Geotechnical and Environmental Consultants, Inc.

Report of Preliminary Geotechnical Engineering Evaluation

SEFFNER TOWNS

Seffner, Florida

GEC Project No. 5062G

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APPENDIX

A. Exploration Method Descriptions

1.0 SITE LOCATION AND PROJECT DESCRIPTION

The site is located at 5425 Mobile Villa Drive, in Seffner, Florida as shown on **Figure 1**. The property is 9.88 acres and identified as Parcel No. 063066-000. The property is a vacant, undeveloped wooded lot. Adjacent properties include residences to the north and west, a construction company and cleared field to the east, and an unnamed lake and volleyball fields to the south. Additionally, a large homeless camp was encountered in the southern portion of the site during our site reconnaissance. The site topography can be described as gently sloping with the lowest elevation areas in the southern portion of the site. The USGS Brandon Florida Quadrangle Map, shown on **Figure 1**, indicates site ground surface elevations range from +20 to +30 feet NGVD. Additionally, the quadrangle map depicts a marsh or swamp in the southern portion of the site bordered by an unnamed lake.

We understand that preliminary plans include the development of this site for a residential development. Details of the proposed development are not available at this time. However, we assume the development will generally be comprised of one to two-story, single family to multi-family residential buildings with paved roadways and stormwater ponds.

If any of the above project information is incorrect, please notify us so that we can evaluate whether the changes in design affect our recommendations.

2.0 NRCS SOIL SURVEY

The Natural Resources Conservation Service (NRCS) Soil Survey of Hillsborough County, Florida was reviewed for near-surface soil and groundwater information. The NRCS Soil Survey map is shown on **Figure 1**. The soils near the project site are summarized in **Table 1**.

Table 1: Summary of NRCS Soil Survey Soil Units

Soil Unit No.	Soil Name		Depth (inches)	Soil Description	Unified Classification Symbol	Depth to Seasonal High Groundwater (feet)	Hydrologic Group
5	Basinger, Holopaw, and Samsula soils, depressional	Basinger	0 – 7 7 – 80	Fine sand Sand, fine sand	SP SP-SM, SP	+2.0 – 0.0	A/D
		Holopaw	0 – 52 52 – 80	Fine sand Sandy loam, fine sandy loam, sandy clay loam	SP-SM, SP SC-SM, SM		
		Samsula	0 – 34 34 – 80	Muck Sand, fine sand, loamy sand	PT SP-SM, SM, SP		

Soil Unit No.	Soil Name	Depth (inches)	Soil Description	Unified Classification Symbol	Depth to Seasonal High Groundwater (feet)	Hydrologic Group
7	Candler fine sand, 0 to 5 percent slopes	0 – 80	Fine sand	SP-SM, SM	> 6	A
46	St. Johns fine sand	0 – 12 12 – 29 29 – 46 46 – 80	Fine sand Sand, fine sand Sand, fine sand Sand, fine sand	SP-SM, SP SP-SM, SP SP-SM, SM SP-SM, SP	0.0 – 1.0	B/D

The NRCS soil survey depicts St. Johns fine sand (Soil Unit No. 46) across the majority of the project site, with the exception of the southern swamp area. This soil is generally classified as nearly level and poorly drained sands (SP, SP-SM, SM) with the NRCS predicting seasonal high groundwater levels to range from the ground surface to 1-foot below the natural ground surface.

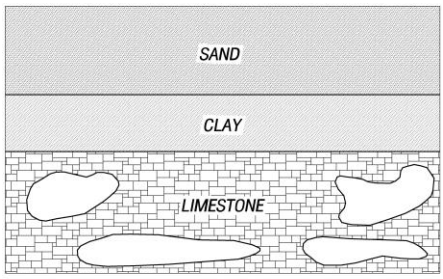
The southern portion of the property consists of Basinger, Holopaw and Samsula soils. These soils are classified as poorly drained, nearly level soils with some organic material (PT). Organic soils are highly compressible and can have severe limitations for future development if left untreated. The NRCS predicts seasonal high groundwater levels for this soil type to generally range from 2 feet above to at the natural ground surface.

Information contained in the NRCS Soil Survey is very general and may be outdated. Therefore, it may not be reflective of actual soil and groundwater conditions, particularly if recent development in the site vicinity has modified soil conditions or surface/subsurface drainage. The information obtained from recent soil borings provides a better characterization of actual site conditions.

3.0 POTENTIOMETRIC MAP DATA

Artesian groundwater conditions can be predicted based on comparison of the Floridan aquifer potentiometric surface and ground surface elevations. The Florida Geological Survey map entitled *The Upper Floridan Aquifer Potentiometric Surface Contours, September, 2017* (the most recent map available) indicates the potentiometric surface of the Floridan aquifer at the site is approximately +28 feet NGVD. Since the existing ground surface at the site ranges from +20 to +30 feet NGVD, artesian flow conditions may occur in excavations which penetrate the aquifer confining layer. Artesian conditions were not encountered in our soil borings, which were performed to a depth of 10 feet. However, our drilling operations required the use of high density drilling mud which could potentially obscure the effect of artesian conditions during drilling.

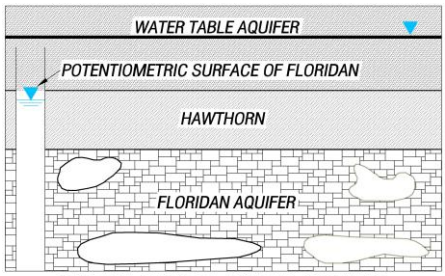
4.0 CENTRAL FLORIDA GEOLOGY



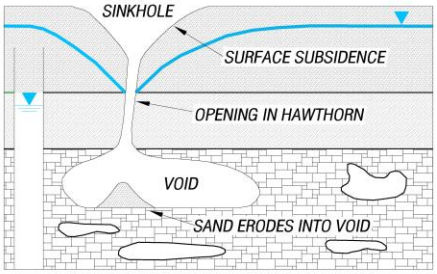
KARST GEOLOGY OF CENTRAL FLORIDA

Central Florida geology is defined by the nature and relationship of three sedimentary layers. The deepest layer is cavernous limestone known as the Floridan aquifer (Floridan). The Floridan is overlain by the clayey sand to sandy clay of the Hawthorn Group (Hawthorn). The Hawthorn is in turn overlain by a surface layer of sand, which comprises the water table aquifer.

Central Florida geology is classified as "karst" or sinkhole-prone. Where the Hawthorn is absent, water and sand can flow downward to cavities within Floridan aquifer, like sand through an hourglass, ***recharging*** the Floridan aquifer, and sometimes causing the formation of surface depressions, or sinkholes. This process of subsurface erosion caused by recharge is known as ***raveling***. Thus, areas of groundwater ***recharge*** to the Floridan aquifer are more likely to experience sinkhole activity.



CENTRAL FLORIDA AQUIFER SYSTEMS



SINKHOLE FORMATION MECHANISM

No field exploration method can accurately predict the occurrence of sinkholes. It is common geotechnical practice in Central Florida to assess sinkhole risk at a site based on published geology and recent sinkhole history. Further evaluation can be made by performing deep soil borings. The purpose of the borings is to explore the Hawthorn and overlying sands for indicators of sinkhole activity, including extensive zones of loose, ***raveled*** soil and losses of drilling fluid circulation. Evaluation of sinkhole risk by deep borings is typically performed for significant structures, but is not usually performed for horizontal facilities such as highways. Evaluation of sinkhole risk was not performed as part of this study.

5.0 SUBSURFACE EXPLORATION

In addition to consulting published sources, GEC conducted an exploration of the project site to evaluate subsurface conditions. Our field exploration is summarized in **Table 2**. Please refer to **Appendix A** for a description of the field exploration methods used for this investigation.

Table 2: Site Exploration Summary

Location	Exploration Method	Quantity	Boring No.	Depth Explored (feet)	Figure No.
Project Site	SPT Borings	8	SPT-1 to SPT-8	10	4
Wetland Area	Manual Muck Probes	3	---	---	3

The locations of the field activities listed in **Table 2** are shown on the site plan in **Figure 2**. These locations were not surveyed; they were estimated by using a handheld GPS unit. The approximate method used to locate them is sufficient to meet the intent of our study. If greater accuracy is desired, a registered Professional Land Surveyor should survey the locations.

6.0 LABORATORY TESTING

Selected soil samples retrieved from the borings were tested in accordance with Florida Standard Testing Methods (FM), American Association of State Highway Transportation Officials (AASHTO) testing methods and American Standard Testing Methods (ASTM). Our laboratory testing program is summarized on the following table:

Table 3: Summary of Laboratory Testing Program

Test	Test No.
Percent Fines	AASHTO - T88
Atterberg Limits	AASHTO - T89/90
Organic Content	FM 1 - T267
Natural Moisture Content	AASHTO - T265

The results of our laboratory tests (i.e., percent fines, Atterberg limits, organic content and natural moisture content) are shown adjacent to the soil profiles on the SPT Boring Result sheets (**Figure 4**).

7.0 SUBSURFACE CONDITIONS

GEC's field exploration was conducted from 5/25/2022 to 5/26/2022. The soil and groundwater conditions encountered are summarized in this section. Please refer to **Figure 4** for a detailed description of the subsurface profile at each boring location shown on **Figure 2**. The results of selected laboratory tests are shown adjacent to the subsurface profiles at the depth the samples were obtained.

7.1 Subsurface Profile

The descriptions and stratum numbers used for the encountered soils are summarized as follows:

Table 4: Soil Stratigraphy

Stratum No.	Unified Classification	Soil Description
1	SP	Light brown fine sand
2	SP-SM	Light brown to dark brown fine sand with silt, trace organic material
3	SM	Brown silty fine sand (-200<15%)
4	SM	Light brown to gray silty fine sand (-200≥15%)
5	SC, CL	Light brown to brown to gray clayey fine sand to sandy lean clay
6	CH	Gray fat clay
7	PT	Dark brown mucky fine sand

In general, the SPT borings encountered loose to medium dense fine sand to fine sand with silt (SP, SP-SM) (Strata 1 and 2) to a depth of 4 to 6 feet underlain by fine sand with silt to silty fine sand to clayey fine sand (SP-SM, SM, SC) (Strata 2, 3, 4 and 5) to the boring termination depth of 10 feet.

The following exceptions were encountered:

- A surficial layer of mucky fine sand (PT) (Stratum 7) was encountered in borings SPT-5 and SPT-8 extending to a maximum depth of 1-foot.
- Borings SPT-1 and SPT-2 encountered fine sand to fine sand with silt (SP, SP-SM) (Strata 1 and 2) to the boring termination depth of 10 feet.
- A layer of stiff fat clay (CH) (Stratum 6) was encountered at SPT-6 at a depth of 8 to 10 feet.

Manual muck probes performed in the wetland area on the southern portion of the site encountered surficial muck ranging from 1 to 3 feet in thickness. Standing water levels at the probe locations ranged from 0.6 to 1.7 feet. Manual muck probe locations and results are shown on **Figure 3**.

7.2 Groundwater Levels

Our technician identified the groundwater surface in the SPT boreholes at depths ranging from 1.3 to 7.9 feet below the ground surface during our field exploration program. Standing water levels at the manual probe locations ranged from 0.6 to 1.7 feet above the ground surface. We estimate seasonal high groundwater depths to range from 0.7 to 4.4 feet below the existing ground surface

across the majority of the site. However, on the southern portion of the site, the seasonal high groundwater level is estimated to be above the existing ground surface, indicated as "AGS." The height to which water may rise should be determined from site environmental indicators or a drainage engineer.

Please refer to **Figure 4** for measured and estimated seasonal high groundwater levels at each boring location shown on **Figure 2**. Standing water depths at the manual muck probe locations are shown on **Figure 3**.

8.0 PRELIMINARY CONCLUSIONS AND RECOMMENDATIONS

The conclusions and recommendations contained in this report are based in part on the data obtained from a limited number of soil samples and groundwater measurements obtained from widely-spaced borings. The sampling methods used indicate subsurface conditions only at the specific boring locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Borings cannot be relied upon to accurately reflect the variations that usually exist between boring locations and these variations may not become evident until construction.

8.1 Soil Suitability

Based on the results of our preliminary borings, it is our opinion that the soils encountered in the SPT borings are generally suitable for support of the proposed residential development. The fine sand (SP) (Stratum 1) and fine sand with silt (SP-SM) (Stratum 2) encountered at the site are generally suitable for use as engineered fill. The silty fine sand with fines content less than 15% (SM) (Stratum 3), occasionally encountered at the site, is adaptable for use as fill, but will require more handling effort and manipulation of moisture content to achieve compaction requirements. Soils with fines content greater than or equal to 15% and/or a plastic index greater than 10 (SM, SM-SC, SC, CH) (Strata 4, 5 and 6) are not suitable for use as engineered fill.

The mucky fine sand (PT) (Stratum 7) encountered at boring locations SPT-5 and SPT-8 and the manual probe locations is not suitable for use as engineered fill, and will require removal beneath pavement and foundation limits.

8.2 Site Preparation

Throughout the northern portion of the site, routine site preparation including topsoil/root stripping, fill placement and fill compaction should provide for adequate foundation and pavement support.

In the southern portion of the site, surficial layers of mucky fine sand to muck (PT) (Stratum 7) were encountered in borings SPT-5 and SPT-8. The manual muck probes performed in this area also encountered surficial muck to depths of 1 to 3 feet. Organic soil (PT) should be removed from all structure and pavement areas to a minimum of 5 feet beyond the proposed structure and pavement limits.

Surface water should be anticipated and addressed with adequate site grading and surface drainage during construction.

8.3 Pavements and Site Grading

The site grading plan should provide adequate vertical separation between the seasonal high groundwater level and the bottom of the pavement base. A minimum separation of 2 feet is recommended. Based on the estimated seasonal high groundwater levels across the project site, we anticipate 1 to 4 feet of fill required to mass grade the site.

8.4 Stormwater Ponds

Pond sites with relatively shallow surficial groundwater levels, less than about 6 feet deep, typically necessitate wet detention pond systems. However, dry retention pond systems may be feasible on pond sites with relatively deep groundwater, i.e., deeper than 6 feet. As a result of our measured and estimated seasonal high groundwater levels, we anticipate that wet detention pond systems will be feasible on the site.

8.5 Additional Geotechnical Investigation

Additional geotechnical exploration and evaluation may be necessary once final design site plans have been developed. Additional borings may be required to develop geotechnical engineering recommendations for design and construction of pavements, underground utilities and stormwater ponds based on the final site layout.

9.0 REPORT USE AND LIMITATIONS

This section of the report presents important information regarding the proper use of this report, our investigative methods and the limitations of this study. The test data, conclusions and recommendations presented in this report should be reviewed and applied with these limitations in mind.

Subsurface Variability. The analyses and recommendations contained in this report are based in part on the data obtained from a limited number of soil samples and groundwater measurements obtained from widely-spaced borings. The sampling methods used indicate subsurface conditions only at the specific boring locations where samples were obtained, only at the time they were obtained, and only to the depths penetrated. Borings cannot be relied upon to accurately reflect the variations that usually exist between boring locations and these variations may not become evident until construction. Conditions at the boring locations can change over time. Groundwater levels fluctuate seasonally, and soil conditions can be altered by earthmoving operations.

Manual Probes. Manual muck probes were performed by pushing a slender metal rod into the surficial soil and evaluating the relative resistance of the soil to manual penetration. Highly organic soils, such as muck and/or peat, are characteristically very soft and will easily yield to the manual probe. Manual probes, however, cannot detect peat or muck layers which are present beneath layers of sand or dense soils which cannot be penetrated by the probe. The probes can also penetrate to some extent in very loose sands which may be present beneath peat or muck layers. No soil samples are obtained for visual examination or laboratory testing when using this exploratory technique. The soil type being penetrated is inferred solely by evaluating the relative resistance of the soil to penetration. These limitations can lead to some under-estimation or over-estimation of peat or muck layer thicknesses. The probe data presented in this report should be evaluated with these limitations in mind.

Soil Stratification. The depths and thicknesses of the subsurface strata indicated on the boring logs were interpolated between samples obtained at different depths in the borings. The actual transition between soil layers may be different than indicated. *These stratification lines were used for our analytical purposes. Earthwork quantity estimates based on the results of the borings will vary from the actual quantities measured during construction.*

Groundwater Measurements. Groundwater levels can vary seasonally and with changes in subsurface conditions between boring locations. Alterations in surface and/or subsurface drainage brought about by site development can also affect groundwater levels. *Therefore, groundwater depths measured at different times or at different locations on the site can be expected to vary from those measured by GEC during this investigation.*

Groundwater Predictions. For purposes of this report, estimated seasonal high groundwater levels are defined as groundwater levels that are anticipated at the end of the wet season during a "normal rainfall" year under pre-development site conditions. We define a "normal rainfall" year as a year in which rainfall quantity and distribution were at or near historical averages.

Construction Variations. If variations from the subsurface conditions described in this report do become evident during construction, GEC should be retained to reevaluate this report's conclusions and recommendations, and modify the recommendations included in this report, if needed, in light of such changes.

Plans/Specifications Review. GEC should be provided with the construction plans and specifications prior to bidding so that we can verify that the recommendations presented in this report were correctly interpreted and incorporated into the plans and specifications. The recommendations in this report were not written in specification language and are not intended to be used verbatim as a part of the plans and specifications. This report should not be wholly incorporated into the project contract documents.

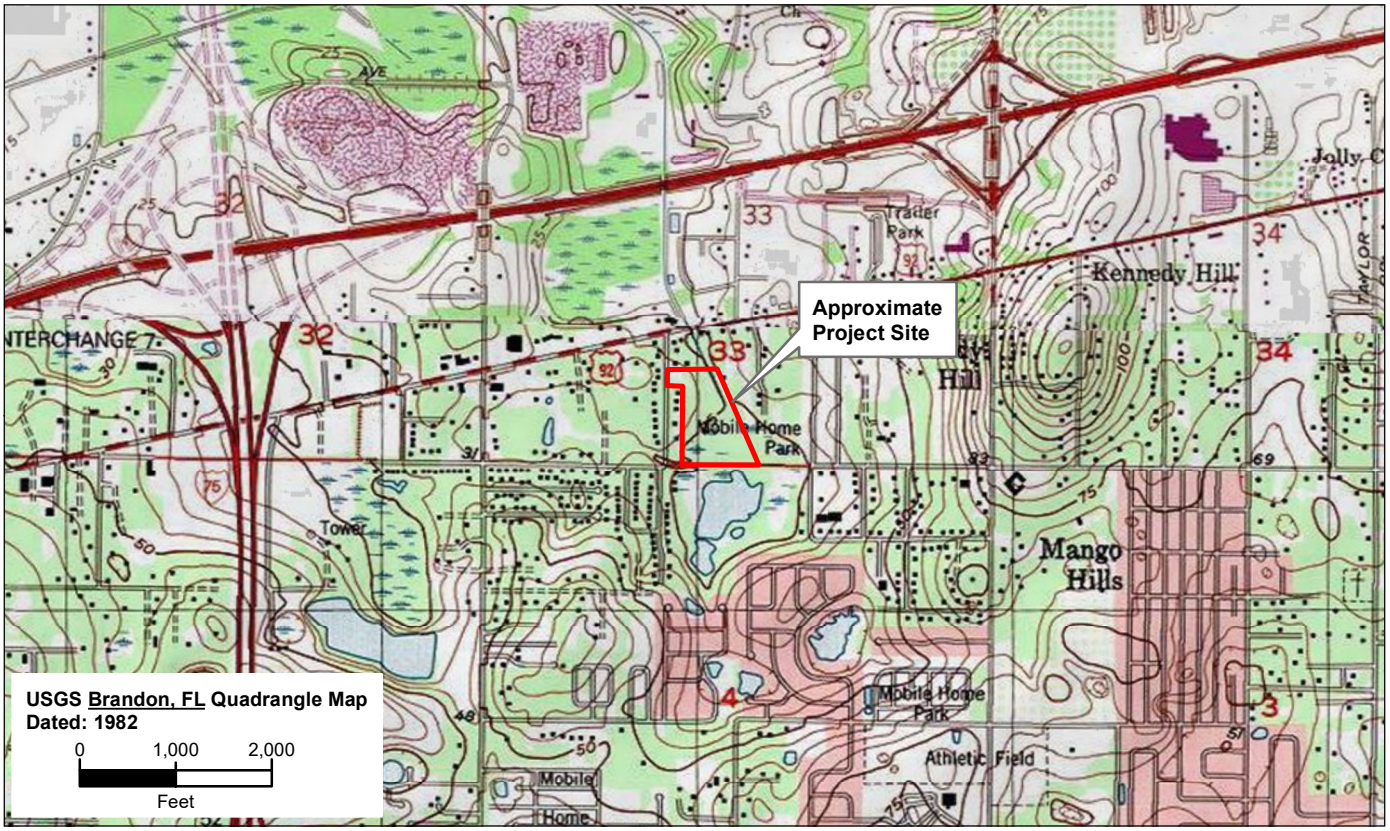
Design Changes. The conclusions or recommendations of this report should be disregarded if the nature, design, or location of the facilities is changed. If such changes are contemplated, GEC should be retained to review the new plans to assess the applicability of this report in light of the proposed changes.

Contamination Exclusion. The sole purpose of the borings performed by GEC at this site was to obtain indications of subsurface conditions as part of a geotechnical exploration program. GEC has evaluated the site for the potential presence of contaminated soil or groundwater, it is included under separate cover.

Report Reliance. GEC has prepared this report for the exclusive use of our client, Resibuilt, and for specific application to this project. GEC is not responsible for any third party's interpretation or use of this report's subsurface data, engineering analysis or recommendations without our written authorization.

Standard of Care. GEC has performed the services described in this report in a manner consistent with that level of care and skill ordinarily exercised by members of our profession currently practicing in Central Florida. No other representation is made or implied in this document.

FIGURES



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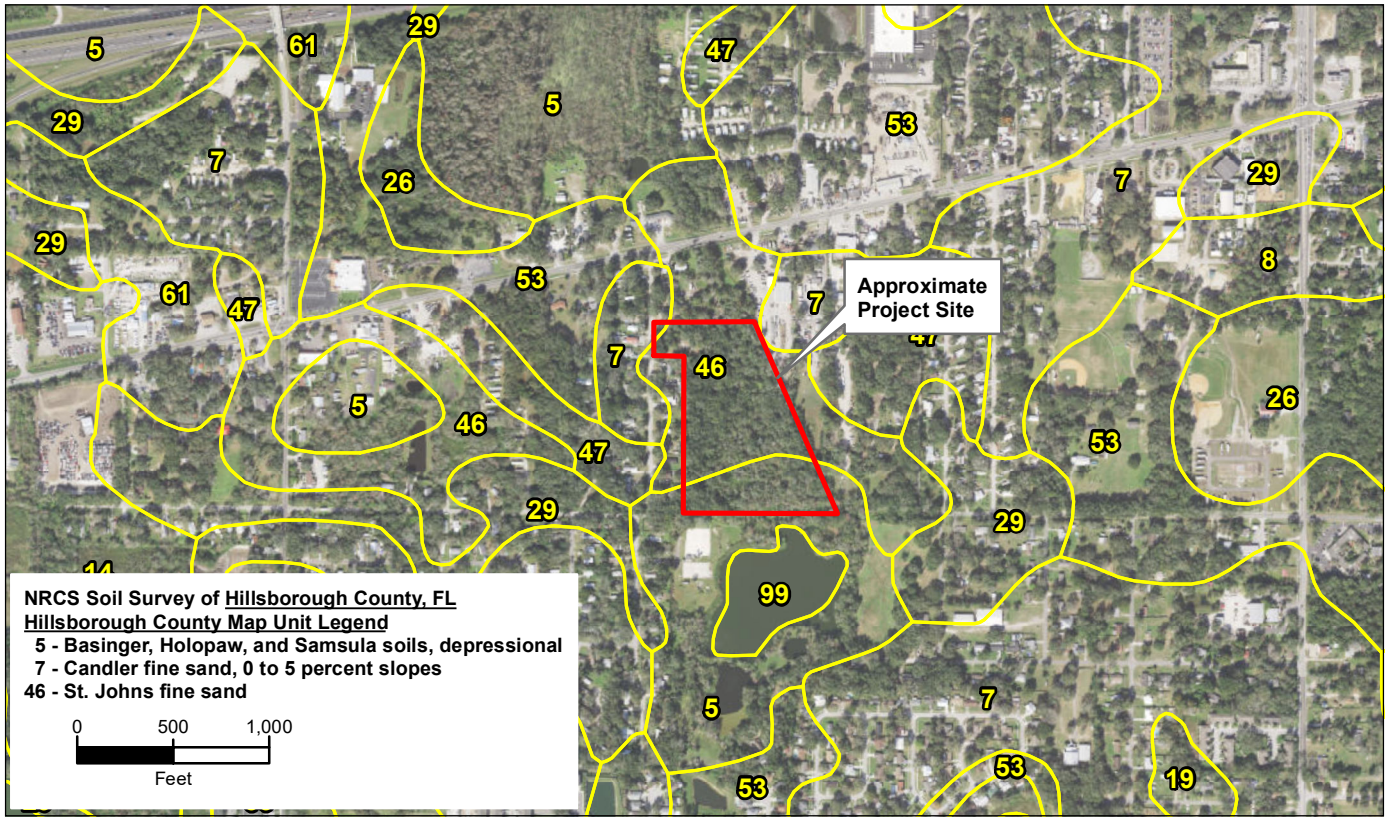

Geotechnical and Environmental Consultants, Inc. 919 LAKE BALDWIN LANE ORLANDO, FL. 32814 CRAIG G. BALLOCK, P.E. P.E. LICENSE NUMBER 71571	SEFFNER TOWNS	USGS QUADRANGLE AND NRCS SOIL SURVEY MAPS	FIGURE NO. 1

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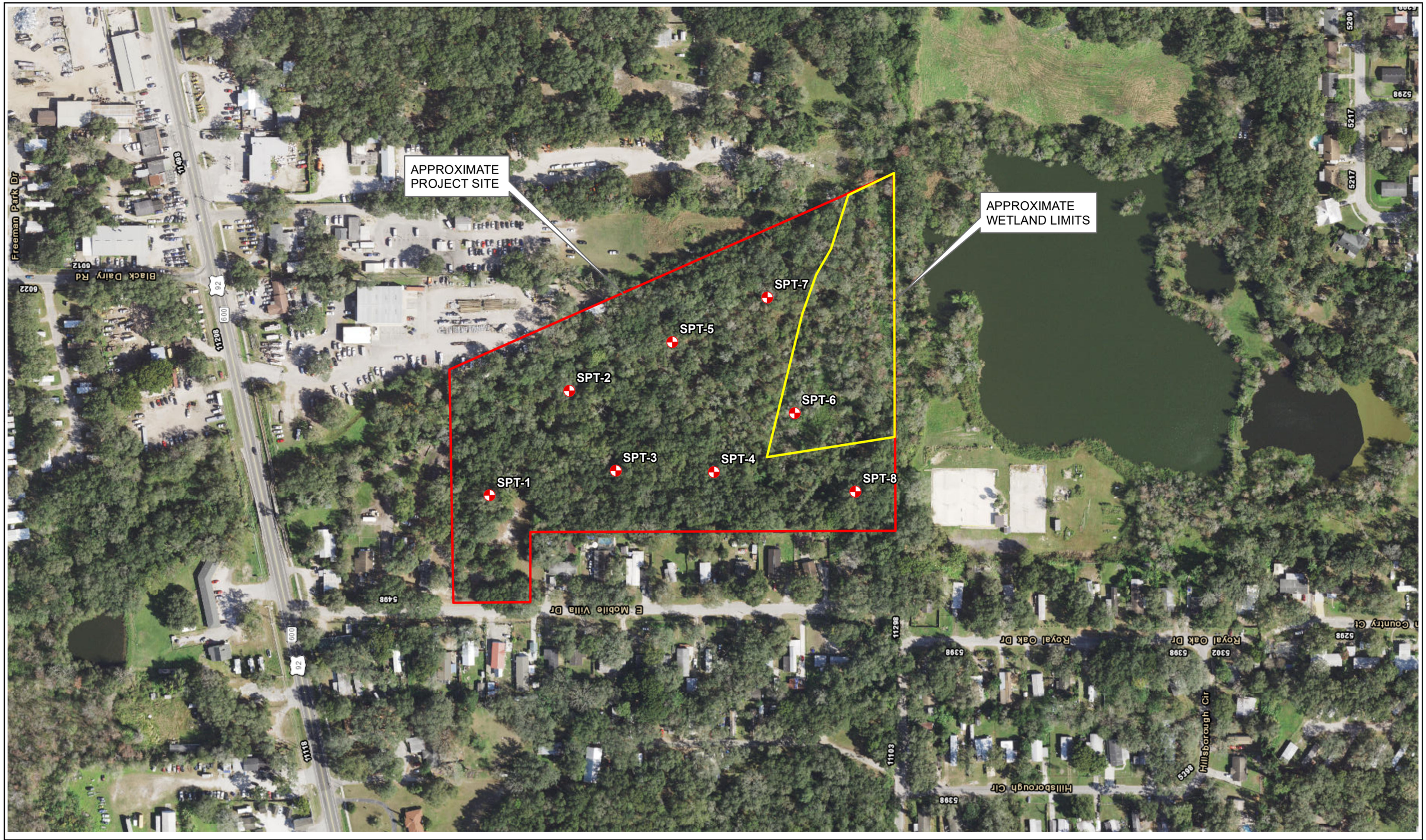

APPROXIMATE SPT BORING LOCATION

N

0 100 200
Feet

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SEFFNER TOWNS

BORING LOCATION PLAN

FIGURE NO.
2

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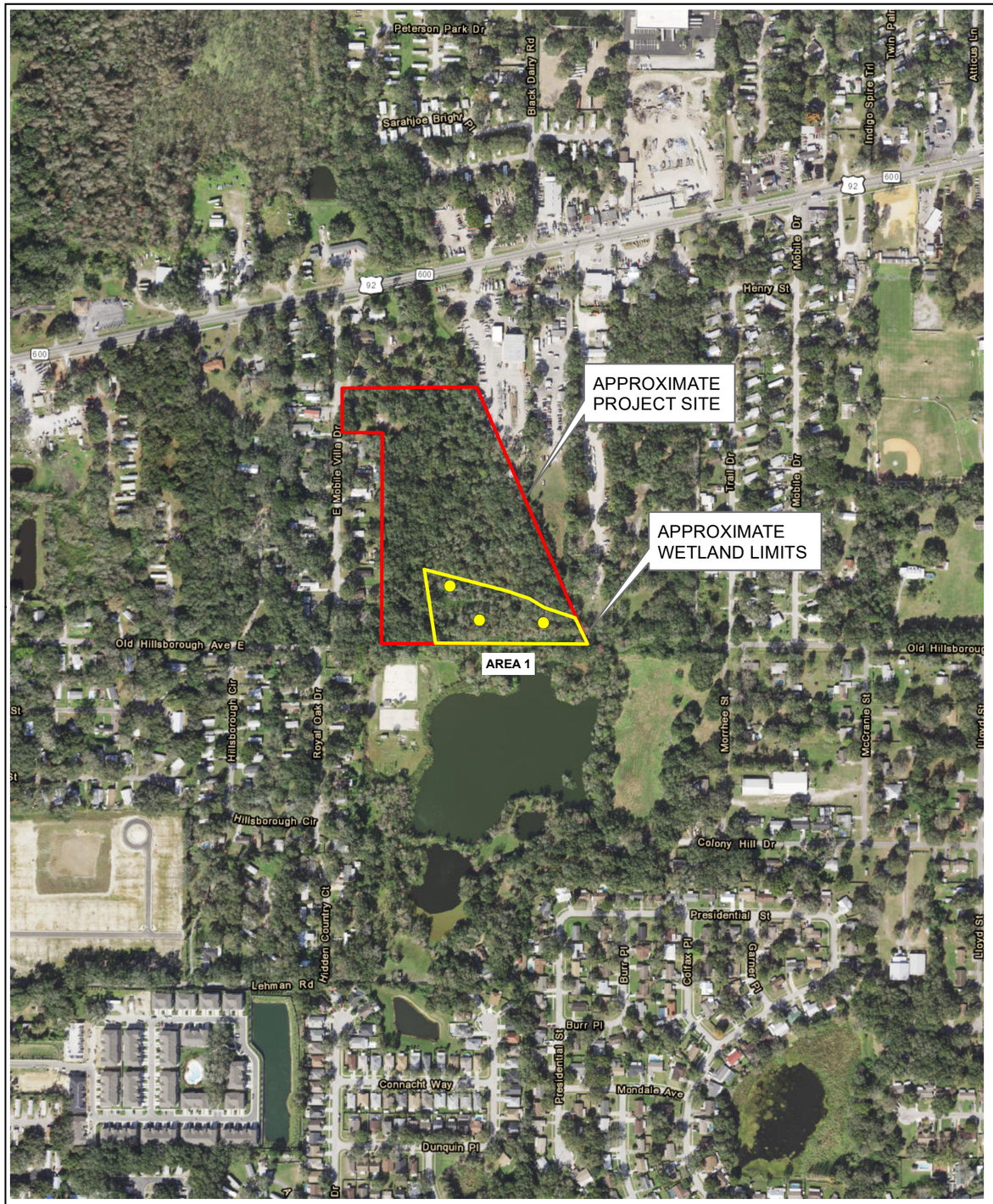

AREA 1
Scale: 1"=100'

N

STANDING WATER DEPTH (FT.)
0.5 | 1.9 APPROXIMATE MUCK PROBE LOCATION
SURFICIAL MUCK THICKNESS (FT.)

0 250 500
Feet

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SEFFNER TOWNS

MUCK PROBE LOCATION PLAN WITH RESULTS

FIGURE NO. 3

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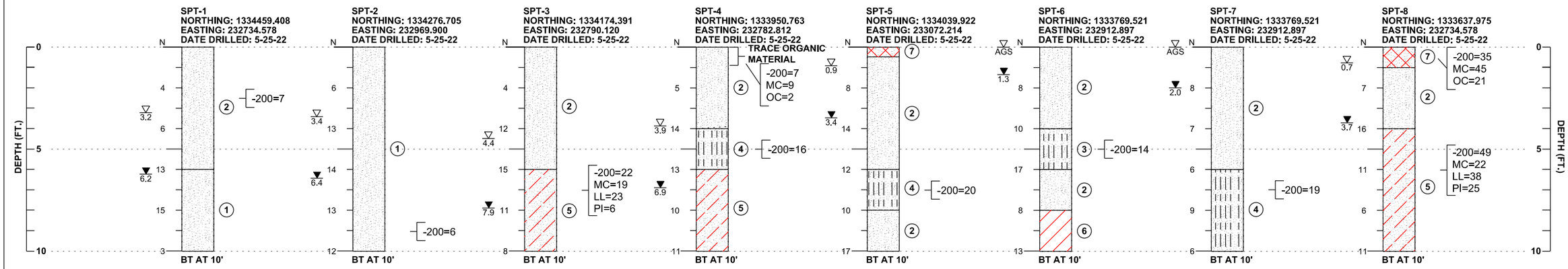

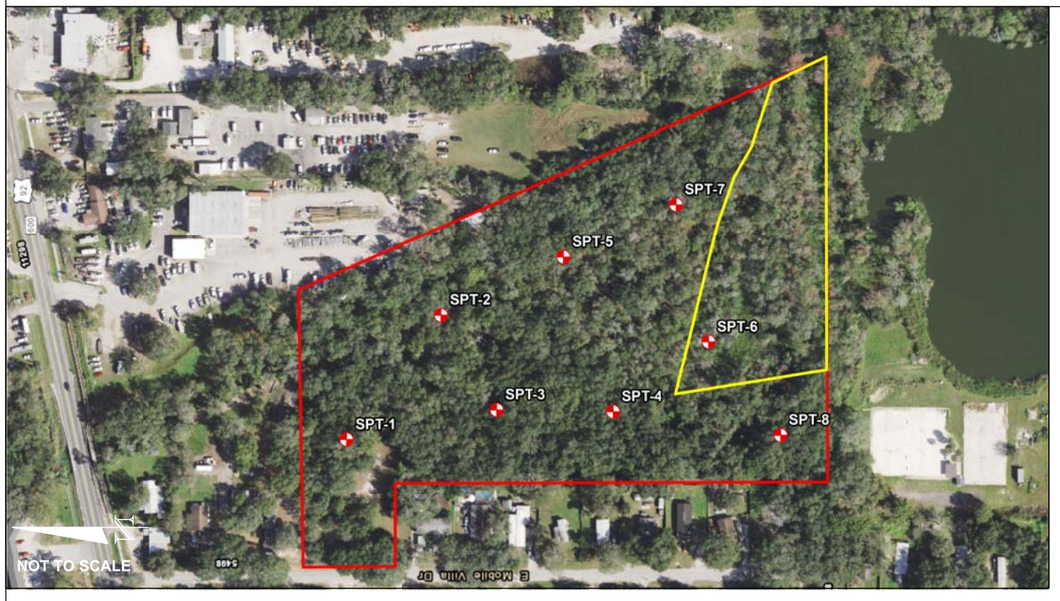

LEGEND

N	STANDARD PENETRATION RESISTANCE, BLOWS PER FOOT
▽ AGS	ESTIMATED SEASONAL HIGH GROUNDWATER LEVEL ABOVE GROUND SURFACE
▽ 3.2	ESTIMATED SEASONAL HIGH GROUNDWATER DEPTH (FT.)
▼ 6.2	ENCOUNTERED GROUNDWATER DEPTH (FT.) 24 HRS. AFTER DATE DRILLED
BT	BORING TERMINATED AT DEPTH INDICATED
-200=	PERCENT PASSING NO. 200 U.S. STANDARD SIEVE
MC=	PERCENT NATURAL MOISTURE CONTENT
LL=	LIQUID LIMIT
PI=	PLASTICITY INDEX
OC=	PERCENT ORGANIC CONTENT

GENERAL NOTES

SUBSURFACE CONDITIONS SHOWN ON THE BORINGS REPRESENT THE CONDITIONS ENCOUNTERED AT THE BORING LOCATIONS. ACTUAL CONDITIONS BETWEEN THE BORINGS MAY VARY FROM THOSE SHOWN. UNIFIED SOIL CLASSIFICATIONS SHOWN ON THE BORINGS ARE BASED ON VISUAL EXAMINATION AND THE LABORATORY TESTING SHOWN.

STANDARD PENETRATION TEST BORINGS WERE PERFORMED IN ACCORDANCE WITH ASTM D-1586. STANDARD PENETRATION RESISTANCES ARE SHOWN ON THE BORINGS AT THE TEST DEPTHS IN BLOWS PER FOOT UNLESS OTHERWISE NOTED.

BORING LOCATIONS WERE ESTABLISHED IN THE FIELD USING A SUB-METER ACCURACY TRIMBLE GPS UNIT.

SPLIT SPOON SAMPLER:
INSIDE DIAMETER: 1.375 IN.
OUTSIDE DIAMETER: 2.0 IN.
AVERAGE HAMMER DROP: 30 IN.
HAMMER WEIGHT: 140 LBS.

STRATUM NO.	UNIFIED CLASSIFICATION	HATCHING	SOIL DESCRIPTION
1	SP		LIGHT BROWN FNE SAND
2	SP-SM		LIGHT BROWN TO DARK BROWN FINE SAND WITH SILT, TRACE ORGANIC MATERIAL
3	SM		BROWN SILTY FINE SAND (-200<15%)
4	SM		LIGHT BROWN TO GRAY SILTY FINE SAND (-200 ≥15%)
5	SC, CL		LIGHT BROWN TO BROWN TO GRAY CLAYEY FINE SAND TO SANDY LEAN CLAY
6	CH		GRAY FAT CLAY
7	PT		DARK BROWN MUCKY FINE SAND

AUTOMATIC HAMMER			
GRANULAR SOILS: SANDS		NON-GRANULAR SOILS: SILTS, CLAYS, MUCK	
N VALUE (BLOWS/FT)	RELATIVE DENSITY	N VALUE (BLOWS/FT)	CONSISTENCY
0-3	VERY LOOSE	0-1	VERY SOFT
3-8	LOOSE	1-3	SOFT
8-24	MEDIUM DENSE	3-6	FIRM
24-40	DENSE	6-12	STIFF
OVER 40	VERY DENSE	12-24	VERY STIFF
		OVER 24	HARD

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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SPT BORING RESULTS

FIGURE NO. 4

APPENDIX A
FIELD EXPLORATION METHODS

A. FIELD EXPLORATION METHODS

A.1 Standard Penetration Test Borings

Standard Penetration Test (SPT) borings were drilled in general accordance with ASTM Standard D1586. The boreholes were advanced by the rotary wash method with bentonite-based mud used as the circulating fluid to help remove cuttings and stabilize the borehole. GEC's field crew obtained SPT samples continuously in the borings to a depth of 10 feet and at 5-foot depth intervals thereafter. A GEC engineering technician supervised the drilling operation, and collected, examined and visually classified each sample. Representative samples were collected for further visual examination and classification in the GEC laboratory.

A.2 Groundwater Measurement

A GEC engineering technician measured the depth to groundwater in the boreholes at the time of drilling and again after approximately 24 hours. Once the 24-hour groundwater measurement was recorded, the boreholes were then backfilled with soil cuttings to prevailing ground surface.

A.3 Manual Muck Probes

Manual muck probes were performed by pushing a slender metal rod into the surficial soil and evaluating the relative resistance of the soil to manual penetration. Highly organic soils, such as muck and/or peat, are characteristically very soft and will easily yield to the manual probe. Manual probes, however, cannot detect peat or muck layers which are present beneath layers of sand or dense soils which cannot be penetrated by the probe. The probes can also penetrate to some extent in very loose sands which may be present beneath peat or muck layers. No soil samples are obtained for visual examination or laboratory testing when using this exploratory technique. The soil type being penetrated is inferred solely by evaluating the relative resistance of the soil to penetration. These limitations can lead to some under-estimation or over-estimation of peat or muck layer thicknesses. The probe data presented in this report should be evaluated with these limitations in mind.