclusion of small pockets of different soils such as small lenses of sand scattered through a mass of clay; note thickness
Homogeneous	Same color and appearance throughout

ABBREVIATIONS AND ACRONYMS

WOH	Weight of Hammer	N-Value	Sum of the blows for last two 6-in increments of SPT
WOR	Weight of Rod		
Ref.	Refusal	NA	Not Applicable or Not Available
ATD	At Time of Drilling	OD	Outside Diameter
DCP	Dynamic Cone Penetrometer	PPV	Pocket Penetrometer Value
Elev.	Elevation	SFA	Solid Flight Auger
ft.	feet	SH	Shelby Tube Sampler
HSA	Hollow Stem Auger	SS	Split-Spoon Sampler
ID	Inside Diameter	SPT	Standard Penetration Test
in.	inches	USCS	Unified Soil Classification System
lbs	pounds		

SAMPLERS AND DRILLING METHODS

▌	AUGER CUTTINGS
◇	BAG/BULK SAMPLE
✋	GRAB SAMPLE
▤	CONTINUOUS SAMPLES
■	SHELBY TUBE SAMPLE
⧗	PITCHER SAMPLE
☒	STANDARD PENETRATION SPLIT-SPOON SAMPLE
○	SPLIT-SPOON SAMPLE WITH NO RECOVERY
▼	DYNAMIC CONE PENETROMETER
▐	ROCK CORE

WATER LEVEL SYMBOLS

▽	WATER LEVEL AT TIME OF DRILLING
≡	PERCHED WATER OBSERVED AT DRILLING
▼	DELAYED WATER LEVEL OBSERVATION
▨	CAVE-IN DEPTH
≈	OBSERVED SEEPAGE

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

COARSE GRAINED SOILS (>50% of the material is larger than the #200 sieve)	GRAVELS (>50% of coarse fraction is larger than the #4 sieve)	CLEAN GRAVEL WITH <5% FINES	Cu > 4 Cc = 1-3	▨	GW	Well-graded gravels, gravel-sand mixtures with trace or no fines
			Cu ≤ 4 and/or Cc < 1 Cc > 3	▨	GP	Poorly-graded gravels, gravel-sand mixtures with trace or no fines
		GRAVEL WITH 5% TO 12% FINES	Cu > 4 Cc = 1-3	▨	GW-GM	Well-graded gravels, gravel-sand mixtures with silt fines
				▨	GW-GC	Well-graded gravels, gravel-sand mixtures with clay fines
			Cu ≤ 4 and/or Cc < 1 Cc > 3	▨	GP-GM	Poorly-graded gravels, gravel-sand mixtures with silt fines
				▨	GP-GC	Poorly-graded gravels, gravel-sand mixtures with clay fines
		GRAVEL WITH MORE THAN 12% FINES		▨	GM	Silty gravels, gravel-silt-sand mixtures
				▨	GC	Clayey gravels, gravel-sand-clay mixtures
				▨	GC-GM	Clayey gravels, gravel-sand-clay-silt mixtures
	SANDS (>50% of coarse fraction is smaller than the #4 sieve)	CLEAN SAND WITH <5% FINES	Cu > 6 Cc = 1-3	▨	SW	Well-graded sands, sand-gravel mixtures with trace or no fines
			Cu ≤ 6 and/or Cc < 1 Cc > 3	▨	SP	Poorly-graded sands, sand-gravel mixtures with trace or no fines
		SAND WITH 5% TO 12% FINES	Cu > 6 Cc = 1-3	▨	SW-SM	Well-graded sands, sand-gravel mixtures with silt fines
				▨	SW-SC	Well-graded sands, sand-gravel mixtures with clay fines
			Cu ≤ 6 and/or Cc < 1 Cc > 3	▨	SP-SM	Poorly-graded sands, sand-gravel mixtures with silt fines
				▨	SP-SC	Poorly-graded sands, sand-gravel mixtures with clay fines
		SAND WITH MORE THAN 12% FINES		▨	SM	Silty sands, sand-gravel-silt mixtures
				▨	SC	Clayey sands, sand-gravel-clay mixtures
				▨	SC-SM	Clayey sands, sand-gravel-clay-silt mixtures
FINE GRAINED SOILS (>50% of material is smaller than the #200 sieve)		SILTS & CLAYS (Liquid Limit less than 50)		▨	ML	Inorganic silts with low plasticity
				▨	CL	Inorganic clays of low plasticity, gravelly or sandy clays, silty clays, lean clays
				▨	CL-ML	Inorganic clay-silts of low plasticity, gravelly clays, sandy clays, silty clays, lean clays
				▨	OL	Organic silts and organic silty clays of low plasticity
		SILTS & CLAYS (Liquid Limit more than 50)		▨	MH	Inorganic silts of high plasticity, elastic silts
				▨	CH	Inorganic clays of high plasticity, fat clays
				▨	OH	Organic clays and organic silts of high plasticity

USCS - HIGHLY ORGANIC SOILS

Primarily organic matter, dark in color, organic odor

▨	PT	Peat, humus, swamp soils with high organic contents

OTHER MATERIALS

■	BITUMINOUS CONCRETE (ASPHALT)
▨	CONCRETE
▨	CRUSHED STONE/AGGREGATE BASE
▨	TOPSOIL
▨	FILL
▨	UNDIFFERENTIATED ALLUVIUM
▨	UNDIFFERENTIATED OVERBURDEN
▨	BOULDERS AND COBBLES

UNIFORMITY COEFFICIENT

$$C_u = D_{60}/D_{10}$$

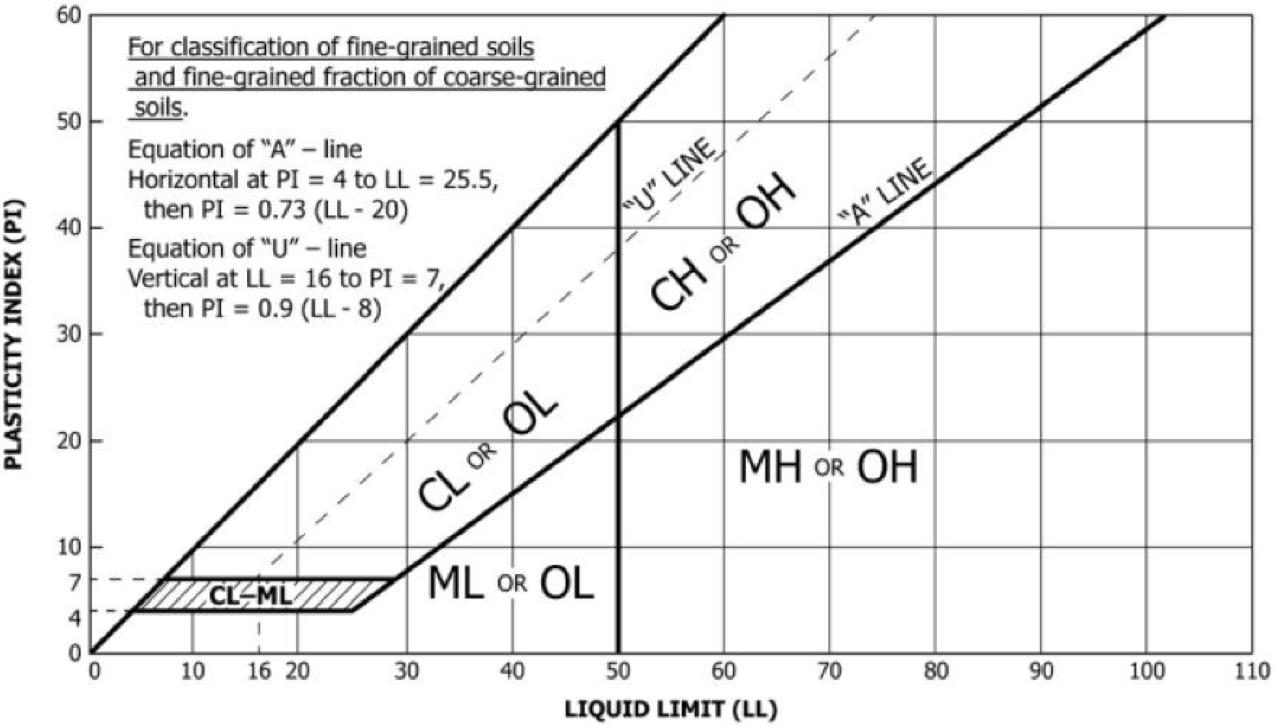
COEFFICIENT OF CURVATURE

$$C_C = (D_{30})^2/(D_{60}xD_{10})$$

Where:

D_{60} = grain diameter at 60% passing
D_{30} = grain diameter at 30% passing
D_{10} = grain diameter at 10% passing

PLASTICITY CHART FOR USCS CLASSIFICATION OF FINE-GRAINED SOILS


For classification of fine-grained soils and fine-grained fraction of coarse-grained soils.

Equation of "A" – line
Horizontal at PI = 4 to LL = 25.5,
then PI = 0.73 (LL - 20)

Equation of "U" – line
Vertical at LL = 16 to PI = 7,
then PI = 0.9 (LL - 8)

IMPORTANT NOTES ON TEST BORING RECORDS

1) The report and graphics key are an integral part of these logs. All data and interpretations in this log are subject to the explanations and limitations stated in the report.

2) Lines separating strata on the logs represent approximate boundaries only. Actual transitions may be gradual or differ from those shown. Solid lines are used to indicate a change in the material type, particularly a change in the USCS classification. Dashed lines are used to separate two materials that have the same material type, but that differ with respect to two or more other characteristics (e.g. color, consistency).

3) No warranty is provided as to the continuity of soil or rock conditions between individual sample locations.

4) Logs represent general soil and rock conditions observed at the point of exploration on the date indicated.

5) In general, Unified Soil Classification System (USCS) designations presented on the logs were based on visual classification in the field and were modified where appropriate based on gradation and index property testing.

6) Fine-grained soils that plot within the hatched area on the Plasticity Chart, and coarse-grained soils with between 5% and 12% passing the #200 sieve require dual USCS symbols as presented on the previous page.

7) If the sampler is not able to be driven at least 6 inches, then 50/X" indicates that the sampler advanced X inches when struck 50 times with a 140-pound hammer falling 30 inches.

8) If the sampler is driven at least 6 inches, but cannot be driven either of the subsequent two 6-inch increments, then either 50/X" or the sum of the second 6-inch increment plus 50/X" for the third 6-inch increment will be indicated.
Example 1: Recorded SPT blow counts are 16 - 50/4", the SPT N-value will be shown as N = 50/4"
Example 2: Recorded SPT blow counts are 18 - 25 - 50/2", the SPT N-value will be shown as N = 75/8"

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Valdosta, Lowndes County, Georgia

Log of B-1

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/15/2023*
Logged by:	*P. Kelly*	Boring Depth:	*20 feet*
Equipment:	*CME 45*	Boring Elevation:	*197 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	∇ Water Level at Time of Drilling:	*13.5 ft BGS*
		Cave-In at Time of Drilling:	*N/A*

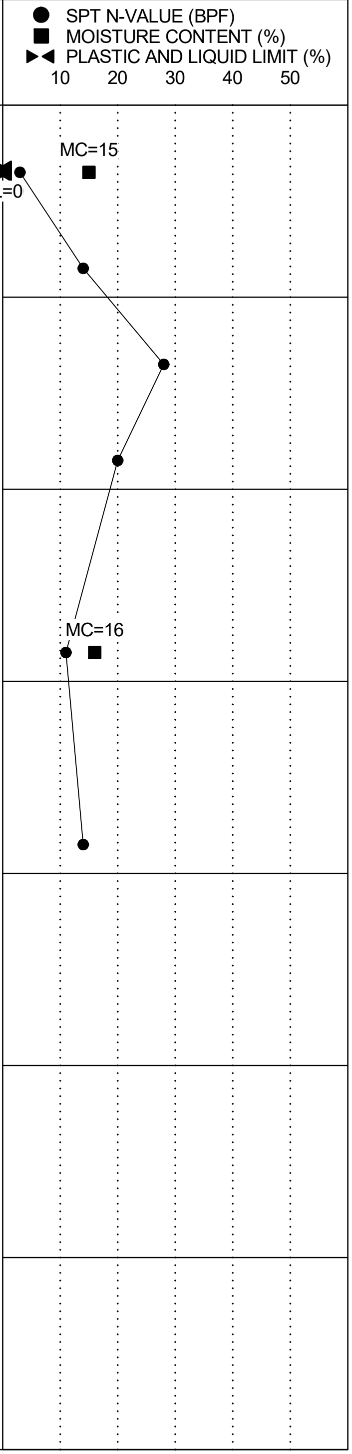
Remarks:
The boring was backfilled with drill cuttings following an observation period for delayed groundwater measurement. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *Not Encount.*

Delayed Water Observation Date: *12/15/2023*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	% PASSING #200 SIEVE	TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE
197	0	\ TOPSOIL (2 Inches) /			
		COASTAL PLAIN: SILTY SAND, very loose, medium to fine grained, brown, moist (SM)	27.6	☒	3 - 2 - 1 N = 3
	3	CLAYEY SAND, medium dense, medium to fine grained, brown, moist (SC)		☒	3 - 5 - 9 N = 14
		- becomes white and red below 6 feet		☒	6 - 13 - 15 N = 28
	8	SANDY FAT CLAY, very stiff to stiff, light pink and orange, moist (CH)		☒	7 - 8 - 12 N = 20
		- becomes gray and white below 13.5 feet	∇	☒	9 - 5 - 6 N = 11
				☒	10 - 6 - 8 N = 14
177	20	Boring terminated at 20 feet.			



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Log of B-2

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/15/2023*
Logged by:	*P. Kelly*	Boring Depth:	*30 feet*
Equipment:	*CME 45*	Boring Elevation:	*197 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	∇ Water Level at Time of Drilling:	*13.5 ft BGS*
		Cave-In at Time of Drilling:	*23 ft BGS*

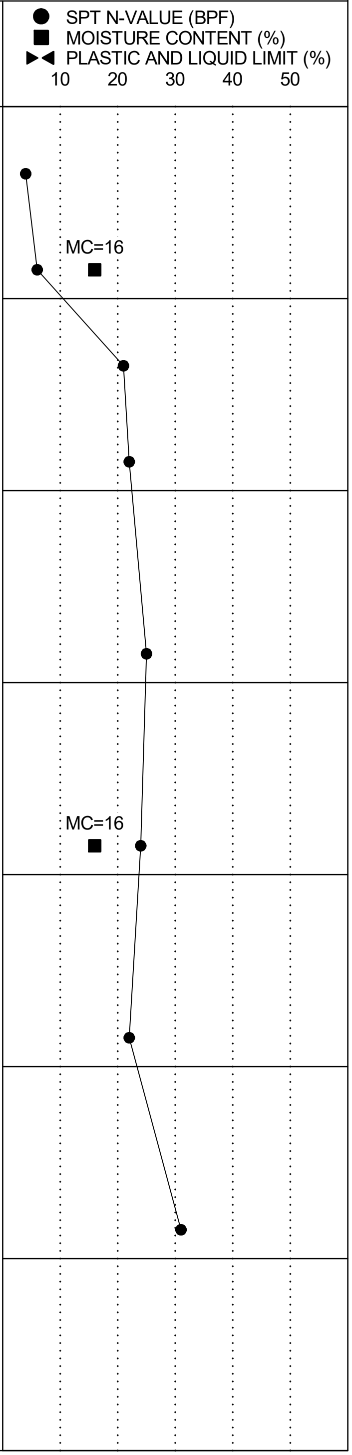
Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *Not Encount.*

Delayed Water Observation Date: *12/15/2023*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	SPT/CORE DATA 1st 6" - 2nd 6" - 3rd 6" / N-VALUE	MOISTURE CONTENT (%)
197	0	TOPSOIL (2 Inches)		
		COASTAL PLAIN: SILTY SAND, very loose, coarse to fine grained, gray and orange, wet (SM)	2 - 2 - 2 N = 4	
		SANDY LEAN CLAY, firm, brownish-red and gray, moist (CL)	3 - 3 - 3 N = 6	MC=16
		CLAYEY SAND, medium dense, coarse to fine grained, gray and white, moist (SC)	4 - 8 - 13 N = 21	
		- becomes orangish-red and gray below 8.5 feet	5 - 10 - 12 N = 22	
		FAT CLAY, very stiff, reddish-brown and white, moist (CH)	4 - 11 - 14 N = 25	
		SILTY SAND, medium dense, coarse to fine grained, brownish-red and white, moist (SM)	4 - 9 - 15 N = 24	MC=16
		SANDY FAT CLAY, very stiff to hard, grayish-orange and red, wet (CH)	8 - 11 - 11 N = 22	
			8 - 14 - 17 N = 31	
167	30	Boring terminated at 30 feet.		



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Log of B-3

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/15/2023*
Logged by:	*P. Kelly*	Boring Depth:	*30 feet*
Equipment:	*CME 45*	Boring Elevation:	*197 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	▽ Water Level at Time of Drilling:	*18.5 ft BGS*
		Cave-In at Time of Drilling:	*21.5 ft BGS*

Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

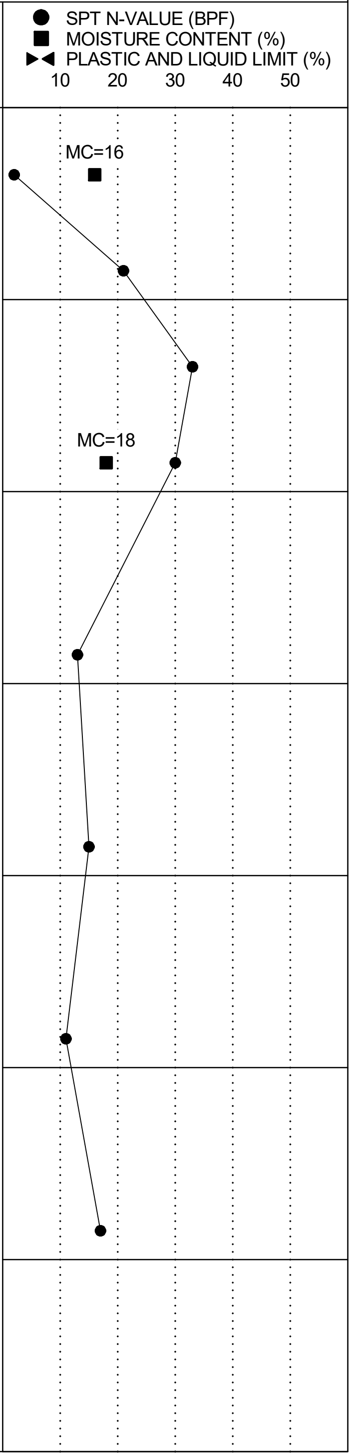
▼ Delayed Water Level: *Not Encount.*

Delayed Water Observation Date: *12/15/2023*

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION
195		TOPSOIL (2 Inches) **COASTAL PLAIN:** SILTY SAND, very loose, coarse to fine grained, brown, moist (SM)
	5	CLAYEY SAND, medium dense, medium to fine grained, reddish-orange and gray, moist (SC)
190	10	FAT CLAY, hard to very stiff, purple and white, moist (CH)
185	15	LEAN CLAY, stiff, brown and white, moist (CL)
180	20	CLAYEY SAND, medium dense, medium to fine grained, reddish-orange and white, moist (SC)
175	25	SANDY FAT CLAY, stiff, light orange and red, wet (CH)
170		FAT CLAY, very stiff, orangish-red and gray, moist (CH)
165	30	Boring terminated at 30 feet.

SAMPLE DATA

SPT/CORE DATA (1st 6" - 2nd 6" - 3rd 6", N-VALUE)
1 - 1 - 1 N = 2
4 - 8 - 13 N = 21
8 - 14 - 19 N = 33
10 - 13 - 17 N = 30
5 - 6 - 7 N = 13
4 - 7 - 8 N = 15
3 - 5 - 6 N = 11
5 - 6 - 11 N = 17



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Log of B-4

Page 1 of 1

Drilling Co.: *TTL, Inc.*

Driller: *P. Gay*

Logged by: *P. Kelly*

Equipment: *CME 45*

Hammer Type: *Automatic*

Drilling Method: *Hollow Stem Auger w/SPT Sampling*

TTL Project No.: *23-07-02183.00*

Date Drilled: *12/14/2023*

Boring Depth: *30 feet*

Boring Elevation: *197 feet*

Coordinates: *N: n/a E: n/a*

▽ Water Level at Time of Drilling: *3.5 ft BGS*

Cave-In at Time of Drilling: *16 ft BGS*

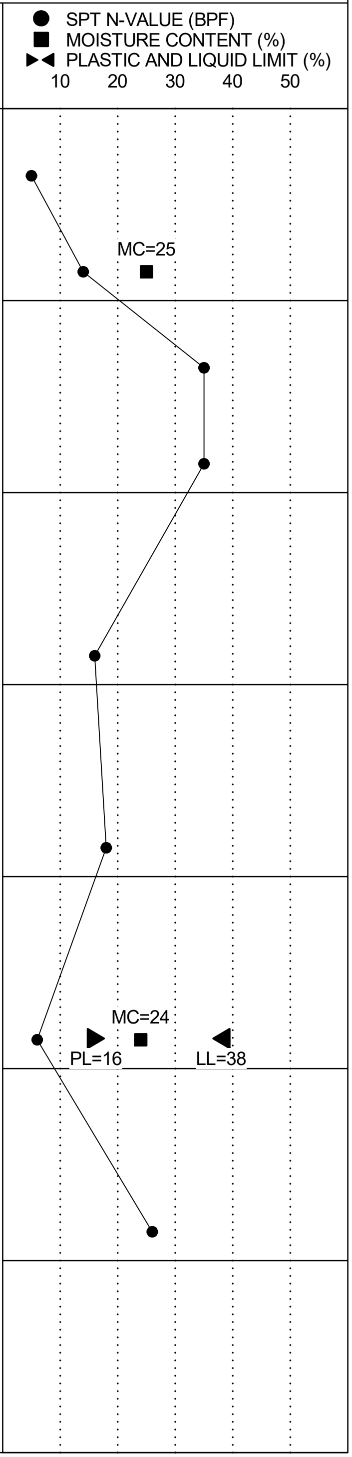
Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *6 ft BGS*

Delayed Water Observation Date: *12/14/2023*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE
		\ TOPSOIL (2 Inches) /			
		COASTAL PLAIN: SILTY SAND, loose, coarse to fine grained, tan and gray, moist (SM)			
195					2 - 2 - 3 N = 5
		CLAYEY SAND, medium dense to dense, medium to fine grained, reddish-gray and brown, moist (SC)		▽	
					1 - 6 - 8 N = 14
	5				
				▼	
190					6 - 14 - 21 N = 35
		LEAN CLAY, hard to very stiff, reddish-gray and brown, moist (CL)			
					8 - 13 - 22 N = 35
	10				
185					
		- becomes red and brown below 13.5 feet			2 - 7 - 9 N = 16
	15				
				▨	
180					
		SANDY LEAN CLAY, very stiff, reddish-orange and white, moist (CL)			3 - 6 - 12 N = 18
	20				
175					
		CLAYEY SAND, loose, medium to fine grained, brownish-red and gray, wet (SC)			
			39.5		3 - 3 - 3 N = 6
	25				
170					
		SANDY FAT CLAY, very stiff, light orange and tan, moist (CH)			
					9 - 10 - 16 N = 26
	30	Boring terminated at 30 feet.			
165					



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Log of B-5

Page 1 of 1

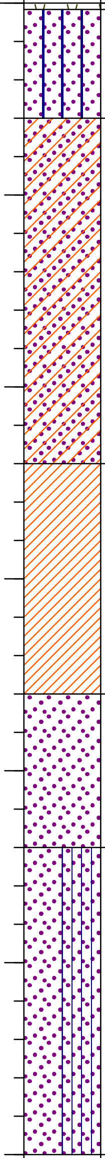
Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/14/2023*
Logged by:	*P. Kelly*	Boring Depth:	*30 feet*
Equipment:	*CME 45*	Boring Elevation:	*197 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	▽ Water Level at Time of Drilling:	*18.5 ft BGS*
		Cave-In at Time of Drilling:	*19 ft BGS*

Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *3 ft BGS*

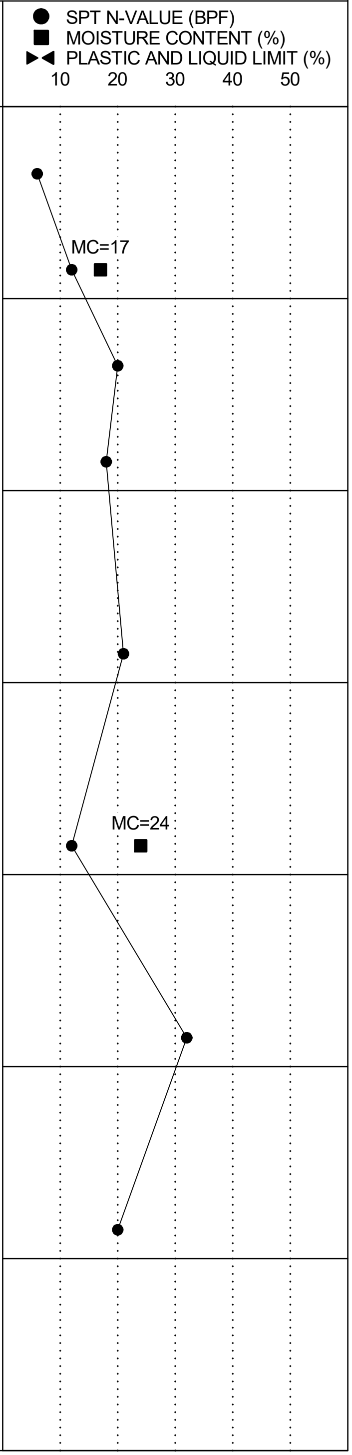
Delayed Water Observation Date: *12/14/2023*

SAMPLE DATA



MATERIALS DESCRIPTION	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	MOISTURE CONTENT (%)
TOPSOIL (2 Inches)		
COASTAL PLAIN: SILTY SAND, loose, coarse to fine grained, tan and gray, moist (SM)	1 - 3 - 3 N = 6	
CLAYEY SAND, medium dense, medium to fine grained, grayish-orange and brown, moist (SC)	3 - 5 - 7 N = 12	MC=17
- becomes light gray and brown below 6 feet	4 - 9 - 11 N = 20	
- becomes gray and red below 8.5 feet	5 - 9 - 9 N = 18	
SANDY LEAN CLAY, very stiff, grayish-brown and red, moist (CL)	4 - 10 - 11 N = 21	
POORLY GRADED SAND, medium dense, coarse to fine grained, orange and gray, wet (SP)	3 - 6 - 6 N = 12	MC=24
POORLY GRADED SAND with SILT, dense to medium dense, medium to fine grained, orange and gray, wet (SP-SM)	10 - 15 - 17 N = 32	
	3 - 5 - 15 N = 20	

Boring terminated at 30 feet.



ELEVATION (ft): 195, 190, 185, 180, 175, 170, 165

DEPTH (ft): 5, 10, 15, 20, 25, 30

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Valdosta Water Treatment Plant

Valdosta, Lowndes County, Georgia

Log of B-6

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/14/2023*
Logged by:	*P. Kelly*	Boring Depth:	*30 feet*
Equipment:	*CME 45*	Boring Elevation:	*197 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	⊽ Water Level at Time of Drilling:	*18.5 ft BGS*
		Cave-In at Time of Drilling:	*21.5 ft BGS*

Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *9 ft BGS*

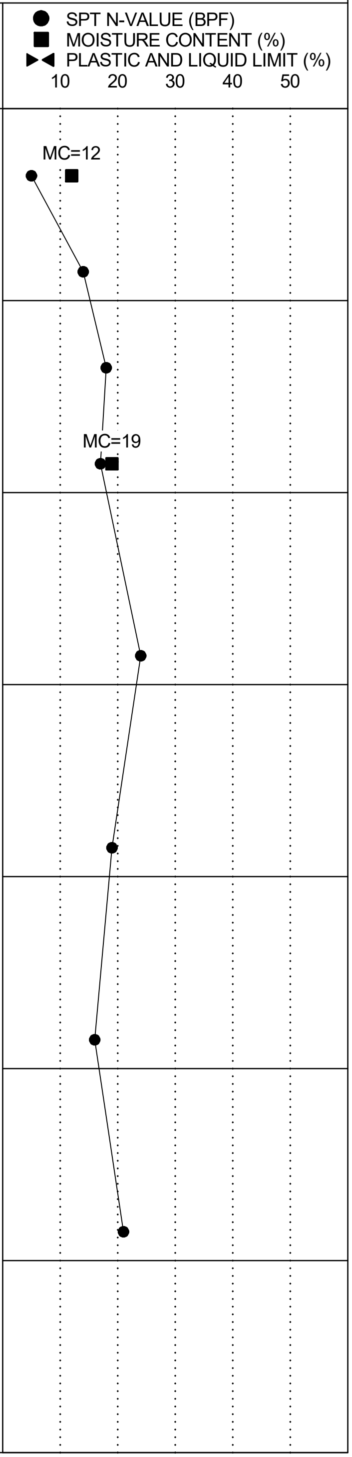
Delayed Water Observation Date: *12/14/2023*

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION
		TOPSOIL (2 Inches)
195		**COASTAL PLAIN:** SILTY SAND, loose, coarse to fine grained, tan and gray, moist (SM)
		CLAYEY SAND, medium dense, medium to fine grained, reddish-orange and gray, moist (SC)
	5	
190		- becomes grayish-purple and brown below 6 feet
	10	
185		- becomes gray and white below 13.5 feet
	15	
180		
	20	
175		SANDY FAT CLAY, very stiff, light brown and yellow, moist (CH)
	25	
170		
	30	Boring terminated at 30 feet.
165		

SAMPLE DATA

SPT/CORE DATA (1st 6" - 2nd 6" - 3rd 6")	N-VALUE
2 - 3 - 2	N = 5
4 - 6 - 8	N = 14
3 - 7 - 11	N = 18
4 - 7 - 10	N = 17
7 - 11 - 13	N = 24
5 - 9 - 10	N = 19
3 - 6 - 10	N = 16
4 - 8 - 13	N = 21

● SPT N-VALUE (BPF)
■ MOISTURE CONTENT (%)
▶◀ PLASTIC AND LIQUID LIMIT (%)



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Log of B-7

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/14/2023*
Logged by:	*P. Kelly*	Boring Depth:	*30 feet*
Equipment:	*CME 45*	Boring Elevation:	*197 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	▽ Water Level at Time of Drilling:	*9 ft BGS*
		Cave-In at Time of Drilling:	*10 ft BGS*

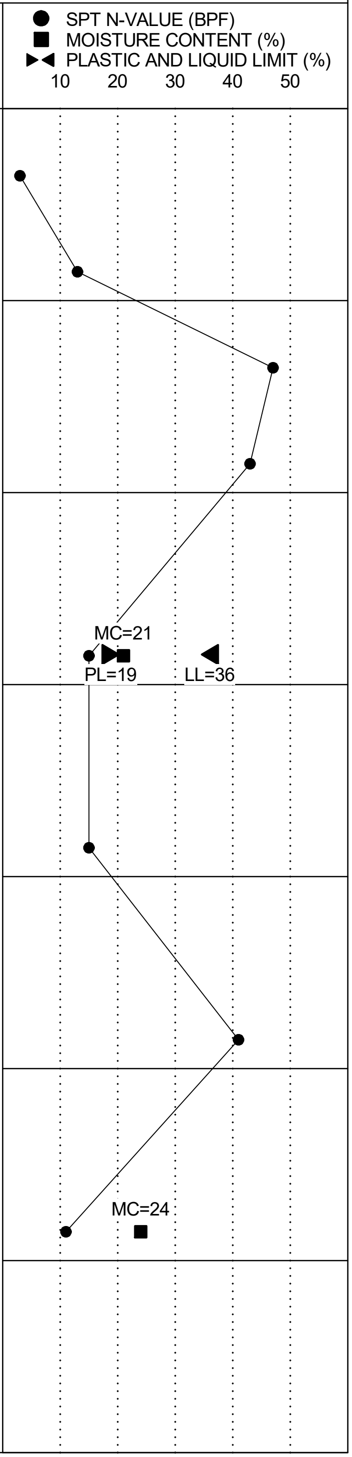
Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *5 ft BGS*

Delayed Water Observation Date: *12/14/2023*

SAMPLE DATA

MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE
TOPSOIL (2 Inches)				
COASTAL PLAIN: SILTY SAND, loose, coarse to fine grained, tan and gray, moist (SM)			☒	2 - 2 - 1 N = 3
CLAYEY SAND, medium dense, medium to fine grained, reddish-orange and gray, moist (SC)			☒	3 - 5 - 8 N = 13
CLAYEY SAND, dense, medium to fine grained, reddish-brown and white, moist (SC)		▼	☒	10 - 18 - 29 N = 47
		▽	☒	11 - 16 - 27 N = 43
SANDY LEAN CLAY, very stiff, grayish-red and orange, moist (CL)	61.4		☒	5 - 7 - 8 N = 15
- becomes light brown and red below 18.5 feet			☒	4 - 5 - 10 N = 15
SANDY LEAN CLAY, hard, brownish-red and white, moist (CL)			☒	7 - 15 - 26 N = 41
POORLY GRADED SAND, medium dense, coarse to fine grained, brownish-red, wet (SP)			☒	5 - 5 - 6 N = 11
Boring terminated at 30 feet.				



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Valdosta, Lowndes County, Georgia

Log of
RB-1

Page 1 of 1

Drilling Co.: *TTL, Inc.*

Driller: *P. Gay*

Logged by: *P. Kelly*

Equipment: *CME 45*

Hammer Type: *Automatic*

Drilling Method: *Hollow Stem Auger w/SPT Sampling*

TTL Project No.: *23-07-02183.00*

Date Drilled: *12/15/2023*

Boring Depth: *7.5 feet*

Boring Elevation: *200 feet*

Coordinates: *N: n/a E: n/a*

▽ Water Level at Time of Drilling: *Not Encount.*

Cave-In at Time of Drilling: *N/A*

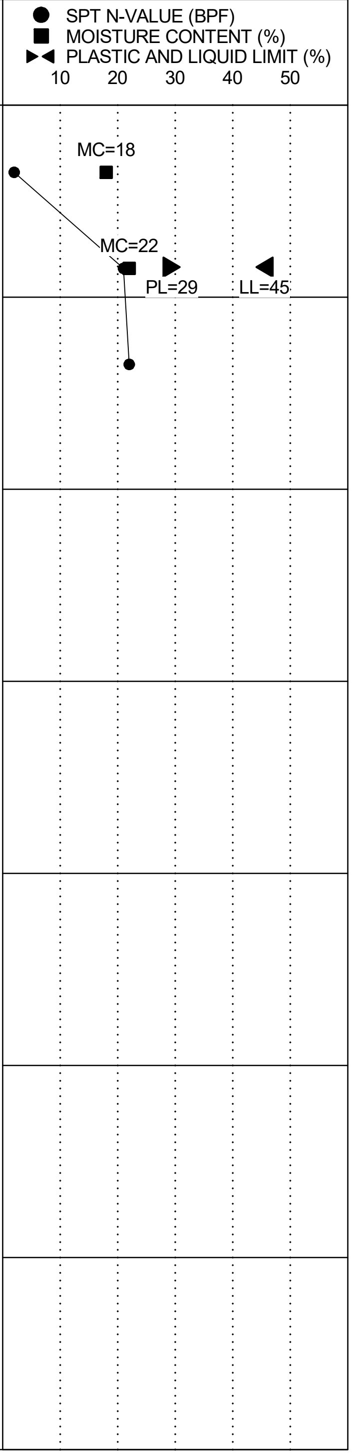
Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *Not Encount.*

Delayed Water Observation Date: *12/15/2023*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	**MATERIALS DESCRIPTION**	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" - 2nd 6" - 3rd 6" N-VALUE	RQD % REC
200			TOPSOIL (2 Inches)					
			COASTAL PLAIN: SANDY SILT soft, fine grained, brown, moist (ML)			☒	2 - 1 - 1 N = 2	
			SANDY SILT, very stiff, medium to fine grained, reddish-orange and gray, moist (ML)	65.0		☒	4 - 7 - 14 N = 21	
195	5		- becomes dry below 6 feet			☒	2 - 6 - 16 N = 22	
			Boring terminated at 7.5 feet.					
190	10							
185	15							
180	20							
175	25							
170	30							



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Valdosta, Lowndes County, Georgia

Log of RB-2

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/15/2023*
Logged by:	*P. Kelly*	Boring Depth:	*7.5 feet*
Equipment:	*CME 45*	Boring Elevation:	*202 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	▽ Water Level at Time of Drilling: Cave-In at Time of Drilling:	*Not Encount.* *N/A*

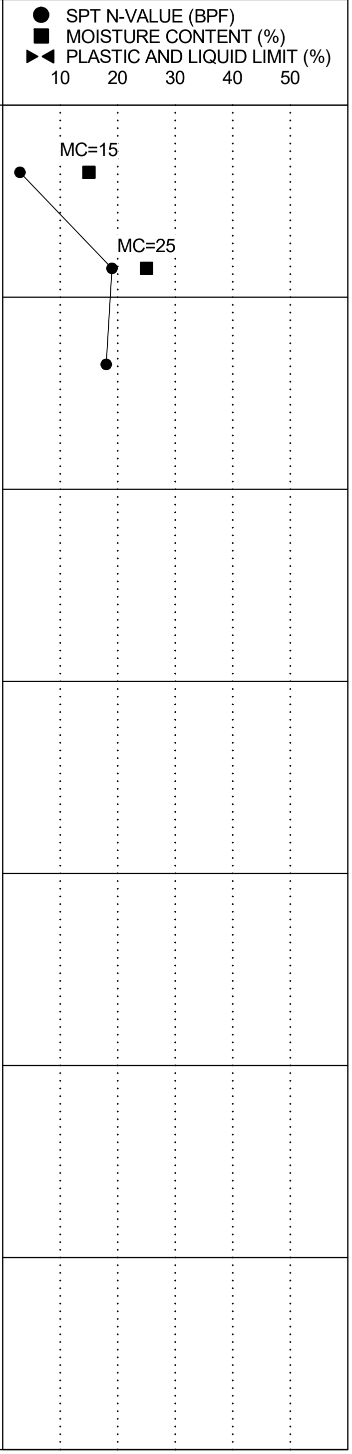
Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *Not Encount.*

Delayed Water Observation Date: *12/15/2023*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD / % REC	● SPT N-VALUE (BPF) ■ MOISTURE CONTENT (%) ▶◀ PLASTIC AND LIQUID LIMIT (%)
			\ TOPSOIL (2 Inches) /						
200		▨	**COASTAL PLAIN:** CLAYEY SAND, very loose, coarse to fine grained, brown, moist (SC)			☒	2 - 2 - 1 N = 3		MC=15
	5	▨	CLAYEY SAND, medium dense, medium to fine grained, reddish-orange and gray, moist (SC)			☒	2 - 6 - 13 N = 19		MC=25
195		▨				☒	2 - 6 - 12 N = 18		
			Boring terminated at 7.5 feet.						
	10								
190									
	15								
185									
	20								
180									
	25								
175									
	30								
170									



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TTL

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Valdosta, Lowndes County, Georgia

Log of
RB-3

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/15/2023*
Logged by:	*P. Kelly*	Boring Depth:	*7.5 feet*
Equipment:	*CME 45*	Boring Elevation:	*203 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	▽ Water Level at Time of Drilling:	*Not Encount.*
		Cave-In at Time of Drilling:	*N/A*

Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

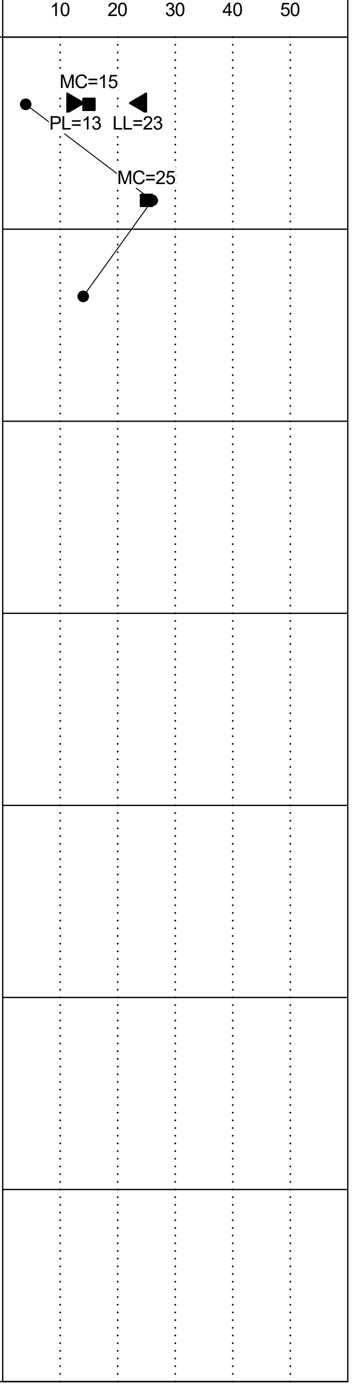
▼ Delayed Water Level: *Not Encount.*

Delayed Water Observation Date: *12/15/2023*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	**MATERIALS DESCRIPTION**	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD % REC
		▨	TOPSOIL (2 Inches)					
		▨	**COASTAL PLAIN:** CLAYEY SAND, very loose, coarse to fine grained, brown, moist (CL)	31.8		☒	2 - 2 - 2 N = 4	
200		▨	CLAYEY SAND, medium dense, medium to fine grained, reddish-orange and white, moist (SC)			☒	7 - 12 - 14 N = 26	
	5	▨				☒	3 - 4 - 10 N = 14	
195			Boring terminated at 7.5 feet.					
	10							
190								
	15							
185								
	20							
180								
	25							
175								
	30							
170								

● SPT N-VALUE (BPF)
■ MOISTURE CONTENT (%)
▶◀ PLASTIC AND LIQUID LIMIT (%)



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TTL

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Valdosta, Lowndes County, Georgia

Log of RB-4

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Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/15/2023*
Logged by:	*P. Kelly*	Boring Depth:	*7.5 feet*
Equipment:	*CME 45*	Boring Elevation:	*197 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	∇ Water Level at Time of Drilling:	*Not Encount.*
		Cave-In at Time of Drilling:	*N/A*

Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

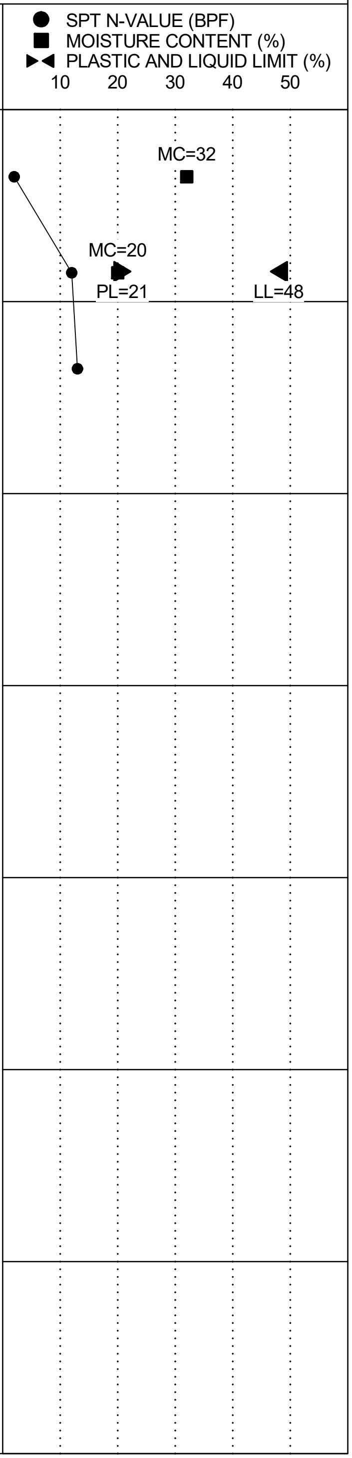
▼ Delayed Water Level: *Not Encount.*

Delayed Water Observation Date: *12/15/2023*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD % REC
		TOPSOIL (2 Inches)					
		COASTAL PLAIN: SILT with SAND, soft, brown and gray, moist (ML)			☒	3 - 1 - 1 N = 2	
		CLAYEY SAND, medium dense, medium to fine grained, reddish-orange and gray, moist (SC)	47.3		☒	2 - 5 - 7 N = 12	
					☒	2 - 6 - 7 N = 13	
		Boring terminated at 7.5 feet.					

ELEVATION (ft)	195	190	185	180	175	170	165
DEPTH (ft)	5	10	15	20	25	30	



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Log of
RB-5

Page 1 of 1

Drilling Co.: *TTL, Inc.*

Driller: *P. Gay*

Logged by: *P. Kelly*

Equipment: *CME 45*

Hammer Type: *Automatic*

Drilling Method: *Hollow Stem Auger w/SPT Sampling*

TTL Project No.: *23-07-02183.00*

Date Drilled: *12/15/2023*

Boring Depth: *7.5 feet*

Boring Elevation: *199 feet*

Coordinates: *N: n/a E: n/a*

▽ Water Level at Time of Drilling: *Not Encount.*

Cave-In at Time of Drilling: *N/A*

Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *Not Encount.*

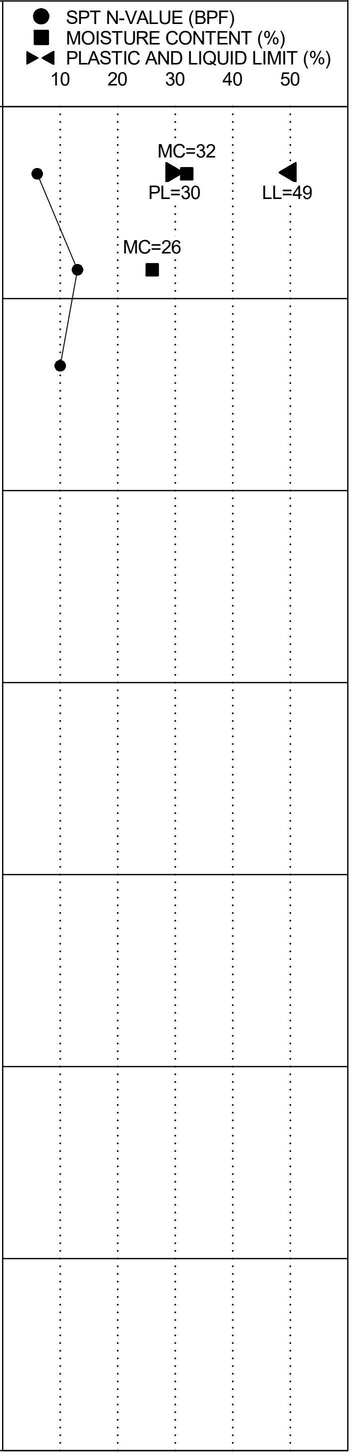
Delayed Water Observation Date: *12/15/2023*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD % REC
			TOPSOIL (2 Inches)					
			COASTAL PLAIN: SILT with SAND, firm, brown and red, moist (ML)	81.5		☒	3 - 3 - 3 N = 6	
195			FAT CLAY, stiff, white and red, moist (CH)			☒	3 - 6 - 7 N = 13	
	5					☒	3 - 3 - 7 N = 10	
			Boring terminated at 7.5 feet.					

ELEVATION (ft): 195, 190, 185, 180, 175, 170, 165

DEPTH (ft): 5, 10, 15, 20, 25, 30



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TTL

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Valdosta, Lowndes County, Georgia

Log of SW-1

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*D. Campbell*	Date Drilled:	*1/8/2024*
Logged by:	*E. Brunner*	Boring Depth:	*10 feet*
Equipment:	*CME 550X ATV*	Boring Elevation:	*195 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	∇ Water Level at Time of Drilling:	*4 ft BGS*
		Cave-In at Time of Drilling:	*N/A*

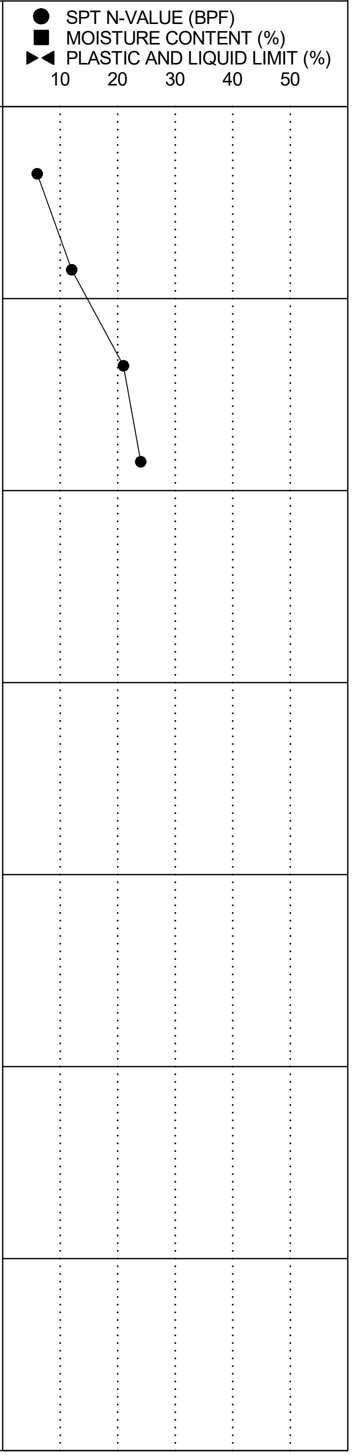
Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 83%.

▼ Delayed Water Level: *Not Encount.*

Delayed Water Observation Date: *1/8/2024*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	% PASSING #200 SIEVE	TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD % REC
195		TOPSOIL (3 Inches)				
		SILTY SAND, loose, coarse to fine grained, tan, wet (SM)		☒	3 - 2 - 4 N = 6	
		SANDY LEAN CLAY, stiff to very stiff, tan and gray, moist (CL)	∇	☒	3 - 5 - 7 N = 12	
190	5			☒	8 - 8 - 13 N = 21	
				☒	8 - 11 - 13 N = 24	
185	10	Boring terminated at 10 feet.				
180	15					
175	20					
170	25					
165	30					



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Valdosta, Lowndes County, Georgia

Log of
SW-2

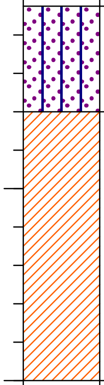
Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*D. Campbell*	Date Drilled:	*1/8/2024*
Logged by:	*E. Brunner*	Boring Depth:	*10 feet*
Equipment:	*CME 550X ATV*	Boring Elevation:	*195 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	∇ Water Level at Time of Drilling:	*Not Encount.*
		Cave-In at Time of Drilling:	*N/A*

Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 83%.

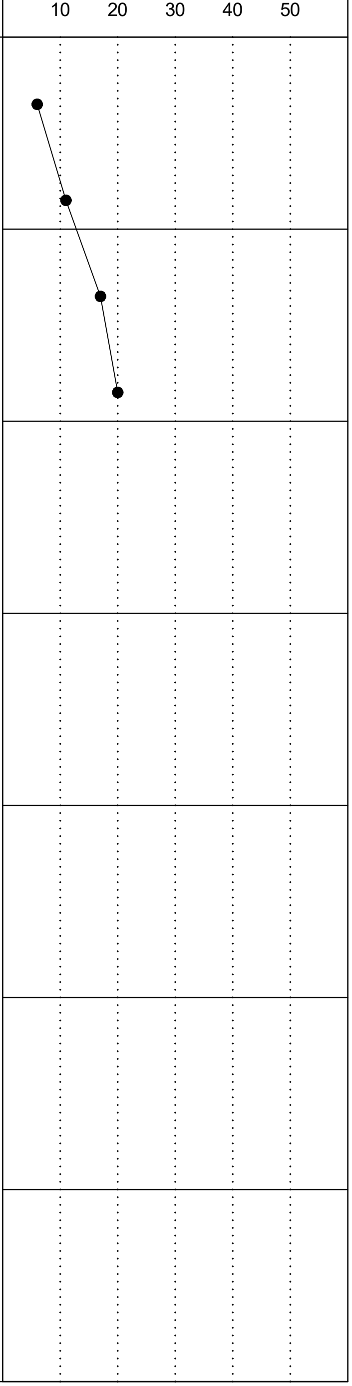
▼ Delayed Water Level: *N/A*

Delayed Water Observation Date: *N/A*

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD % REC
195			TOPSOIL (3 Inches)					
			SILTY SAND, loose, coarse to fine grained, tan, wet (SM)			☒	2 - 3 - 3 N = 6	
			SANDY LEAN CLAY, stiff to very stiff, tan and gray, moist (CL)			☒	6 - 6 - 5 N = 11	
190	5							
			- becomes red-orange and gray below 6 feet			☒	8 - 8 - 9 N = 17	
						☒	7 - 9 - 11 N = 20	
185	10		Boring terminated at 10 feet.					
180	15							
175	20							
170	25							
165	30							

SAMPLE DATA

● SPT N-VALUE (BPF)
■ MOISTURE CONTENT (%)
▶◀ PLASTIC AND LIQUID LIMIT (%)



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Valdosta, Lowndes County, Georgia

Log of TB-1

Drilling Co.: *TTL, Inc.*
Driller: *D. Campbell*
Logged by: *E. Brunner*
Equipment: *CME 550X ATV*
Hammer Type: *Automatic*
Drilling Method: *Hollow Stem Auger w/SPT Sampling and Rotary Wash w/Mud*

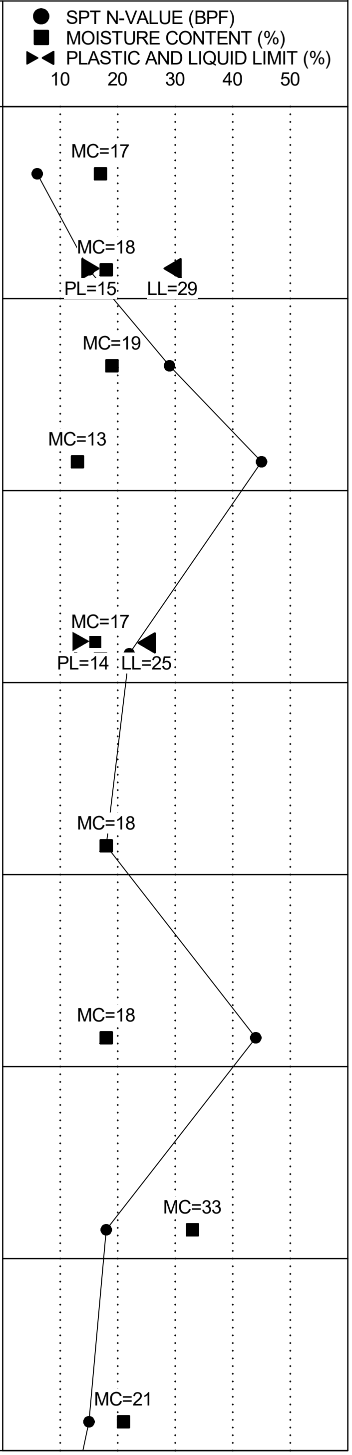
TTL Project No.: *23-07-02183.00*
Date Drilled: *1/3/2024*
Boring Depth: *100 feet*
Boring Elevation: *196 feet*
Coordinates: *N: n/a E: n/a*
∇ Water Level at Time of Drilling: *23.5 ft BGS*
Cave-In at Time of Drilling: *N/A*

Remarks:
The boring was backfilled with grout after drilling was completed. The hammer efficiency of the rig used was 83%.

▼ Delayed Water Level: *N/A*
Delayed Water Observation Date: *N/A*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD / % REC	● SPT N-VALUE (BPF) ■ MOISTURE CONTENT (%) ▶◀ PLASTIC AND LIQUID LIMIT (%)
		TOPSOIL (3 Inches)						
195		CLAYEY SAND, loose, medium to fine grained, white, wet (SC)			☒	1 - 3 - 3 N = 6		MC=17
	5	CLAYEY SAND, medium dense, medium to fine grained, white and orange, wet (SC)	42.3		☒	4 - 6 - 9 N = 15		MC=18 PL=15 LL=29
190		SANDY LEAN CLAY, very stiff, white and red, moist (CL)			☒	9 - 9 - 20 N = 29		MC=19
185	10	CLAYEY SAND, dense, medium to fine grained, white and red, moist (SC)			☒	14 - 22 - 23 N = 45		MC=13
180	15	CLAYEY SAND, medium dense, medium to fine grained, pink, moist (SC)	23.0		■			MC=17 PL=14 LL=25
175	20				☒	7 - 7 - 11 N = 18		MC=18
170	25	SILTY SAND, dense to medium dense, coarse to fine grained, orange and white, wet (SM)		∇	☒	16 - 22 - 22 N = 44		MC=18
165	30	- becomes white below 28.5 feet			☒	5 - 5 - 13 N = 18		MC=33
		POORLY GRADED SAND, medium dense, coarse to fine grained, gray, wet (SP)			☒	5 - 9 - 6 N = 15		MC=21



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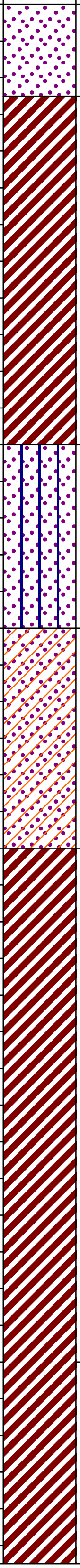
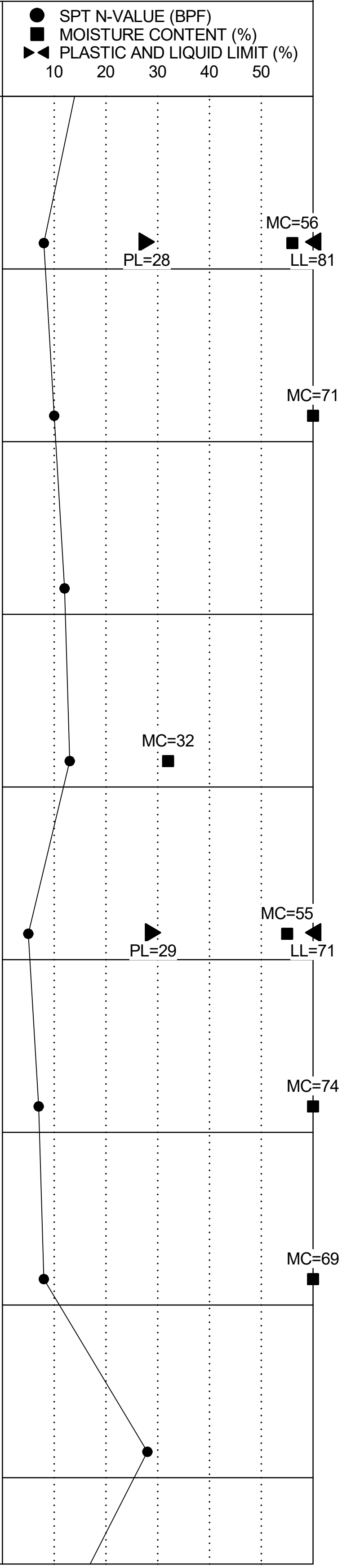
SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	% PASSING #200 SIEVE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	SPT N-VALUE (BPF) / MOISTURE CONTENT (%) / PLASTIC AND LIQUID LIMIT (%)
160		*Continued from previous page* POORLY GRADED SAND, medium dense, coarse to fine grained, gray, wet (SP)			
		FAT CLAY, firm to stiff, blue and gray, wet (CH)			
			89.1	1 - 3 - 5 N = 8	MC=56 PL=28 LL=81
	40				
155					
				3 - 4 - 6 N = 10	MC=71
	45				
150					
		SILTY SAND, medium dense, coarse to fine grained, gray, wet (SM)			
				3 - 5 - 7 N = 12	
	50				
145					
		CLAYEY SAND, medium dense, medium to fine grained, gray, moist (SC)			
				4 - 6 - 7 N = 13	MC=32
	55				
140					
		FAT CLAY with SAND, firm, blue and gray, wet (CH)			
			78.3	2 - 2 - 3 N = 5	MC=55 PL=29 LL=71
	60				
135					
				2 - 3 - 4 N = 7	MC=74
	65				
130					
				2 - 3 - 5 N = 8	MC=69
	70				
125					
		SANDY FAT CLAY, very stiff and stiff, blue and gray, wet (CH)			
				8 - 10 - 18 N = 28	
	75				
120					





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Valdosta, Lowndes County, Georgia

Log of TB-1

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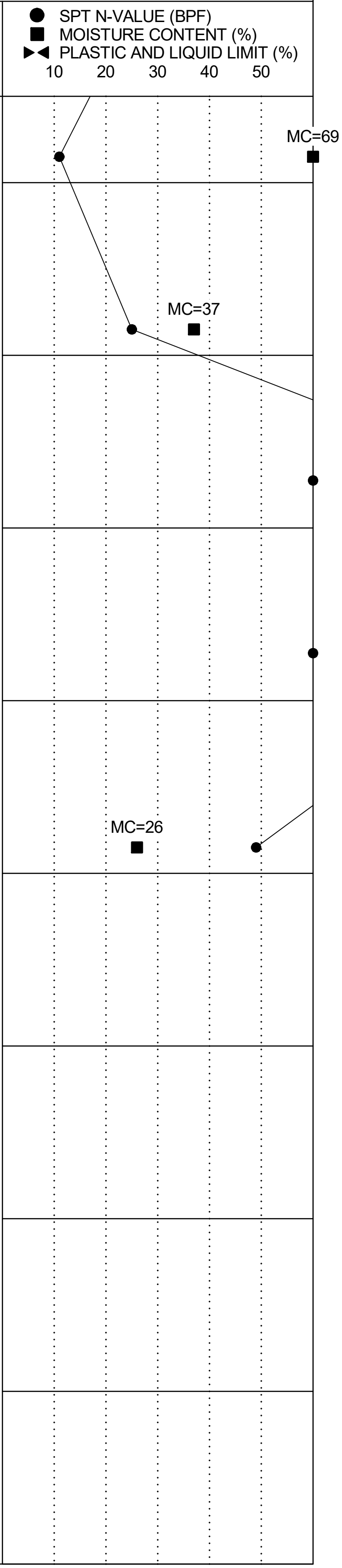
SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE RQD % REC
		▨	*Continued from previous page*				
		▨	SANDY FAT CLAY, very stiff and stiff, blue and gray, wet (CH)			☒	4 - 5 - 6 N = 11
	80	▨					
115		▨					
		▨				☒	6 - 9 - 16 N = 25
	85	▨					
110		▨	FAT CLAY with SAND, hard, blue and gray, trace gravel, moist (CH)				
		▨				☒	50/3 N = 50/3"
	90	▨					
105		▨					
		▨				☒	50/3 N = 50/3"
	95	▨					
100		▨					
		▨				☒	12 - 24 - 25 N = 49
	100		Boring terminated at 100 feet.				
95							
	105						
90							
	110						
85							
	115						
80							

● SPT N-VALUE (BPF)
■ MOISTURE CONTENT (%)
▶◀ PLASTIC AND LIQUID LIMIT (%)



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Log of TB-2

Page 1 of 2

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*D. Campbell*	Date Drilled:	*1/8/2024*
Logged by:	*E. Brunner*	Boring Depth:	*50 feet*
Equipment:	*CME 550X ATV*	Boring Elevation:	*196 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling and Rotary Wash w/Mud*	▽ Water Level at Time of Drilling:	*28.5 ft BGS*
		Cave-In at Time of Drilling:	*N/A*

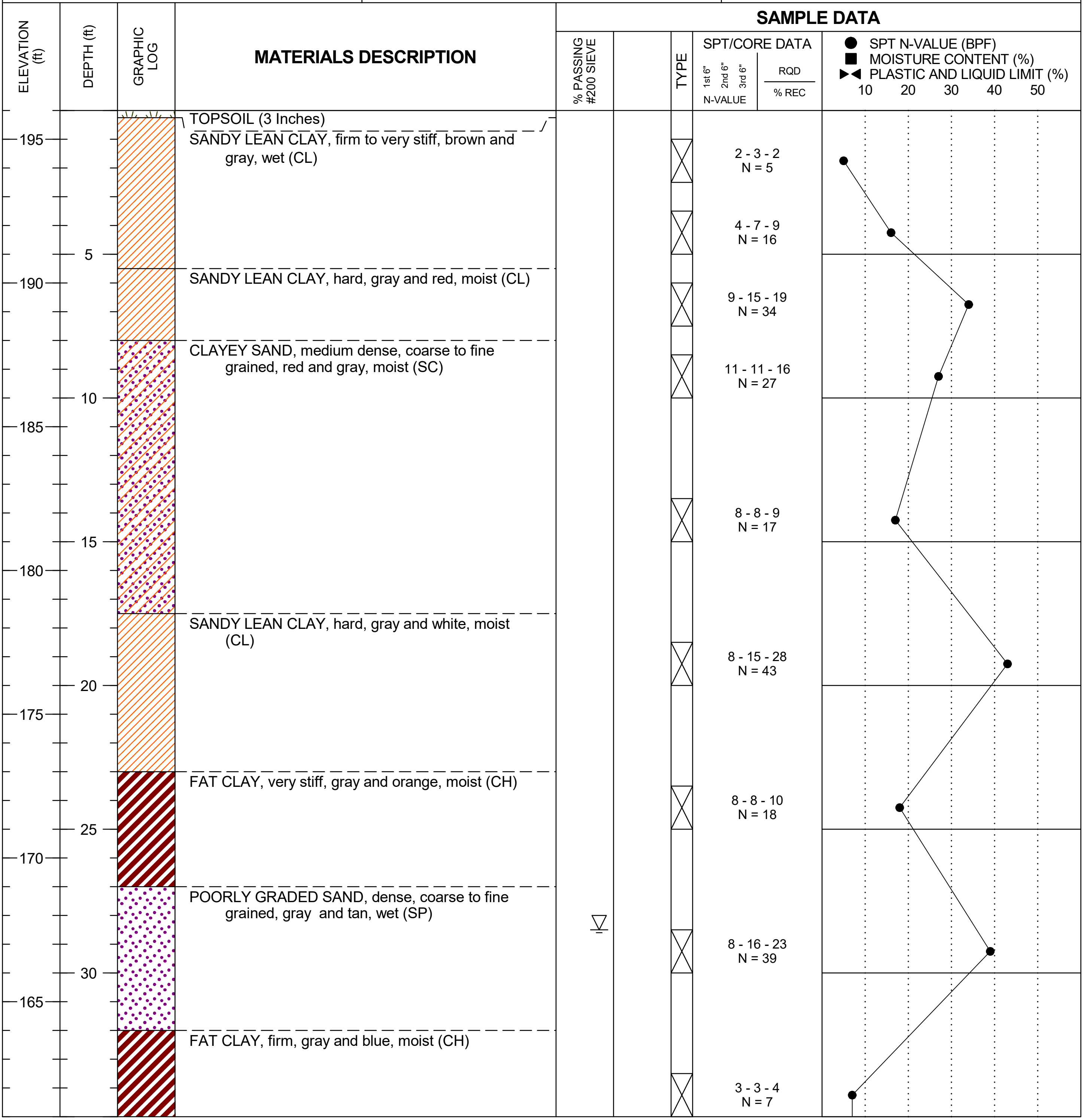
Remarks:
The boring was backfilled with grout after drilling was completed. The hammer efficiency of the rig used was 83%.

▼ Delayed Water Level: *N/A*

Delayed Water Observation Date: *N/A*

SAMPLE DATA

MATERIALS DESCRIPTION	SPT/CORE DATA (1st 6" - 2nd 6" - 3rd 6", N-VALUE)
TOPSOIL (3 Inches)	
SANDY LEAN CLAY, firm to very stiff, brown and gray, wet (CL)	2 - 3 - 2 N = 5 4 - 7 - 9 N = 16
SANDY LEAN CLAY, hard, gray and red, moist (CL)	9 - 15 - 19 N = 34
CLAYEY SAND, medium dense, coarse to fine grained, red and gray, moist (SC)	11 - 11 - 16 N = 27 8 - 8 - 9 N = 17
SANDY LEAN CLAY, hard, gray and white, moist (CL)	8 - 15 - 28 N = 43
FAT CLAY, very stiff, gray and orange, moist (CH)	8 - 8 - 10 N = 18
POORLY GRADED SAND, dense, coarse to fine grained, gray and tan, wet (SP) ▽	8 - 16 - 23 N = 39
FAT CLAY, firm, gray and blue, moist (CH)	3 - 3 - 4 N = 7



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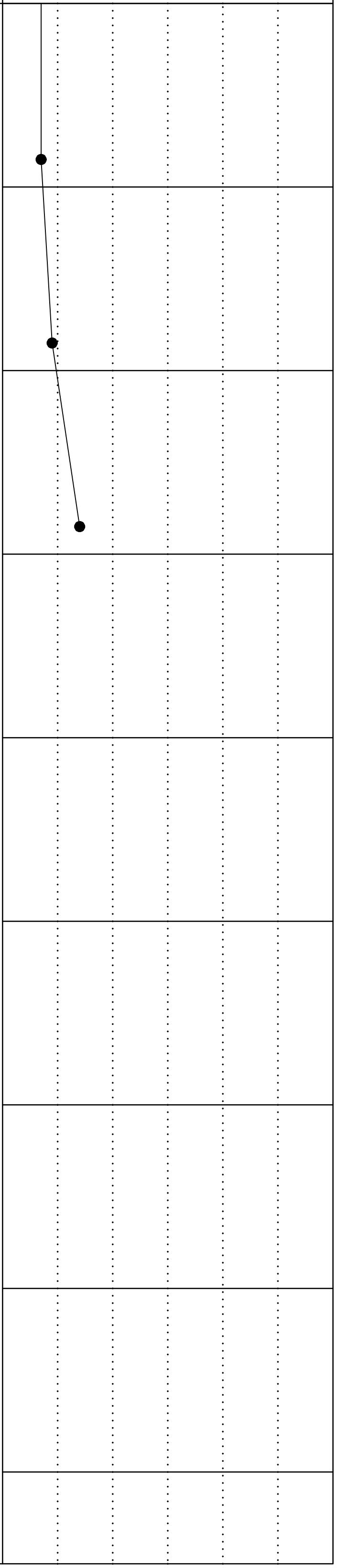
ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD / % REC
160 155	40	▨	*Continued from previous page* FAT CLAY, firm, gray and blue, moist (CH)			☒	3 - 3 - 4 N = 7	
150	45 50	⁘	POORLY GRADED SAND, loose to medium dense, coarse to fine grained, wet (SP)			☒ ☒	3 - 4 - 5 N = 9 5 - 7 - 7 N = 14	
145 140 135 130 125 120	55 60 65 70 75		Boring terminated at 50 feet.					

SAMPLE DATA

- ● SPT N-VALUE (BPF)
- ■ MOISTURE CONTENT (%)
- ▶◀ PLASTIC AND LIQUID LIMIT (%)



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Valdosta, Lowndes County, Georgia

Log of TB-3

Page 1 of 2

Drilling Co.: *TTL, Inc.*
Driller: *D. Campbell*
Logged by: *E. Brunner*
Equipment: *CME 550X ATV*
Hammer Type: *Automatic*
Drilling Method: *Hollow Stem Auger w/SPT Sampling and Rotary Wash w/Mud*

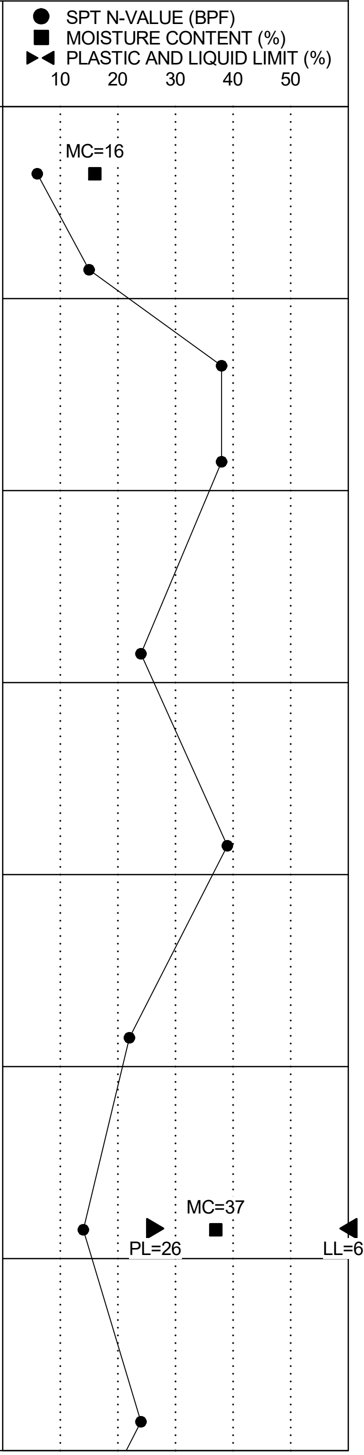
TTL Project No.: *23-07-02183.00*
Date Drilled: *1/4/2024*
Boring Depth: *50 feet*
Boring Elevation: *196 feet*
Coordinates: *N: n/a E: n/a*
▽ Water Level at Time of Drilling: *23.5 ft BGS*
Cave-In at Time of Drilling: *N/A*

Remarks:
The boring was backfilled with grout after drilling was completed. The hammer efficiency of the rig used was 83%.

▼ Delayed Water Level: *N/A*
Delayed Water Observation Date: *N/A*

SAMPLE DATA

MATERIALS DESCRIPTION	% PASSING #200 SIEVE		SPT/CORE DATA (1st 6" - 2nd 6" - 3rd 6") N-VALUE
TOPSOIL (3 Inches) SILTY SAND, loose, coarse to fine grained, brown, wet (SM)			2 - 3 - 3 N = 6
SANDY LEAN CLAY, stiff to hard, gray and orange, moist (CL)			3 - 5 - 10 N = 15
- becomes red and gray below 6 feet			7 - 18 - 20 N = 38
CLAYEY SAND, dense to medium dense, coarse to fine grained, white and gray, moist (SC)			8 - 18 - 20 N = 38
			8 - 10 - 14 N = 24
SANDY LEAN CLAY, hard, white and orange, moist (CL)			6 - 16 - 23 N = 39
CLAYEY SAND, medium dense, coarse to fine grained, gray and orange, moist (SC)		▽	8 - 11 - 11 N = 22
FAT CLAY with SAND, stiff, gray and blue, moist (CH)	81.2		3 - 6 - 8 N = 14
SILTY SAND, medium dense, coarse to fine grained, gray, wet (SM)			8 - 10 - 14 N = 24



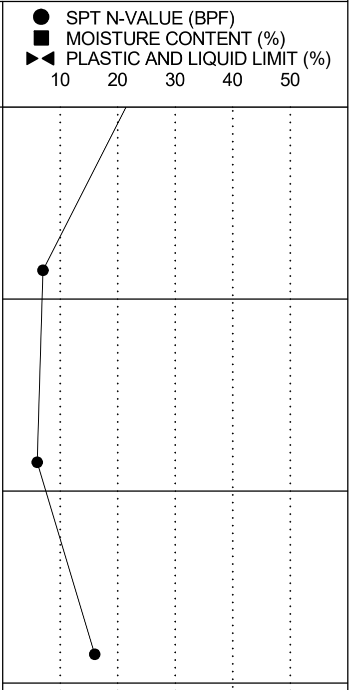
ELEVATION (ft): 195, 190, 185, 180, 175, 170, 165
DEPTH (ft): 5, 10, 15, 20, 25, 30

This boring log shall not be separated from the corresponding Instrument of Service; no third party may rely upon this boring log or the corresponding Instrument of Service absent a written TTL Secondary Client Agreement.

\\FS-LOCAL\PROJECTS\2023\07\23-07-02183.00 CDM SMITH- VALDOSTA WATER TREATMENT PLANT - VALDOSTA, GEORGIA\GEOTECHNICAL\DATA\CDM VALDOSTA WATER - MASTER LAB LOG.GPJ 1/16/24 Report:GEOTECH LOG

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE
160		*Continued from previous page*		
		FAT CLAY, firm, blue and gray, moist (CH)	☒	2 - 3 - 4 N = 7
155	40			
			☒	2 - 3 - 3 N = 6
150	45			
		SILTY SAND, medium dense, coarse to fine grained, gray, wet (SM)	☒	4 - 8 - 8 N = 16
145	50	Boring terminated at 50 feet.		
140	55			
135	60			
130	65			
125	70			
120	75			



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CDM Smith
Valdosta Water Treatment Plant

Valdosta, Lowndes County, Georgia

Log of
TB-4

Page 1 of 2

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*D. Campbell*	Date Drilled:	*1/5/2024*
Logged by:	*E. Brunner*	Boring Depth:	*50 feet*
Equipment:	*CME 550X ATV*	Boring Elevation:	*196 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling and Rotary Wash w/Mud*	∇ Water Level at Time of Drilling:	*13.5 ft BGS*
		Cave-In at Time of Drilling:	*N/A*

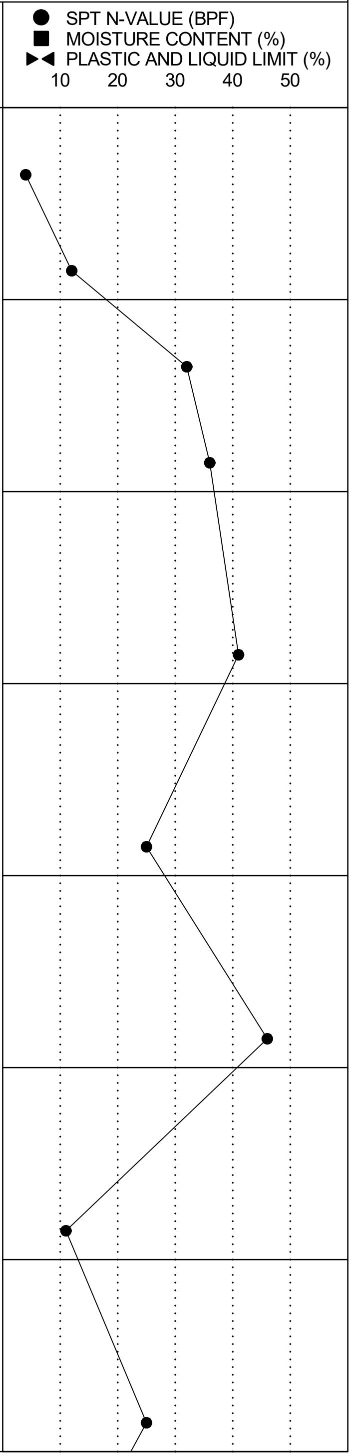
Remarks:
The boring was backfilled with grout after drilling was completed. The hammer efficiency of the rig used was 83%.

▼ Delayed Water Level: *N/A*

Delayed Water Observation Date: *N/A*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	% PASSING #200 SIEVE	TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD % REC
		TOPSOIL (3 Inches)				
195		CLAYEY SAND, very loose, coarse to fine grained, gray and brown, wet (SC)		☒	2 - 2 - 2 N = 4	
		CLAYEY SAND, medium dense to dense, medium to fine grained, red and orange, moist (SC)		☒	3 - 5 - 7 N = 12	
	5					
190		- becomes red and gray below 6 feet		☒	7 - 12 - 20 N = 32	
		- becomes gray-red and orange below 8.5 feet		☒	8 - 16 - 20 N = 36	
	10					
185						
		SILTY SAND, dense to medium dense, medium to fine grained, gray and red, wet (SM)	∇	☒	8 - 20 - 21 N = 41	
	15					
180				☒	10 - 11 - 14 N = 25	
	20					
175						
		CLAYEY SAND, dense, coarse to fine grained, gray, moist (SC)		☒	8 - 16 - 30 N = 46	
	25					
170						
		FAT CLAY with SAND, stiff, gray and orange, wet (CH)		☒	4 - 5 - 6 N = 11	
	30					
165				■		
		SILTY SAND, medium dense, coarse to fine grained, gray, wet (SM)		☒	10 - 13 - 12 N = 25	



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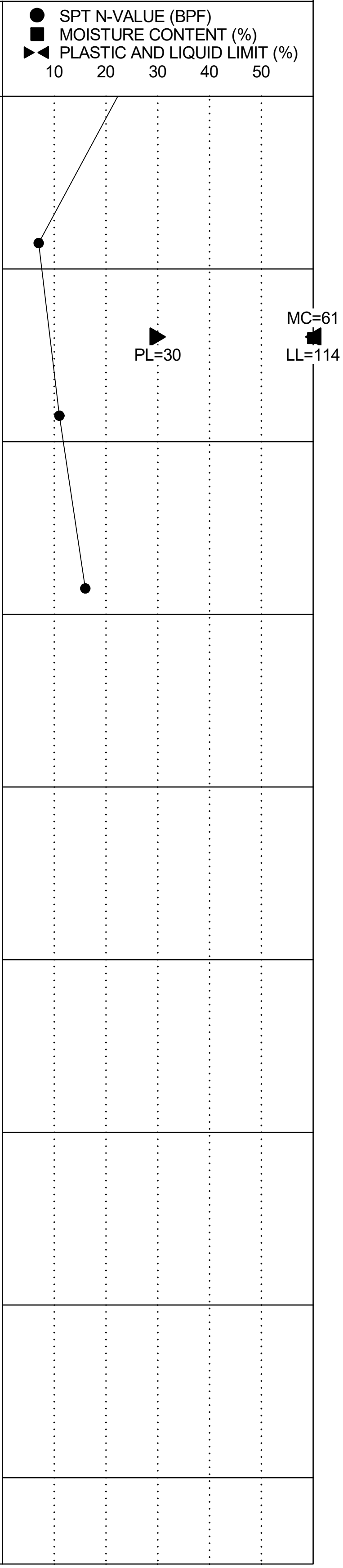
CDM Smith
Valdosta Water Treatment Plant

Valdosta, Lowndes County, Georgia

Log of TB-4

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	GRAPHIC LOG	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE	RQD / % REC
160			*Continued from previous page*					
			FAT CLAY, firm to stiff, green and gray, wet (CH)			☒	3 - 3 - 4 N = 7	
155	40			88.2		■		
150	45					☒	3 - 3 - 8 N = 11	
			SILTY SAND, medium dense, coarse to fine grained, gray, wet (SM)			☒	6 - 7 - 9 N = 16	
145	50		Boring terminated at 50 feet.					
140	55							
135	60							
130	65							
125	70							
120	75							



CDM Smith
Valdosta Water Treatment Plant

Valdosta, Lowndes County, Georgia

Log of TB-5

Page 1 of 2

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*D. Campbell*	Date Drilled:	*1/4/2024*
Logged by:	*E. Brunner*	Boring Depth:	*50 feet*
Equipment:	*CME 550X ATV*	Boring Elevation:	*196 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling and Rotary Wash w/Mud*	▽ Water Level at Time of Drilling: Cave-In at Time of Drilling:	*Not Encount.* *N/A*

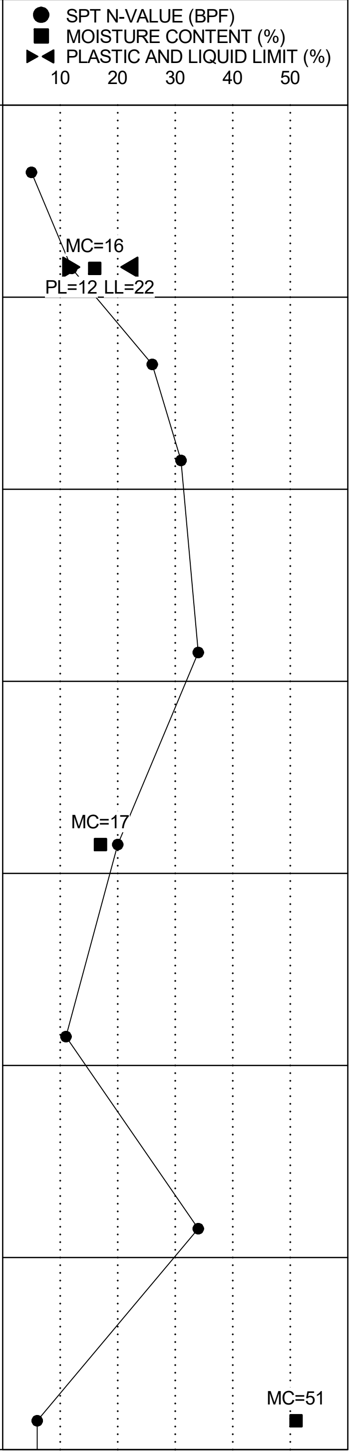
Remarks:
The boring was backfilled with grout after drilling was completed. The hammer efficiency of the rig used was 83%.

▼ Delayed Water Level: *N/A*

Delayed Water Observation Date: *N/A*

SAMPLE DATA

MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE
TOPSOIL (3 Inches)				
SILTY SAND, loose, coarse to fine grained, brown and gray, wet (SM)			☒	2 - 2 - 3 N = 5
CLAYEY SAND, medium dense and dense, medium to fine grained, grayish-red and orange, moist (SC)	36.6		☒	4 - 5 - 7 N = 12
- becomes red and gray below 6 feet			☒	10 - 12 - 14 N = 26
			☒	12 - 14 - 17 N = 31
			☒	10 - 15 - 19 N = 34
- becomes gray below 18.5 feet			☒	7 - 9 - 11 N = 20
FAT CLAY, stiff, orange and gray, moist (CH)				
			☒	5 - 5 - 6 N = 11
SILTY SAND, dense, coarse to fine grained, white and tan, moist (SM)				
			☒	11 - 19 - 15 N = 34
FAT CLAY, firm, blue and gray, wet (CH)				
			☒	2 - 2 - 4 N = 6



ELEVATION (ft): 195, 190, 185, 180, 175, 170, 165

DEPTH (ft): 5, 10, 15, 20, 25, 30

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CDM Smith
Valdosta Water Treatment Plant

Valdosta, Lowndes County, Georgia

Log of TB-5

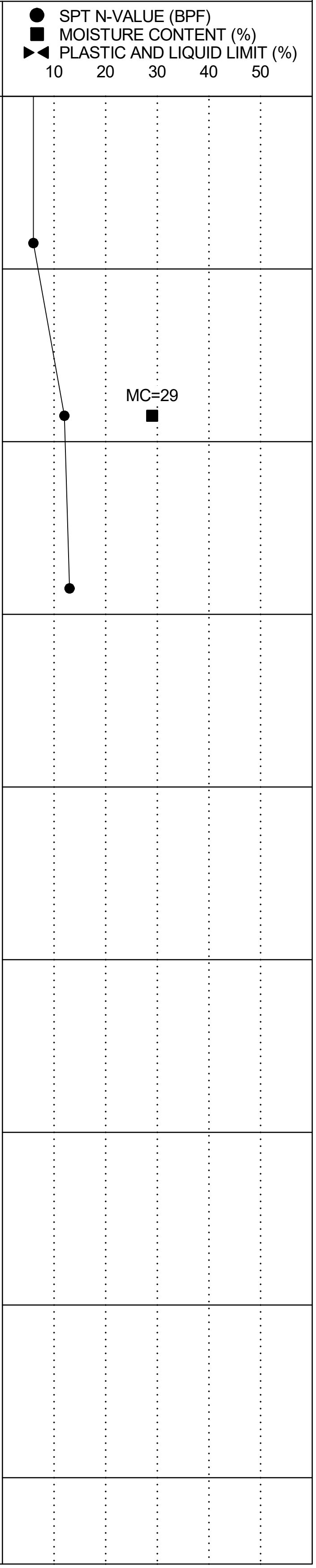
Page 2 of 2

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	TYPE	SPT/CORE DATA 1st 6" 2nd 6" 3rd 6" N-VALUE
160		*Continued from previous page* FAT CLAY, firm, blue and gray, wet (CH)		
155	40		☒	2 - 3 - 3 N = 6
		SILTY SAND, medium dense, coarse to fine grained, gray, wet (SM)	☒	4 - 6 - 6 N = 12
150	45			
145	50		☒	4 - 6 - 7 N = 13
		Boring terminated at 50 feet.		
140	55			
135	60			
130	65			
125	70			
120	75			

% PASSING #200 SIEVE

RQD / % REC



TTL

CDM Smith
Valdosta Water Treatment Plant

Valdosta, Lowndes County, Georgia

Log of W-1

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*D. Campbell*	Date Drilled:	*1/8/2024*
Logged by:	*E. Brunner*	Boring Depth:	*20 feet*
Equipment:	*CME 550X ATV*	Boring Elevation:	*194 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger w/SPT Sampling*	∇ Water Level at Time of Drilling:	*Not Encount.*
		Cave-In at Time of Drilling:	*N/A*

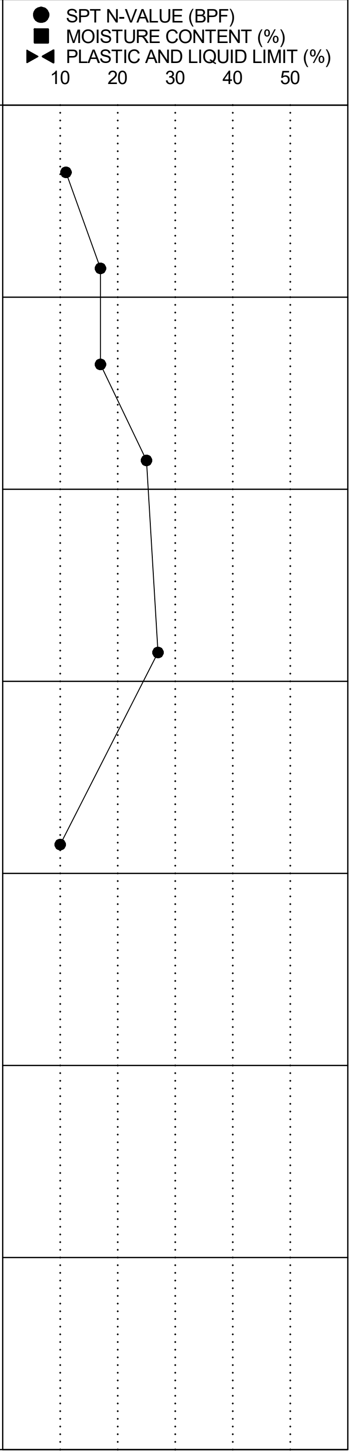
Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 83%.

▼ Delayed Water Level: *N/A*

Delayed Water Observation Date: *N/A*

SAMPLE DATA

ELEVATION (ft)	DEPTH (ft)	MATERIALS DESCRIPTION	% PASSING #200 SIEVE		TYPE	SPT/CORE DATA 1st 6" - 2nd 6" - 3rd 6" N-VALUE	RQD / % REC
194	0	TOPSOIL (3 Inches)					
		SILTY SAND, medium dense, coarse to fine grained, tan, wet (SM)			☒	3 - 5 - 6 N = 11	
	3	SANDY LEAN CLAY, very stiff, tan and orange, moist (CL)			☒ ☒	3 - 8 - 9 N = 17 4 - 7 - 10 N = 17	
	8	CLAYEY SAND, medium dense, coarse to fine grained, tan, moist (SC)			☒	11 - 12 - 13 N = 25	
	13	SANDY LEAN CLAY, very stiff to stiff, white, moist (CL)			☒ ☒	8 - 12 - 15 N = 27 5 - 5 - 5 N = 10	
	20	Boring terminated at 20 feet.					



\\FS-LOCAL\PROJECTS\2023\07\23-07-02183.00 CDM SMITH- VALDOSTA WATER TREATMENT PLANT - VALDOSTA, GEORGIA\GEOTECHNICAL\DATA\CDM VALDOSTA WATER - MASTER LAB LOG.GPJ 1/16/24 Report:GEOTECH LOG

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CDM Smith
Valdosta Water Treatment Plant

Valdosta, Lowndes County, Georgia

Log of W-2

Page 1 of 1

Drilling Co.:	*TTL, Inc.*	**TTL** Project No.:	*23-07-02183.00*
Driller:	*P. Gay*	Date Drilled:	*12/15/2023*
Logged by:	*P. Kelly*	Boring Depth:	*20 feet*
Equipment:	*CME 45*	Boring Elevation:	*201 feet*
Hammer Type:	*Automatic*	Coordinates:	*N: n/a E: n/a*
Drilling Method:	*Hollow Stem Auger*	∇ Water Level at Time of Drilling:	*9 ft BGS*
		Cave-In at Time of Drilling:	*N/A*

Remarks:
The boring was backfilled with drill cuttings following a groundwater measurement once drilling tools were removed. The hammer efficiency of the rig used was 91.5%.

▼ Delayed Water Level: *6 ft BGS*

Delayed Water Observation Date: *12/15/2023*

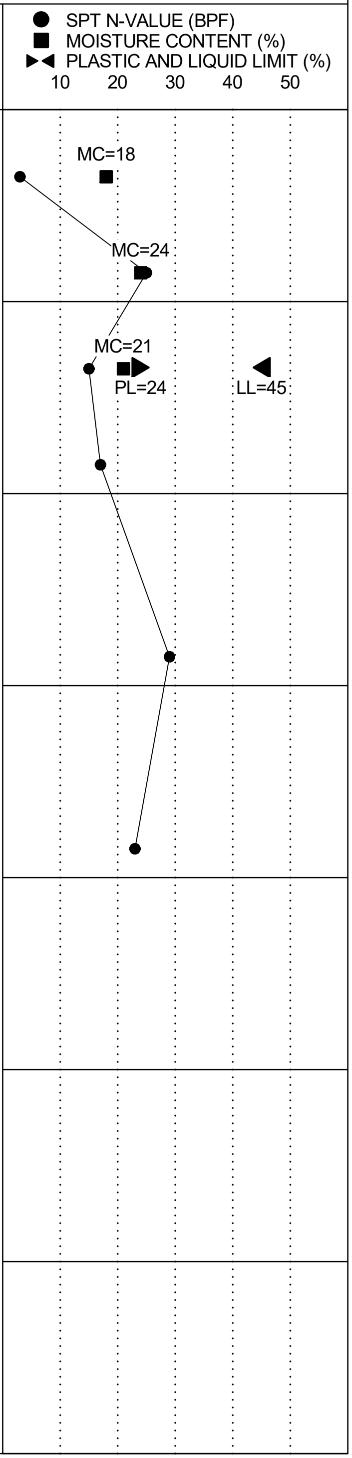
SAMPLE DATA

MATERIALS DESCRIPTION	% PASSING #200 SIEVE	SPT/CORE DATA (1st 6" - 2nd 6" - 3rd 6", N-VALUE)
TOPSOIL (2 Inches)		
COASTAL PLAIN: LEAN CLAY, soft, brown and gray, moist (CL)		2 - 2 - 1 N = 3
CLAYEY SAND, medium dense, medium to fine grained, red-gray and orange, moist (SC)		4 - 10 - 15 N = 25
SANDY LEAN CLAY, very stiff, red and gray, moist (CL)	64.1	5 - 6 - 9 N = 15 5 - 6 - 11 N = 17 3 - 14 - 15 N = 29 3 - 8 - 15 N = 23
Boring terminated at 20 feet.		

ELEVATION (ft): 200, 195, 190, 185, 180, 175, 170

DEPTH (ft): 5, 10, 15, 20, 25, 30

● SPT N-VALUE (BPF)
■ MOISTURE CONTENT (%)
▶◀ PLASTIC AND LIQUID LIMIT (%)



\\FS-LOCAL\PROJECTS\2023\07\23-07-02183.00 CDM SMITH- VALDOSTA WATER TREATMENT PLANT - VALDOSTA, GEORGIA\GEOTECHNICAL\DATA\CDM VALDOSTA WATER - MASTER LAB LOG.GPJ 1/16/24 Report:GEOTECH LOG

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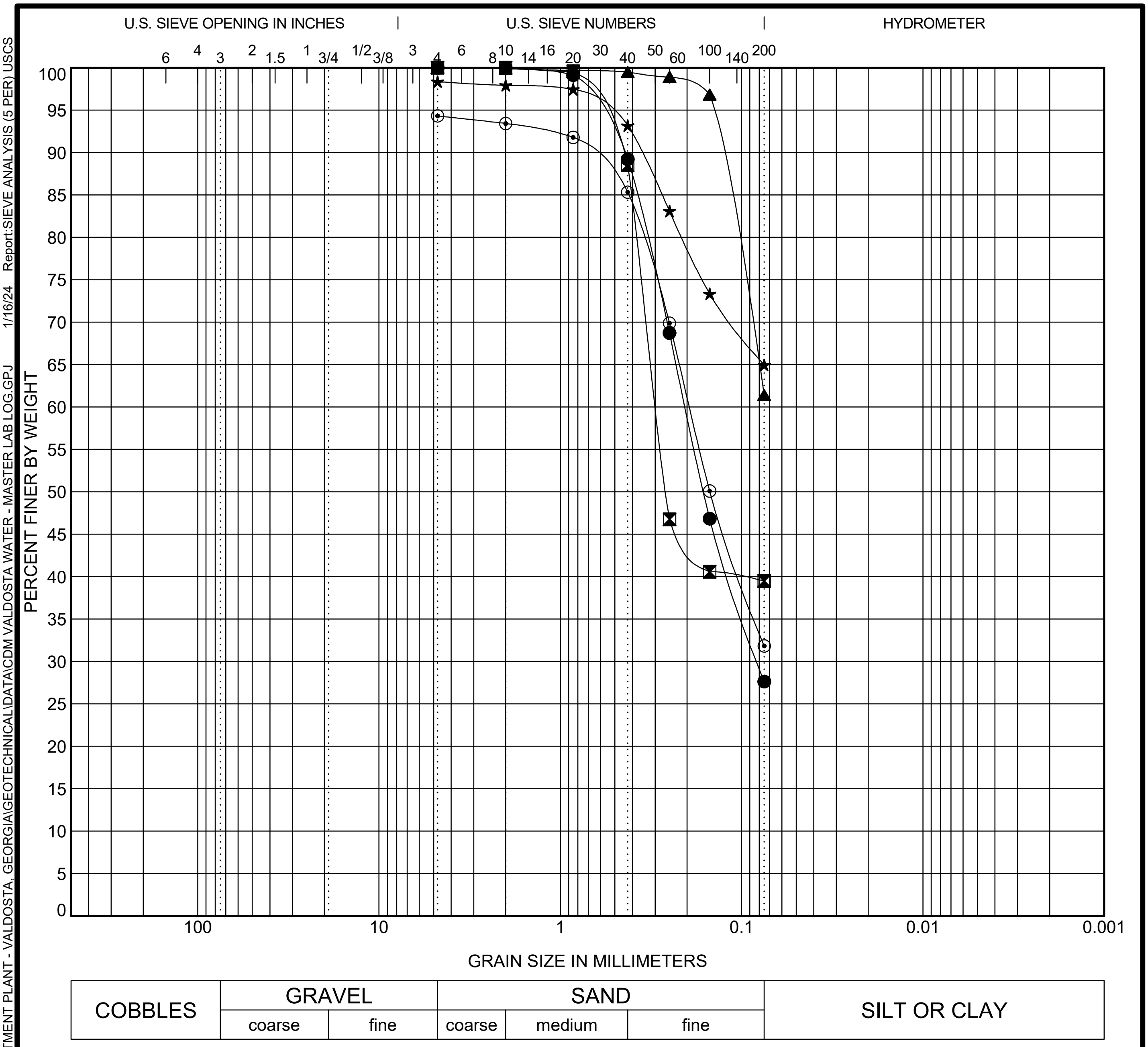


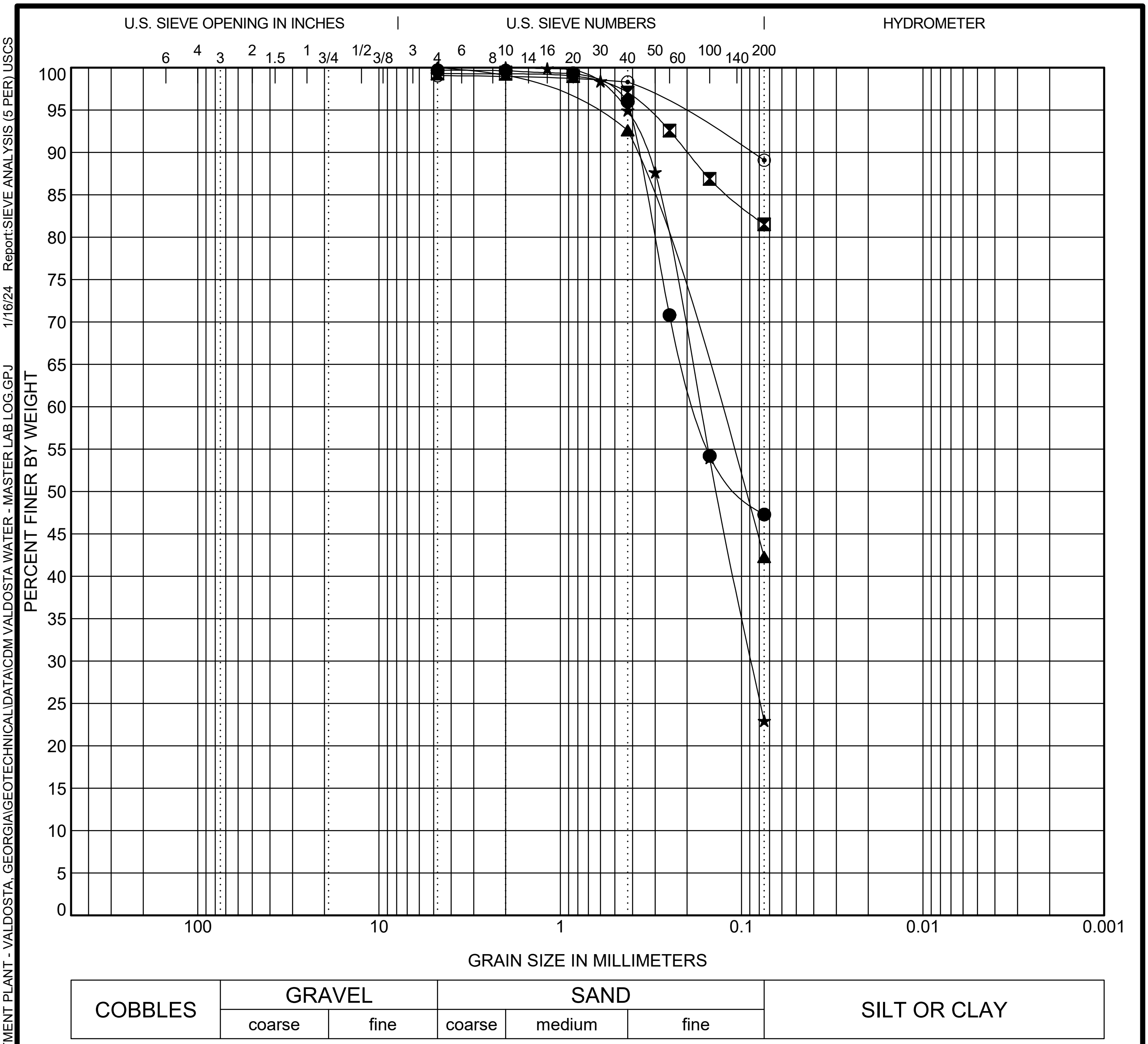
	Sample ID	USCS Classification	LL	PL	PI	Cc	Cu
●	**B-1 / 1 - 2.5 feet**	**SILTY SAND (SM)**	**NP**	**NP**	**NP**		
⊠	**B-4 / 23.5 - 25 feet**	**CLAYEY SAND (SC)**	**38**	**16**	**22**		
▲	**B-7 / 13.5 - 15 feet**	**SANDY LEAN CLAY (CL)**	**36**	**19**	**17**		
★	**RB-1 / 3.5 - 5 feet**	**SANDY SILT (ML)**	**45**	**29**	**16**		
⊙	**RB-3 / 1 - 2.5 feet**	**CLAYEY SAND (SC)**	**23**	**13**	**10**		

	Sample ID	D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**B-1 / 1 - 2.5 feet**	**4.75**	**0.162**	**0.082**		**0.0**	**72.4**	**27.6**	
⊠	**B-4 / 23.5 - 25 feet**	**4.75**	**0.261**			**0.0**	**60.5**	**39.5**	
▲	**B-7 / 13.5 - 15 feet**	**4.75**				**0.0**	**38.6**	**61.4**	
★	**RB-1 / 3.5 - 5 feet**	**4.75**				**0.0**	**35.0**	**65.0**	
⊙	**RB-3 / 1 - 2.5 feet**	**4.75**	**0.149**			**0.0**	**68.2**	**31.8**	

TTL

SIEVE ANALYSIS RESULTS

Client: CDM Smith
Project: Valdosta Water Treatment Plant
Location: Valdosta, Lowndes County, Georgia
Project Number: 23-07-02183.00



	Sample ID	USCS Classification	LL	PL	PI	Cc	Cu
●	**RB-4 / 3.5 - 5 feet**	**CLAYEY SAND (SC)**	**48**	**21**	**27**		
⧗	**RB-5 / 1 - 2.5 feet**	**SILT with SAND (ML)**	**49**	**30**	**19**		
▲	**TB-1 / 3.5 - 5 feet**	**CLAYEY SAND (SC)**	**29**	**15**	**14**		
★	**TB-1 / 13 - 15 feet**	**CLAYEY SAND (SC)**	**25**	**14**	**11**		
⊙	**TB-1 / 38.5 - 40 feet**	**FAT CLAY (CH)**	**81**	**28**	**53**		

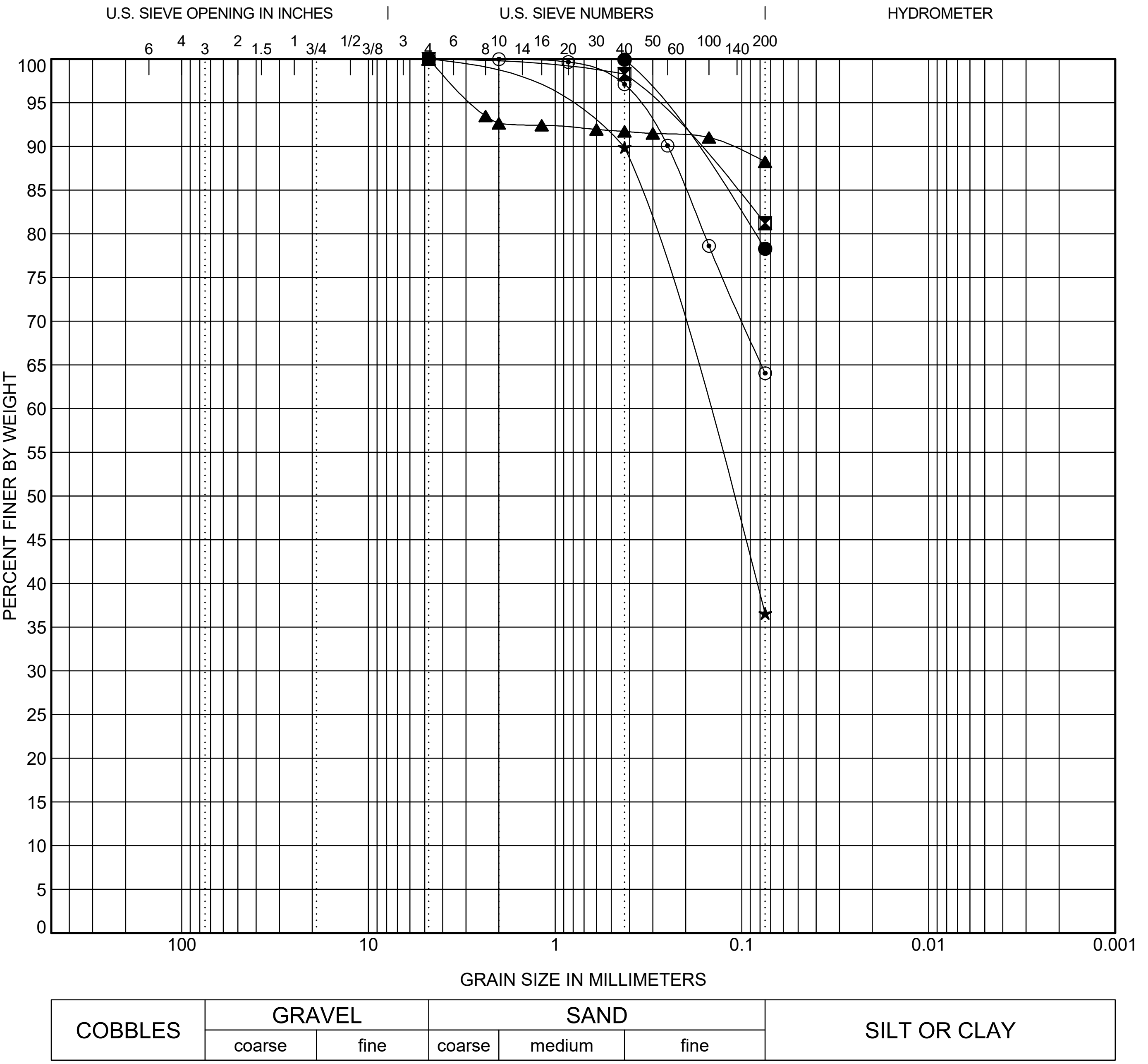
	Sample ID	D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**RB-4 / 3.5 - 5 feet**	**4.75**	**0.098**			**0.0**	**52.7**	**47.3**	
⧗	**RB-5 / 1 - 2.5 feet**	**4.75**				**0.0**	**18.5**	**81.5**	
▲	**TB-1 / 3.5 - 5 feet**	**4.75**	**0.098**			**0.0**	**57.7**	**42.3**	
★	**TB-1 / 13 - 15 feet**	**2**	**0.137**	**0.088**		**0.0**	**77.0**	**23.0**	
⊙	**TB-1 / 38.5 - 40 feet**	**4.75**				**0.0**	**9.9**	**89.1**	

TTL

SIEVE ANALYSIS RESULTS

Client: CDM Smith
Project: Valdosta Water Treatment Plant
Location: Valdosta, Lowndes County, Georgia
Project Number: 23-07-02183.00

\\FS-LOCAL\PROJECTS\2023\07\23-07-02183.00 CDM SMITH- VALDOSTA WATER TREATMENT PLANT - VALDOSTA, GEORGIA\GEOTECHNICAL\DATA\CDM VALDOSTA WATER - MASTER LAB LOG.GPJ 1/16/24 Report:SIEVE ANALYSIS (5 PER) USCS



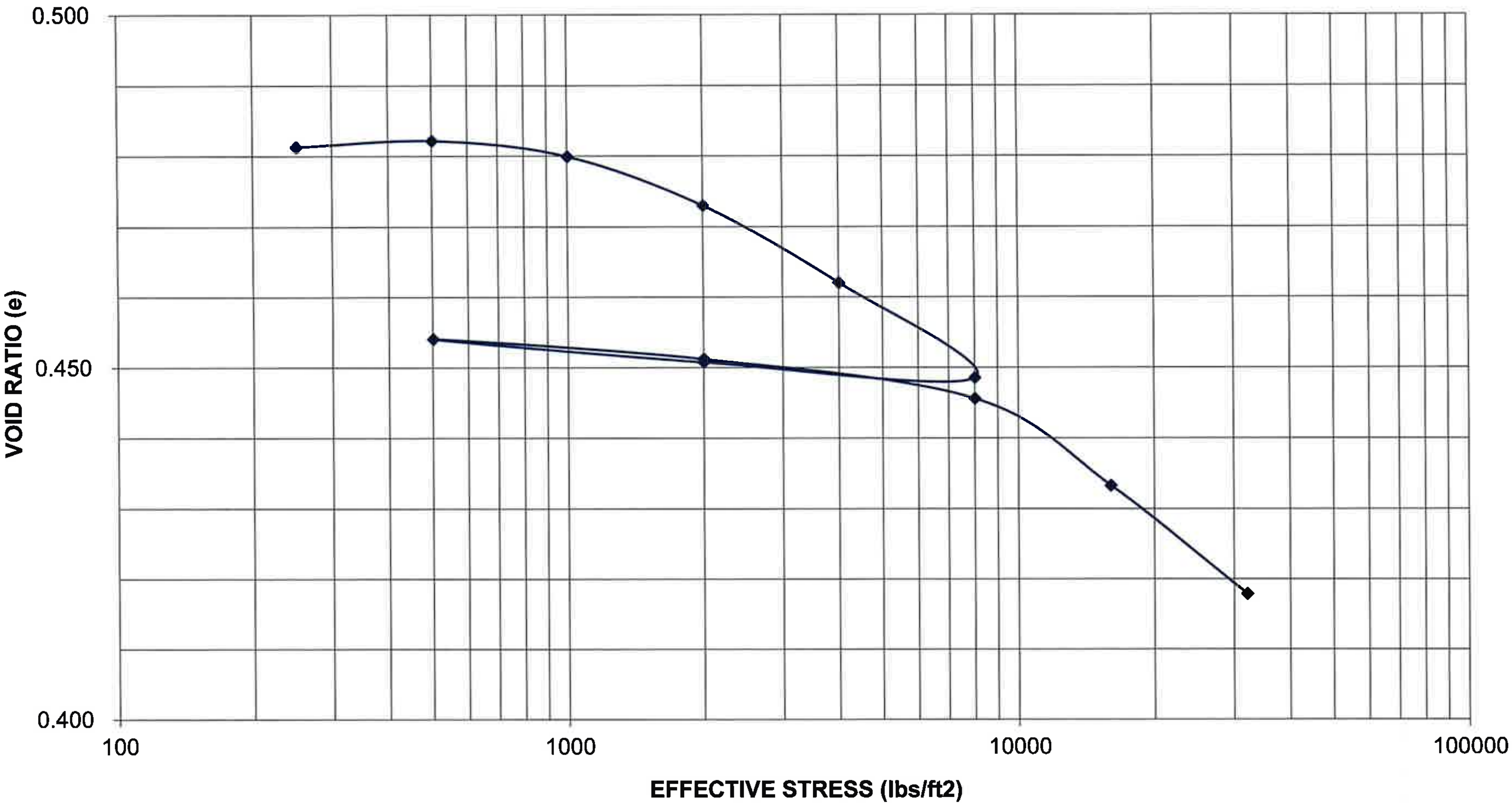
	Sample ID	USCS Classification	LL	PL	PI	Cc	Cu
●	**TB-1 / 58.5 - 60 feet**	**FAT CLAY with SAND (CH)**	**71**	**29**	**42**		
⊠	**TB-3 / 28.5 - 30 feet**	**FAT CLAY with SAND (CH)**	**63**	**26**	**37**		
▲	**TB-4 / 41 - 43 feet**	**FAT CLAY (CH)**	**114**	**30**	**84**		
★	**TB-5 / 3.5 - 5 feet**	**CLAYEY SAND (SC)**	**22**	**12**	**10**		
⊙	**W-2 / 6 - 7.5 feet**	**SANDY LEAN CLAY (CL)**	**45**	**24**	**21**		

	Sample ID	D100	D50	D30	D10	%Gravel	%Sand	%Silt	%Clay
●	**TB-1 / 58.5 - 60 feet**	**4.75**				**0.0**	**21.7**	**78.3**	
⊠	**TB-3 / 28.5 - 30 feet**	**4.75**				**0.0**	**18.8**	**81.2**	
▲	**TB-4 / 41 - 43 feet**	**4.75**				**0.0**	**11.8**	**88.2**	
★	**TB-5 / 3.5 - 5 feet**	**4.75**	**0.116**			**0.0**	**63.4**	**36.6**	
⊙	**W-2 / 6 - 7.5 feet**	**4.75**				**0.0**	**35.9**	**64.1**	

SIEVE ANALYSIS RESULTS

Client: CDM Smith
Project: Valdosta Water Treatment Plant
Location: Valdosta, Lowndes County, Georgia
Project Number: 23-07-02183.00

CDM Smith
Valdosta WTP
TB-1 (13.0'-15.0')



CDM Smith
Valdosta WTP
TB-4 (41.0'-43.0')

ALAMO ANALYTICAL LABORATORIES, LTD.
Main: 10526 Gulfdale • San Antonio, Texas 78216-3601 • (210) 340-8121 . Fax. (210) 340-8123

REPORT NARRATIVE 1/17/2024

Asher Tchoya
TTL
3202 Gillionville Rd
Albany , GA - 31721
TEL: (229) 244-8619 Email: asher.tchoya@ttlusa.com
FAX:

RE: 23-07-02183.00 CDM Smith Valdosta WTP

Dear Asher Tchoya: Order No.: 2401023

Enclosed please find the analytical report for the sample/s received on 1/11/2024.

SAMPLE RECEIPT: Samples were received intact and with chain of custody documentation.
HOLDING TIMES: All samples were analyzed within prescribed holding times and/or in accordance with the Sample Acceptance Policy unless otherwise noted in the report.

If you have any questions regarding these test results call (210) 340-8121.

Thank you,

Reddy Gosala, Ph.D
Laboratory Director

Date: 17-Jan-24

ALAMO ANALYTICAL LABORATORIES, LTD.

Analytical Results Report

CLIENT: TTL
Lab Order: 2401023
Project: 23-07-02183.00 CDM Smith Valdosta WTP

Alamo Lab ID	Client ID	Collection Date	Analyses	Matrix	Result	MDL	PQL	Units	DF	Qua
TestName: CORROSIVITY by pH		**TestNo:**	SW9045D	**Date Analyzed**	1/16/2024 11:00:00 AM			Initials: YK		
2401023-01A	TB 1 - 48.5 sm, gray	1/3/2024	pH at 25 o C	Solid	9.1	0.07	0.1	pH Units	1	
2401023-02A	TB 3 - 13.5 sm, gray	1/4/2024	pH at 25 o C	Solid	8.4	0.07	0.1	pH Units	1	
2401023-03A	TB 5 -28.5 sm, gray	1/4/2024	pH at 25 o C	Solid	8.2	0.07	0.1	pH Units	1	
TestName: RESISTIVITY		**TestNo:**	SM2510B	**Date Analyzed**	1/16/2024 4:00:00 PM			Initials: YK		
2401023-01A	TB 1 - 48.5 sm, gray	1/3/2024	Resistivity	Solid	10800	0	0.0001	ohms-cm	1	
2401023-02A	TB 3 - 13.5 sm, gray	1/4/2024	Resistivity	Solid	7300	0	0.0001	ohms-cm	1	
2401023-03A	TB 5 -28.5 sm, gray	1/4/2024	Resistivity	Solid	20500	0	0.0001	ohms-cm	1	
TestName: CHLORIDE		**TestNo:**	M4500-CL B	**Date Analyzed**	1/17/2024 9:10:00 AM			Initials: YK		
2401023-01A	TB 1 - 48.5 sm, gray	1/3/2024	Chloride	Solid	100	2.57	5	mg/Kg	1	
2401023-02A	TB 3 - 13.5 sm, gray	1/4/2024	Chloride	Solid	60	2.57	5	mg/Kg	1	
2401023-03A	TB 5 -28.5 sm, gray	1/4/2024	Chloride	Solid	100	2.57	5	mg/Kg	1	
TestName: SULFATE - TURBIDIMETRIC		**TestNo:**	M4500-SO4 E	**Date Analyzed**	1/17/2024 11:00:00 AM			Initials: YK		
2401023-01A	TB 1 - 48.5 sm, gray	1/3/2024	Sulfate	Solid	4700	341	1000	mg/Kg	50	
2401023-02A	TB 3 - 13.5 sm, gray	1/4/2024	Sulfate	Solid	23.3	6.82	20	mg/Kg	1	
2401023-03A	TB 5 -28.5 sm, gray	1/4/2024	Sulfate	Solid	5860	341	1000	mg/Kg	50	

H Holding times for preparation or analysis excceeded; J - Analyte detected below quanititation limits

* Non-NELAP Standards ** Sub Contracted

Approved by: Reddy Gosala, Laboratory Direc

Report of Laboratory Analysis

Date: *17-Jan-24*

ALAMO ANALYTICAL LABORATORIES, LTD.

CLIENT: TTL
Work Order: 2401023 **Project:** 23-07-02183.00 CDM Smith Valdosta WTP

QC SUMMARY REPORT

			%REC	%REC		RPD		Low - High			RPD	
Analyte	**BLK**	**SPK value**	**LCS**	**MS**	**MSD**	**%**	**Limit**	**Limit**	**Parent**	**DUP**	**%**	**Limi**
Batch ID: CL_S-1/17/2024	**TestName:** CHLORIDE											
Run ID: CL_240117A	**Test Code:** M4500-CL B		**Units:** mg/Kg		**Analysis Date:** 1/17/2024 9:10:00 AM				**Prep Date:** 1/16/2024 4:20:00 P			
Chloride	<5	1000	96.0%	90.0%	94.0%	4.000	30.0	80 - 120				
Batch ID: PH_S-1/16/2024	**TestName:** CORROSIVITY by pH											
Run ID: PH_S_240116A	**Test Code:** SW9045D		**Units:** pH Units		**Analysis Date:** 1/16/2024 11:00:00 AM				**Prep Date:** 1/16/2024 8:30:00 A			
pH at 25 o C		7	99.6%					6.9 - 7.1	8.2	8.2	0.000	0.0
Batch ID: RESIST-1/16/2024	**TestName:** RESISTIVITY											
Run ID: COND_240116A	**Test Code:** SM2510B		**Units:** ohms-cm		**Analysis Date:** 1/16/2024 4:00:00 PM				**Prep Date:** 1/16/2024 4:00:00 P			
Resistivity		707.7	100.4%					90 - 110	20500.0	21100.0	3.000	10.0
Batch ID: SO4_S-1/17/2024	**TestName:** SULFATE - TURBIDIMETRIC											
Run ID: UV1_240116A	**Test Code:** M4500-SO4 E		**Units:** mg/Kg		**Analysis Date:** 1/17/2024 11:00:00 AM				**Prep Date:** 1/16/2024 4:20:00 P			
Sulfate	<20	250	94.3%	90.8%	90.1%	0.000	30.0	80 - 120				

Approved by:

Laboratory QC Report

Note: The analysis contained in this report applies only to the samples tested and for the exclusive use of the addressed client. Reproduction of this report wholly or in part requires written permission of the client.

APPENDIX B

Exploration Procedures

Laboratory Testing Procedures

EXPLORATION PROCEDURES

Field Locating of Borings

The exploratory borings were field located by TTL personnel based on the requested locations provided by CDM Smith. The boring locations were located using a handheld global positioning system (GPS) device. Boring elevations were estimated based on the topographic information on site plans provided by CDM Smith. The Boring Location Plans in Appendix A show the approximate locations of the borings. Surveying of the boring locations was not in the scope of services, and the locations depicted should not be considered more accurate than implied by the method described.

Soil Borings

A TTL geoprofessional was present during drilling to document conditions and classify the recovered samples in general accordance with the Unified Soil Classification System (USCS), which is defined by ASTM D2487 and D2488. The geoprofessional maintained handwritten records (called boring logs) of the drilling, sampling, groundwater, and backfilling data.

The soil borings were drilled by an ATV-mounted CME 550x or a truck-mounted CME 45 drilling rig. Mud rotary wash drilling methods were performed on the deeper holes where drilling mud was used to stabilize the borehole. The shallower borings were advanced using hollow stem augers. Soil samples were obtained at selected depths in general accordance with the Standard Penetration Test (SPT) as described in ASTM D1586. For this test, a split-barrel sampler is driven into the soil through three increments of 6 inches each with blows from a 140-pound hammer falling 30 inches. The number of hammer blows required to advance the split-barrel sampler through each 6-inch increment is recorded, and the sum of the final two 6-inch intervals is called the “N-value,” with units of blows per foot (bpf). Where it was not possible to advance the sampler through a full 6-inch increment with 50 hammer blows, driving of the sampler was terminated and the sampler penetration was measured. N-values for this condition are reported as “50/x”, where x is the sampler penetration in inches. The N-values recorded during the sampling process provide an index to the strength and compressibility of the soil.

Relatively undisturbed soil samples were obtained by offsetting a boring approximately 3 feet from the original boring location and augering to the sampling depth. The Shelby tube sample was then obtained by hydraulically pushing a 3- inch-diameter thin-walled “Shelby” tube into the soil in general accordance with ASTM D1587. The ends of each tube were sealed with wax and plastic end caps prior to transport to the laboratory where the sample was extruded from the tube for classification and testing.

Groundwater Measurements

Each borehole was checked for the presence of groundwater by observing the soil samples during drilling. Delayed water readings were attempted in select borings.

Backfilling Boreholes

The relatively shallow boreholes (less than 50 feet bgs) were backfilled with auger cuttings and the boreholes to 50 feet bgs and deeper were backfilled with grout via a tremie pipe from the bottom up after groundwater observations were completed. Return trips to the site to top-off backfill that may have settled were not part of our scope of services.

LABORATORY TESTING PROCEDURES

Classification and Index Testing

The recovered soil samples were classified in the field and reviewed in the laboratory by a geoprofessional using the USCS as a guide. Selected samples were tested for the following properties in general accordance with the applicable ASTM standards:

- Water content (ASTM D 2216),
- Atterberg limits (ASTM D 4318), and
- Sieve analysis (ASTM D 6913).

Results of tests for water content, Atterberg limits, and percent passing No. 200 sieve are presented on the boring logs and full results of sieve analyses and Atterberg limits are presented on the Sieve Analysis Results sheets in Appendix A.

Corrosion Indicator Testing

Select recovered soil samples were subjected to laboratory corrosion indicator testing. Corrosion indicator testing includes the following properties:

- Chloride Ion Content,
- Sulfate Ion Content,
- pH, and
- Resistivity.

Consolidation Testing

Two Shelby tube samples were tested for compressibility to assist with developing recommendations related to shallow foundation performance. The test was performed in general accordance with ASTM D2435. The consolidation curve (void ratio vs stress) from the tests are graphed on the Consolidation Test sheets in Appendix A.