REPORT OF PRELIMINARY GEOTECHNICAL ENGINEERING EVALUATION

VALHALLA POND

Hillsborough County, Florida

PREPARED FOR:

MERITAGE HOMES OF FLORIDA, INC.

10117 Princess Palm Avenue, Suite 550
Tampa, Florida 33610

FES PROJECT NO.: 20-4570

February 20, 2020

PREPARED BY:

FAULKNER
ENGINEERING SERVICES, Inc.

2734 Causeway Center Drive
Tampa, Florida 33619

February 20, 2020

Mr. Garth Noble
Meritage Homes of Florida, Inc.
10117 Princess Palm Avenue, Suite 550
Tampa, Florida 33610

RE: Report of Preliminary Geotechnical Engineering Evaluation
Valhalla Pond
Hillsborough County, Florida
FES Project No.: 20-4570

Dear Mr. Noble:

Faulkner Engineering Services, Inc. (FES) has completed a preliminary geotechnical engineering evaluation for the referenced project. We provided our services in general accordance with our proposal number P19-6886 (Rev.1), dated December 18, 2019 and revised on January 17, 2020. The purpose of our preliminary geotechnical engineering evaluation was to evaluate the suitability of a limited sampling of the subsurface soils to support residential development. This report summarizes the field exploration performed by FES and presents our findings, conclusions, and preliminary geotechnical engineering recommendations.

PROJECT INFORMATION

Existing Site

Valhalla Pond property consists of two (2) contiguous parcels totaling approximately ±109.85 acres and located at the northwest corner of Valhalla Pond Road and Gornto Lake Road in Hillsborough County, Florida within Section 5, Township 30 South and Range 20 East and Section 32, Township 29 South, and Range 20 East. The property is currently undeveloped and appears to have been a borrow area. The majority of the property is a large pond that appears to have been mined and overburden soils were placed in upland portion of the site during the construction of the interstate 75. The site topography is generally level and slopes towards the pond. A general site location map is included as **Figure 1**.

Soil Survey Review

As part of our evaluation we have reviewed applicable sections of the "Soil Survey for Hillsborough County, Florida" as prepared by the U.S. Department of Agriculture Natural Resource Conservation Service (formerly the Soil Conservation Service). According to the Soil Survey the property is primarily underlain by:

- *Basinger, Holopaw, and Samsula soils, depressional (Map Unit Symbol 5)* – NRCS defines each of these three soil units as very poorly drained and located in depressions on marine terraces. The Basinger soil unit typically has a surface layer of fine sand extending to a depth of 80 inches below ground surface (bgs). The Holopaw soil unit typically has a surface layer of fine sand extending to a depth of about 52 inches bgs underlain by sandy loam to a depth of about 80 inches bgs. Samsula soil unit typically has a surface layer of muck to a depth of about 34 inches bgs followed by fine sand to a depth of about 80 inches bgs. NRCS indicates the seasonal high ground water table (SHGWT) for each of these three soil units is at the ground surface and water frequently ponds.

- *Malabar fine sand, 0 to 2 percent slopes (Map Unit Symbol 27)* – The NRCS defines this unit as poorly drained and located on flats and drainageways on marine terraces. The NRCS indicates that this soil unit has a surface layer of fine sand to a depth of 42 inches bgs followed by fine sandy loam to a depth of 59 inches bgs underlain by loamy fine sand to 80 inches bgs. The NRCS indicates the SHGWT ranges from 3 to 18 inches bgs.
- *Myakka fine sand, 0 to 2 percent slopes (Map Unit Symbol 29)* – The NRCS defines this unit as poorly drained and located on drainageways on flatwoods on marine terraces. The NRCS indicates this soil unit typically has a surface layer of fine sand to a depth of 80 inches bgs. The NRCS indicates the SHGWT is at a depth of 6 to 18 inches bgs.
- St. Johns fine sand (Map Unit Symbol 46) – NRCS defines this unit as poorly drained and located on flats on marine terraces. Soils consist of a surface layer of fine sand extending to a depth of 80 inches bgs. NRCS indicates the SHGWT is 0 to 12 inches bgs.
- *Smyrna fine sand, 0 to 2 percent slopes (Map Unit Symbol 52)* – NRCS describes this soil unit as nearly level and poorly drained. Soils typically consist of a surface layer of fine sand to a depth of 80 inches bgs. NRCS indicates the SHGWT for this soil unit is at a depth of 6 to 18 inches bgs.

The NRCS soil classifications are based on interpretation of a combination of factors including but not limited to aerial photographs and widely spaced hand auger borings. Borders shown on the map included in **Appendix A**, between mapping units are approximate, and the transitions between soil units will be gradual. In addition to various minor inclusions within a mapped soil unit, areas of dissimilar soils can also occur. However, the soil survey provides a good basis for an initial evaluation of shallow soil conditions in the area, and can provide an indication of various historic activities such as development, mining and filling operations at the site.

SUBSURFACE SOILS EEVALUATION

Field Evaluation

During our field evaluation, eight (8) standard penetration test (SPT) borings were advanced to depths of approximately 25 feet bgs at generally equal intervals across the property. The fieldwork was performed on January 23, 2020. The procedures used by FES for field sampling and testing were in general accordance with ASTM procedures, industry standards of care, and established geotechnical engineering practice. In addition to the SPT borings, ten (10) test pits were excavated at generally equal intervals across the property to a depth of about 10 feet bgs on February 4, 2020.

A senior geotechnical engineering technician from FES, experienced in soil sampling and classifications, was onsite during the fieldwork to monitor the drilling and also perform a brief cursory site reconnaissance, noting pertinent site and topographic features as well as surface indicators of soil conditions. The SPT borings (B-1 to B-8) and the test pits (TP-1 to TP-10) were located in the field by FES personnel using a handheld GPS unit. The GPS coordinates of the boring locations were obtained by superimposing the concept plan over an aerial image using Google Earth. Because of the methods used the test locations shown on **Figure 2** should be considered approximate.

The SPT borings were performed using an all-terrain vehicle mounted CME-45 drill rig, operated by J & R Precision Drilling, Inc. The SPT borings were performed utilizing continuous sampling methods within the first 10 feet and every 5 feet thereafter until reaching the termination depths of the borings, employing wet rotary drilling techniques to keep the boreholes from collapsing. The drillers collected soil samples using a 1.4-inch I.D. split barrel sampler driven by an automatic hammer system with a 140-pound hammer falling a distance of 30 inches, in general accordance with standard penetration test procedures (ASTM D1586). Upon completion, each borehole was backfilled with cuttings to the surface.

Test pit excavations were performed using a large excavator. Meritage contracted with Ripa & Associates, LLC. (Ripa) who provided the excavator and operator. The test pits were excavated to depths of approximately 10 feet bgs under the direction of FES representative. Upon completion, each test pit was backfilled with cuttings to the surface.

Detailed descriptions of the soils encountered during the field exploration are presented on the attached boring logs and test pit profiles in **Appendix B**.

Soil Sample Handling, Classification, and Laboratory Testing

FES field personnel classified the soils obtained from the field sampling using standard visual manual methods in accordance with ASTM D2488. The samples recovered from the SPT borings and test pits were placed in sealed containers to retain moisture and transported to the FES soils laboratory accredited by Construction Materials Engineering Council, Inc., (CMEC) for further evaluation and testing. To further aid in classification and evaluation of geotechnical engineering properties, laboratory testing was performed on representative soil samples collected during the field sampling. The laboratory testing performed was in general accordance with appropriate sections of ASTM D1140, material finer than the No. 200 mesh sieve and ASTM D4318, Atterberg Limits. The laboratory test results were in general accordance with field classification of the soils except some soils were reclassified based on the fines content from laboratory testing. The laboratory test results and the soil classifications were reviewed by a professional geotechnical engineer. The results from the laboratory testing are presented on the boring logs and test pit profiles contained in **Appendix B**.

FINDINGS

Subsurface Conditions

General Soil Profile

The subsurface stratigraphy at the project site is illustrated in the soil boring logs and test pit profiles shown in **Appendix B**. The logs and profiles were developed using field and laboratory data from the SPT borings and test pits. The computer generated soil logs and profiles should imply no increased accuracy. Based on this data, four subsurface units, or strata, were identified at the site as described below.

Stratum 1	SAND, SAND with clay, SAND with silt; loose to medium dense, fine grained quartz, with clay, silt, with occasional rock fragments
	USCS classification = SP, SP-SC, SP-SM
Stratum 2	CLAYEY SAND, SILTY SAND; very loose to medium dense, fine grained quartz variably clayey, silty, with occasional cementation, limestone fragments
	USCS classification = SC, SM
Stratum 3	CLAY, SILT; soft to hard, variably sandy, with occasional limestone fragments, cementation, occasionally calcareous
	USCS classification = CL, ML
Stratum 4	LIMESTONE; limestone bedrock

Stratum 1 occurred in only one SPT boring (B-7) and was encountered as a thin layer at the surface in all but two test pits performed at the site. This stratum typically extended with varying thicknesses from ground surface to approximately 0.5 to 1.0 foot bgs in the test pits and to approximately 23.5 feet bgs in the SPT boring. This soil unit consisted of sand, sand with clay, and sand with silt with SPT "N" values ranging from 6 to 21 blows per foot indicating loose to medium dense relative density. The results of laboratory testing performed on representative samples from boring B-7 (0 to 2 feet bgs and 4 to 6 feet bgs) indicated fines contents of 10.3 and 3.4 percent, respectively.

Stratum 2 occurred in all the borings and tests pits performed at the site. This stratum occurred as the surficial stratum in 6 SPT borings and two test pits. Stratum 2 consisted of clayey sand and silty sand and typically extended with varying thicknesses to depths ranging from about 2 feet bgs to SPT boring termination depths of about 25 feet bgs and test pit termination depths of about 10 feet bgs. The SPT "N" values within this stratum ranged from 3 to 15 blows per foot indicating very loose to medium dense relative density. The results of laboratory testing performed on representative samples of this stratum indicated fines contents ranging from 18.1 to 49.1percent, Atterberg Limits tests performed on samples from boring B-5 (2 to 4 feet, bgs) and B-8 (0 to 2 feet, bgs) indicated liquid limits of 40 and 39 percent and plasticity indices of 26 and 20, respectively.

Stratum 3 occurred in all but one SPT boring and 6 of 10 test pits performed on site. This Stratum consisted of clay and silt and typically extended with varying thicknesses from existing ground surface to depths ranging from 4 feet bgs to SPT boring termination depths of about 25 feet bgs and test pit termination depths of about 10 feet bgs. The SPT "N" values within this stratum ranged from 4 to 51 blows per foot indicating soft to hard consistency. The results of laboratory testing performed on representative samples of this stratum indicated fines contents ranging from 63.6 to 83.5 percent.

Stratum 4 consisted of limestone and was encountered in two borings (B-3 and B-8) and was not encountered in any of the test pit excavations within the depths explored. Stratum 4 typically extended from about 13.5 feet bgs to boring termination at about 25 feet bgs. The SPT "N" values within this stratum ranged from 4 to 24 blows per foot.

The conditions presented above highlight the major subsurface stratifications encountered during our field evaluation of the site. More detailed descriptions of the materials encountered are provided in **Appendix B**. A soil classification key sheet is also included as **Appendix C**. It should be understood that subsurface conditions will vary across this site and between test locations. Changes in subsurface strata may be more gradual than indicated.

Groundwater

Groundwater was encountered only in one SPT boring (B-7) at a depth of approximately 6.5 feet bgs at the time of drilling and not-encountered within the first 10 feet in the remaining borings, after which drilling fluid was introduced to keep the boreholes from collapsing. Groundwater could not be measured in the test pit excavations due to test pit collapse. Groundwater levels will fluctuate with time due to seasonal rainfall and locally heavy precipitation events; therefore, future groundwater levels may be encountered at depths different from those indicated by our borings.

The SHGWT is typically encountered during late summer following the rainy season. Several factors can affect the seasonal high groundwater level such as drainage characteristics of the soils; land surface elevation; and relief points such as lakes, rivers, and swamps. Based on our experience (soil indicators were not encountered), review of the soil survey for Hillsborough County, we estimate the seasonal high groundwater levels at the boring locations may be encountered at about 5.0 feet bgs.

PRELIMINARY CONCLUSIONS

Our geotechnical engineering evaluation of this site and our recommendations with respect to the planned residential development are based on our site observations, the field exploratory data obtained from our borings and test pits, laboratory testing results, and our professional judgment.

As previously discussed, it appears that the project area was previously mined and the overburden soils placed in the upland areas of the site. The soils encountered in our SPT borings and test pits were heterogeneous and consisted of sand (SP), sand with clay (SP-SC), sand with silt (SP-SM) (Stratum 1) clayey sand (SC), silty sand (SM) (Stratum 2), clay (CL), silt (ML) (Stratum 3), and limestone bedrock (Stratum 4), interlayered with varying thicknesses from ground surface to boring termination depths of about 25 feet bgs and test pit termination at about 10 feet bgs. Unsuitable bearing soils consisting of clayey sand (SC) and clay (CL) (with fines contents greater than our recommended maximum value of 35 percent for structural fill) were encountered in a majority of borings and test pits at shallow depths as observed in the soil boring logs and profiles included in **Appendix B**.

The subsurface soils at the site within the upper 10 feet are generally very loose to medium dense (sands) with penetration resistances ranging from 3 to 21 blows per foot and soft to stiff (fine-grained soils) with penetration resistances ranging from 4 to 9 blows per foot. The soils below 10 feet extending to the termination of the borings were very loose to medium dense (sands) with penetration resistances ranging from 4 to 15 blows per foot and soft to hard (fine-grained soils) with penetration resistances ranging from 4 to 51 blows per foot. The limestone was competent with SPT “N” values ranging from 4 to 24 blows per foot.

It is our opinion that remediation of the site consisting of either ground improvement/ground modification procedures or a deep foundation system will be required in order to support the planned multi-family residential structures. It appears typical lightly-loaded residential structures can be supported using a shallow foundation system provided the site soils within all structural areas are undercut and replaced with suitable structural fill such that a minimum of 3 feet of separation is maintained between the bottom of the lowest footer and the unsuitable high-fines content soils. However, a more extensive geotechnical engineering evaluation should be performed including SPT borings within the structure areas once the site plan is finalized in order to determine the appropriate remediation program and to provide foundation design recommendations.

Groundwater table was encountered only in one boring, B-7 at about 6.5 feet bgs at the time of drilling and not-encountered within the first 10 feet in the remaining borings. For shallow foundation system we recommend a minimum separation of 1 foot be maintained between the bottom of the lowest footing and the estimated SHGWT. Dewatering of borrow excavations should be anticipated for groundwater control.

We reviewed historic aerial images of the site dating back to 1938. It appears the site was vacant until 1984 when it was possibly mined for fill material for the I-75 construction. Subsequently, the site is being used as a pasture.

A majority of the encountered shallow soils at the site will not provide a suitable subgrade for roadway pavements. The soils should be undercut and replaced using soils with fines contents of less than 15 percent a minimum of 24 inches below the bottom of the planned base course. Additionally, the encountered Stratum 3 soils are unsuitable for reuse as backfill for utility installation. Stratum 2 soils may be used as backfill provided they conform to the criteria specified below. However, based on the heterogeneous nature of the encountered soils and the results of laboratory testing performed on the Stratum 2 soils, it appears most of the Stratum 2 soils may not be suitable for reuse as backfill.

Groundwater table was only encountered in SPT boring (B-7) at a depth of about 6.5 feet bgs and not-encountered within the first 10 feet in the other borings at the time of drilling. Dewatering of borrow excavations should be anticipated for groundwater control.

If development of this property is to proceed, at a minimum, shallow auger borings should be performed along the planned roadway alignments in accordance with Hillsborough County standards to develop appropriate pavement sections. Borings should also be performed in proposed stormwater ponds and structure areas to provide information for pond design, further evaluate the suitability of encountered soils for use as structural fill, and provide recommendations for foundation design and ground modification/improvement.

Use of Information

It should be noted that subsurface conditions can vary across this site and between boring locations. Conditions can also vary in areas not explored by our borings. FES cannot be responsible for interpretations made by others based on the information contained in this report and the attachments.

PRELIMINARY EARTHWORK RECOMMENDATIONS

Borrow Areas

Structural Fill Suitability

Definition

The preferred soil used for structural fill and backfill can be defined as clean fine sand containing less than twelve percent material by weight that is finer than a number 200 sieve (material conforming to SP to SP-SM or SP-SC in the Unified Soils Classification System).

Encountered soils containing up to 35 percent fines (materials conforming to SC, SM or SC-SM in the Unified Soil Classification System) may also be utilized as structural fill, provided the working subgrade is above the existing groundwater level. However, Florida Building Code (Chapter 18, Section 1803.5.3) states that soils with plasticity index of 15 or greater are considered expansive and hence are unsuitable for use as structural fill. Please note that soils conforming to SC, SM, or SC-SM are difficult to work with and will require additional time and effort for either drying or moisture conditioning during placement and compaction.

Any muck or organic laden soil if encountered on site will not be suitable for fill and should be disposed of offsite or placed in landscape areas and used for planting purposes. In addition, soils containing organic content, as determined by ASTM D2974, of more than 5 percent shall not be used as structural fill. Because of the variability of the subsurface soils encountered, additional laboratory testing should be performed on the excavated material during earthwork activities to evaluate its suitability for use as fill material.

Placement

Structural fill with less than 12 percent fines should be placed in lifts not to exceed one foot thick. Materials with fines content greater than 12 percent should be placed in maximum 6-inch loose lifts. The fill material should be compacted to at least 95 percent of its modified Proctor maximum dry density and the moisture content shall be maintained within 2 percent of the optimum moisture content (ASTM D1557). Confined areas, such as utility trenches, should be compacted with manually operated vibratory compaction equipment.

Field density testing to verify compaction should be performed for each lift of structural fill placed for each 2,500 square feet of area below structures and for each 5,000 square feet below pavements.

In pavement areas, the subbase and base materials should be tested to the same frequency. Density tests should be performed for each lift of fill for every 100 lineal feet of backfill placed in utility excavations or other excavations that are within the paving areas.

Depending on the time of year construction occurs, materials excavated and imported containing clay fines may exist in a saturated condition. These soils will require processing and drying to achieve a moisture content to allow placement and proper compaction. Spreading the clayey material in thin lifts (6 inches loose thickness) and aerating by disking can facilitate and hasten the drying process. Disking will also be useful to breakdown larger clods of clayey soils.

Specialty equipment typically associated with clayey soils such as a sheep's foot roller will also be required to achieve proper compaction. The placement and compaction of moisture sensitive soils of this type will require time and effort beyond that typically associated with sandy soils. A grading contractor experienced with placing and compaction of clay soils can likely reduce costly project delays due to soil conditions.

Groundwater Control

Groundwater may be encountered during excavation activities. Dewatering may be accomplished by either draining the water to sumps which can then be pumped away from the area or by the use of sanded, vacuum well points. Groundwater fluctuations can occur due to variations in rainfall and other site-specific factors. These variations should be considered when planning earthwork activities.

An alternative to dewatering in shallow undercut areas where groundwater is encountered is to use clean sand classified as SP material (less than 5% fines) according to the Unified Soil Classification System as a first lift through any standing water. This first lift will create a platform to place and compact additional fill material upon.

LIMITATIONS

This report has been prepared for the exclusive use of **Meritage Homes of Florida, Inc.** for the specific application to the project previously discussed. Our conclusions and recommendations have been rendered using generally accepted standards of geotechnical engineering and geology practice in the state of Florida. No other warranty is expressed or implied.

Our conclusions and recommendations are based on the design information furnished to us, the data obtained from the previously described subsurface exploration, and our experience. They do not reflect variations in the subsurface conditions that are likely to exist in the region of our borings and in unexplored areas of the site. These variations are due to the inherent variability of the subsurface conditions in this geologic region. Should variations become apparent during construction, it will be necessary to re-evaluate our conclusions and recommendations based upon our on-site observations of the conditions.

Florida is underlain by limestone bedrock that is susceptible to dissolution and the subsequent development of karst features such as voids and sinkholes in the natural soil overburden. Construction in a sinkhole prone area is therefore accompanied by some risk that internal soil erosion and ground subsidence could affect new structures in the future. It is not possible to study or design to completely eliminate the possibility of future sinkhole related problems. In any event, the Owner must understand and accept this risk.

The scope of our services does not include any environmental assessments or studies for the possible presence of hazardous or toxic materials in the soil, groundwater or surface water within or in the general vicinity of the site studied. Any statements made in this report or shown on the test boring logs regarding unusual subsurface conditions and/or composition, odor, staining, origin or other characteristics of the surface and/or subsurface materials are strictly for the information of our client and may or may not be indicative of an environmental problem.

CLOSING

Faulkner Engineering Services, Inc. appreciates the opportunity to be of service to **Meritage Homes of Florida, Inc.** by providing these geotechnical consulting services and we look forward to assisting you through project completion. If you have any questions concerning this report, please do not hesitate to contact the undersigned.

Sincerely,

Faulkner Engineering Services, Inc.

Sidni Hoxha, E.I.
Staff Geotechnical Engineer

PAVAN K. KOLUKULA LICENSE No. 83670 STATE OF FLORIDA PROFESSIONAL ENGINEER

Digitally signed by Pavan K Kolukula
DN: c=US, o=Faulkner Engineering Services Inc., ou=A01427E00000169350D9024000070A5, cn=Pavan K Kolukula
Date: 2020.02.20 16:59:59 -05'00'

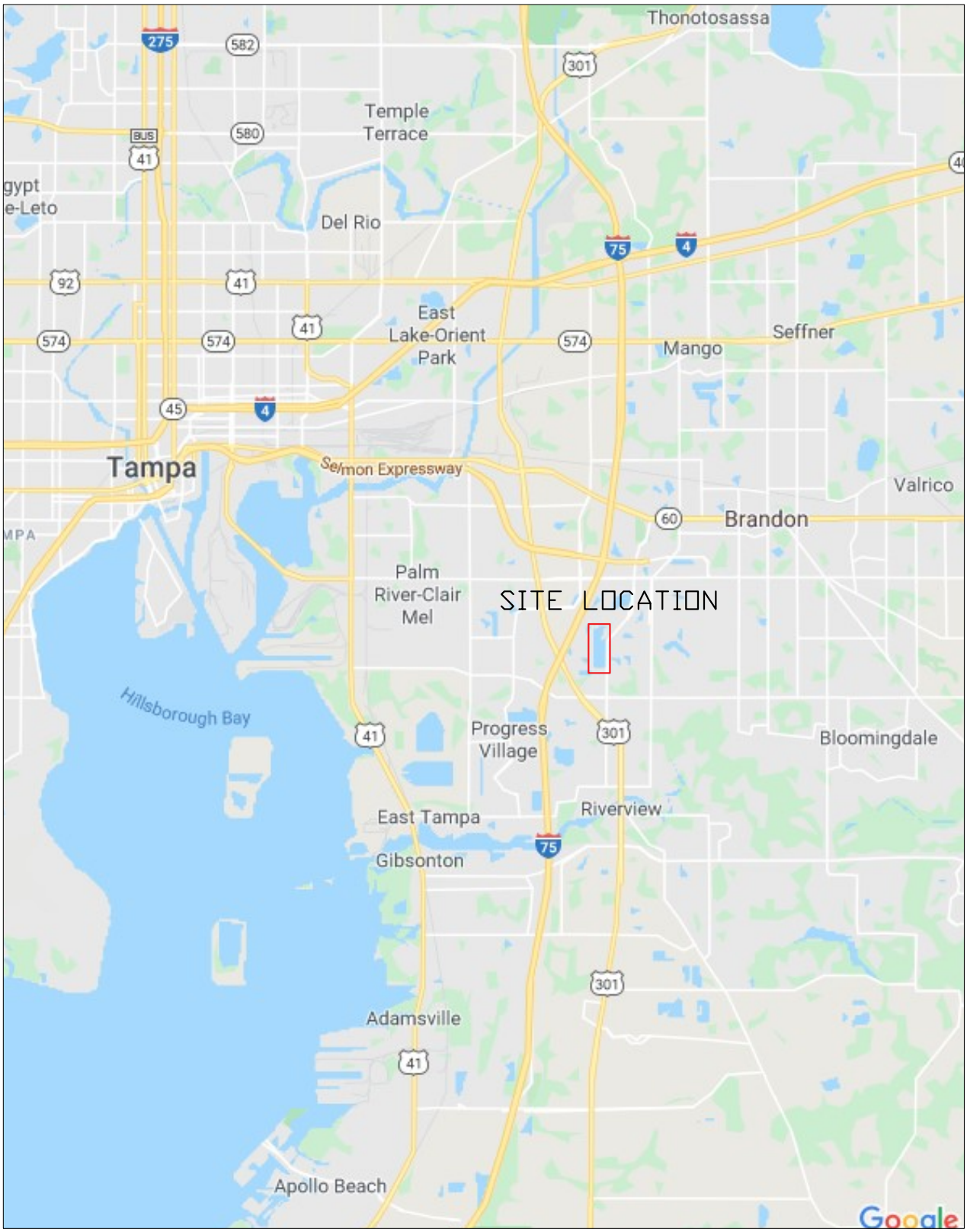
Pavan K. Kolukula, P.E.
Senior Geotechnical Engineer
Florida License No. 83670

This item has been digitally signed and sealed by Pavan K. Kolukula, P.E. on the date adjacent to the seal. Printed copies of this document are not considered signed and sealed and the signature must be verified on any electronic copies.

Attachments: Figure 1: Site Location Map
Figure 2: Test Location Plan

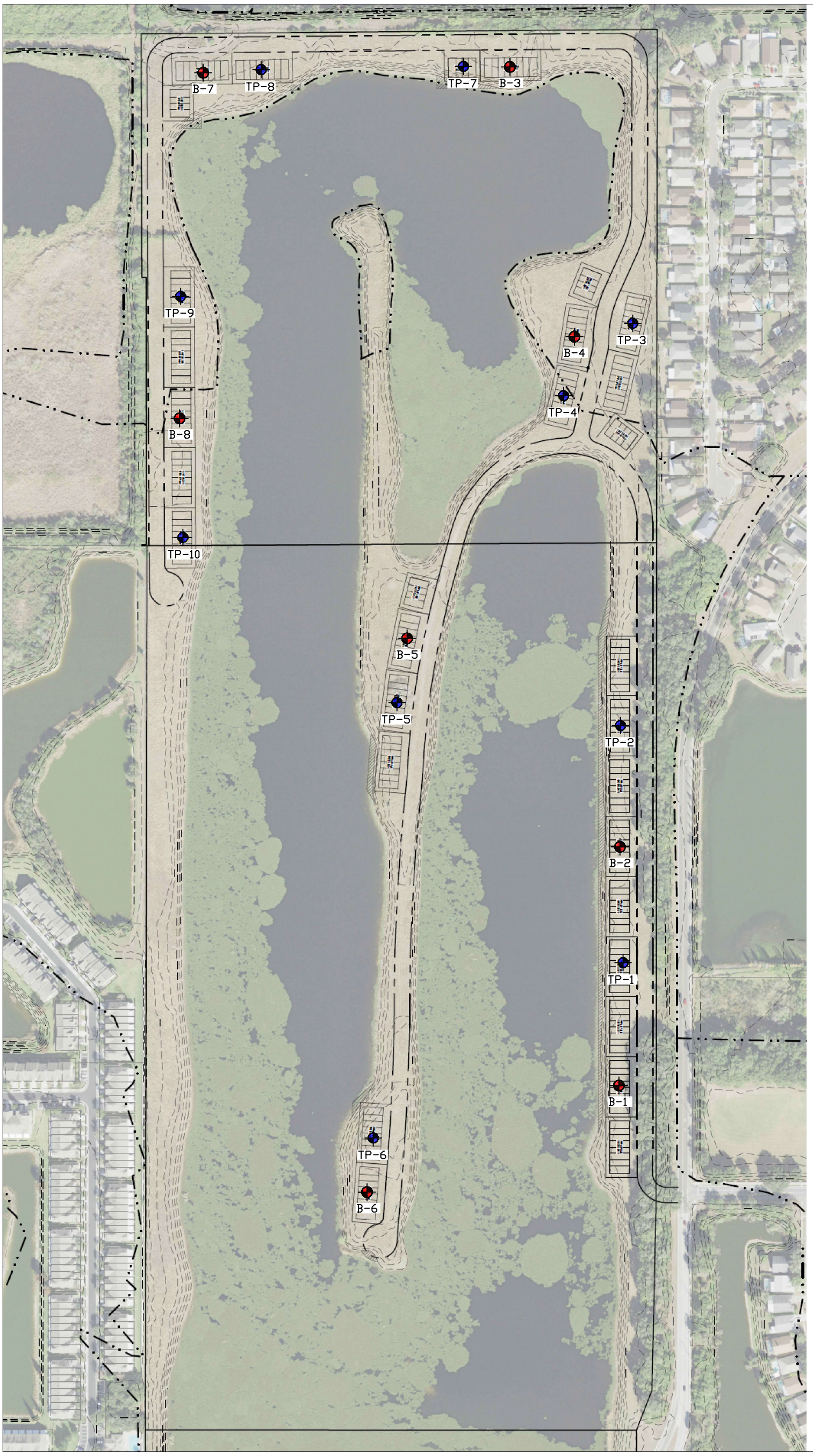
Appendix A: Soil Survey Map
Appendix B: Logs of Soil Borings and Test Pit Profiles
Appendix C: Key to Soil Classification

SITE LOCATION MAP



FAULKNER ENGINEERING SERVICES, Inc.	Valhalla Pond	N.T.S.	DATE 02.20.20 / JOB NO. 20-4570
Geotechnical Engineers Construction Material Testing 2734 Causeway Center Dr Tampa, Florida 33619 PHONE: 813.621.8168 FAX: 813.621.8232 www.faulknereng.com		DRAWN: SH CHKD: PK	FIGURE 1

TEST LOCATION PLAN



LEGEND

B-1 SPT BORING

TP-1 TEST PIT EXCAVATION

Note:
Basemap prepared LevelUp Consulting, LLC

FAULKNER ENGINEERING SERVICES, Inc.

Geotechnical Engineers
Construction Material Testing

2734 Causeway Center Dr
Tampa, Florida 33619
PHONE: 813.621.8168
FAX: 813.621.8232
www.faulknereng.com

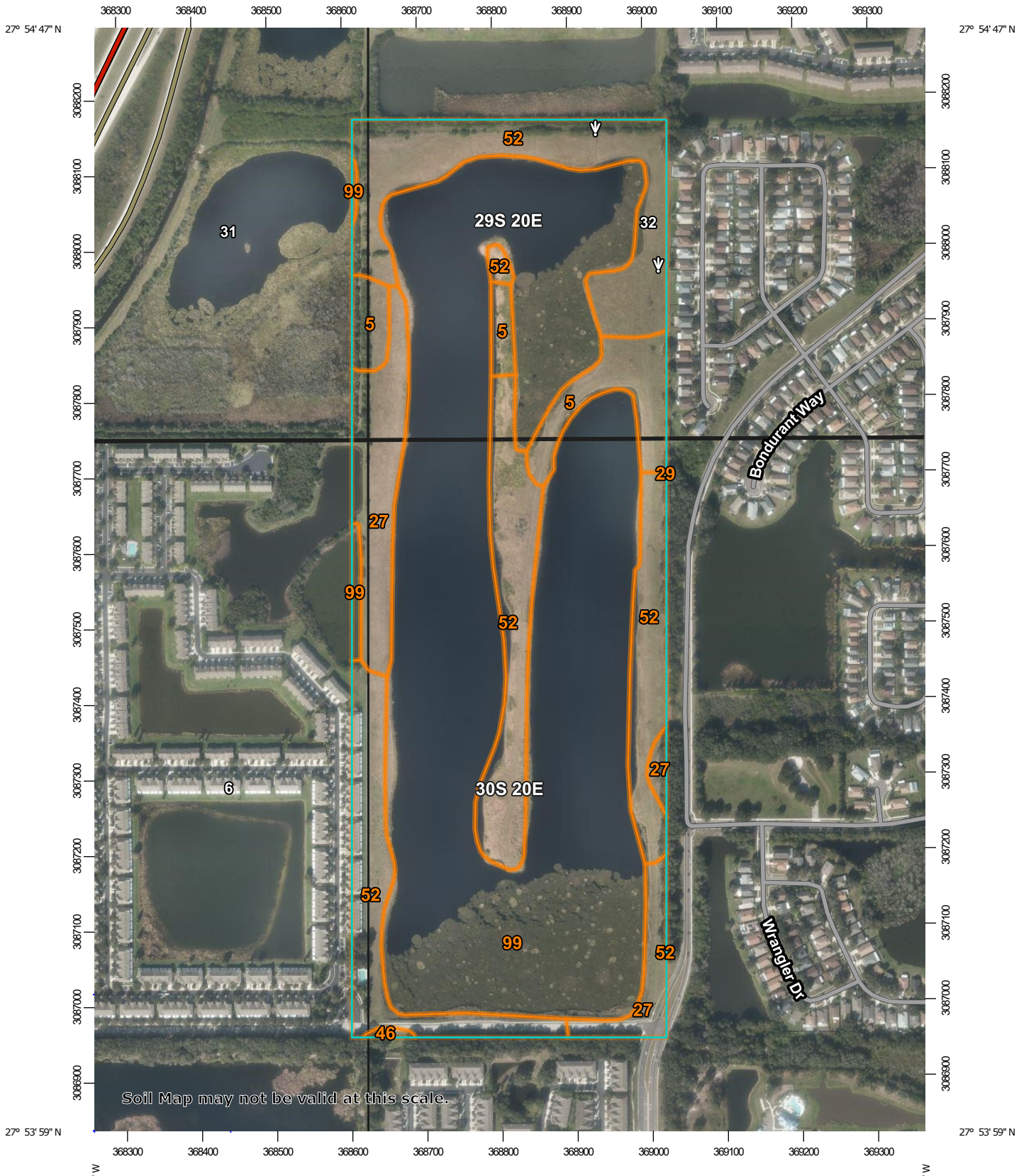
Valhalla Pond

N.T.S.	DATE 02.20.20	JOB NO. 20-4570
DRAWN: SH	FIGURE 2	
CHKD: PK		

APPENDIX A

Soil Survey Map

Soil Map—Hillsborough County, Florida
(Valhalla Pond)



Map Scale: 1:7,130 if printed on A portrait (8.5" x 11") sheet.

N

Meters: 0 100 200 400 600

Feet: 0 300 600 1200 1800

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 17N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Political Features
- PLSS Township and Range
- PLSS Section

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:20,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL:
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: Hillsborough County, Florida
Survey Area Data: Version 19, Feb 3, 2020

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: Dec 6, 2018—Dec 17, 2018

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

Map Unit Symbol	Map Unit Name	Acres in AOI	Percent of AOI
5	Basinger, Holopaw, and Samsula soils, depressional	6.3	5.0%
27	Malabar fine sand, 0 to 2 percent slopes	8.9	7.1%
29	Myakka fine sand, 0 to 2 percent slopes	0.0	0.0%
46	St. Johns fine sand	0.2	0.1%
52	Smyrna fine sand, 0 to 2 percent slopes	31.9	25.3%
99	Water	78.8	62.5%
Totals for Area of Interest		**126.2**	**100.0%**

APPENDIX B

SPT Boring Logs and Test Pit Profiles

FAULKNER ENGINEERING SERVICES, Inc.

DRILL HOLE LOG
BORING NO.: B-1

Project No.: 20-4570
Date: 1/23/2020

Project: Valhalla Pond
Client: Meritage Homes
Location: Hillsborough County, Florida
Driller: J&R Precision Drilling, Inc.
Drill Rig: CME 45
Depth to Water> **Initial** ▽ :

Elevation: NA
Logged By: SH
At Completion ▼ : NE @ 10'

Depth/ Elevation (ft)	Soil Symbols	USCS	Description	Sample Type	Sample No.	Standard Penetration Test Blows	N	Penetration Resistance (10 20 30 40 60 80)
0		CL	Medium, gray brown, CLAY (-200=83.5%)		1	2 3 3	6	
			With limestone fragments		2	3 3 3	6	
5		SC	Loose, gray, clayey SAND (-200=47.5%)		3	2 3 2	5	
			Very Loose		4	2 2 2	4	
		CL	Soft, gray, CLAY with cementation		5	2 2 2	4	
10								
			Medium, with sand		6	3 3 3	6	
15								
			With cementation		7	2 3 4	7	
20								
			Hard		8	18 22 29	51	
25			End of Boring					
30								
35								

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-2

FAULKNER ENGINEERING SERVICES, Inc.

Project No.: 20-4570
Date: 1/23/2020

Project: Valhalla Pond
Client: Meritage Homes
Location: Hillsborough County, Florida
Driller: J&R Precision Drilling, Inc.
Drill Rig: CME 45
Depth to Water> **Initial** ▽ :

Elevation: NA
Logged By: SH
At Completion ▼ : NE @ 10'

Depth/ Elevation (ft)	Soil Symbols	USCS	Description	Sample Type	Sample No.	Standard Penetration Test Blows	N	Penetration Resistance 10 20 30 40 60 80
0								
		SC	Loose, brown, clayey SAND (-200=31.4%)		1	2 2 3	5	
		CL	Stiff, brown, CLAY with limestone fragments		2	4 4 5	9	
5		ML	Medium, light brown, SILT with calcareous		3	3 3 3	6	
			Soft		4	3 2 2	4	
		SC	Loose, gray, clayey SAND (-200=29.5%)		5	2 2 2	4	
10								
		CL	Medium, gray, CLAY		6	3 4 4	8	
15								
			With cementation and sand		7	3 3 3	6	
20								
			Hard		8	11 20 27	47	
25			End of Boring					
30								
35								

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-3

FAULKNER ENGINEERING SERVICES, Inc.

Project No.: 20-4570
Date: 1/23/2020

Project: Valhalla Pond
Client: Meritage Homes
Location: Hillsborough County, Florida
Driller: J&R Precision Drilling, Inc.
Drill Rig: CME 45
Depth to Water> Initial :

Elevation: NA
Logged By: SH
At Completion : NE @ 10'

Depth/ Elevation (ft)	Soil Symbols	USCS	Description	Sample Type	Sample No.	Standard Penetration Test Blows	N	Penetration Resistance 10 20 30 40 60 80
0								
		SC	Very Loose, dark brown, clayey SAND (-200=18.9%)		1	1 2 2	4	
			Loose, brown, with rock fragments (-200=26.2%)		2	2 3 3	6	
5		CL	Medium, light gray, CLAY		3	3 3 3	6	
			Gray		4	2 3 2	5	
			Soft		5	2 2 2	4	
10								
			LIMESTONE		6	2 2 2	4	
15								
		SM	Loose, light gray, silty SAND		7	3 3 4	7	
20								
		CL	Medium, gray, CLAY with sand		8	2 3 5	8	
25			End of Boring					
30								
35								

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-4

FAULKNER ENGINEERING SERVICES, Inc.

Project No.: 20-4570
Date: 1/23/2020

Project: Valhalla Pond
Client: Meritage Homes
Location: Hillsborough County, Florida
Driller: J&R Precision Drilling, Inc.
Drill Rig: CME 45
Depth to Water> **Initial** ▽ :

Elevation: NA
Logged By: SH
At Completion ▼ : NE @ 10'

Depth/ Elevation (ft)	Soil Symbols	USCS	Description	Sample Type	Sample No.	Standard Penetration Test Blows	N	Penetration Resistance 10 20 30 40 60 80
0		SC	Loose, brown, clayey SAND (-200=39.6%)		1	2 2 3	5	
			(-200=37.6%)		2	3 4 4	8	
5			Gray		3	3 3 2	5	
			Very Loose		4	2 2 2	4	
			Loose, light brown, clayey SAND (-200=39.5%)		5	3 3 3	6	
10								
			Gray		6	3 3 4	7	
15								
					7	2 3 3	6	
20								
		ML	Stiff, light brown, calcareous SILT		8	3 4 5	9	
25			End of Boring					
30								
35								

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-5

FAULKNER ENGINEERING SERVICES, Inc.

Project No.: 20-4570
Date: 1/23/2020

Project: Valhalla Pond
Client: Meritage Homes
Location: Hillsborough County, Florida
Driller: J&R Precision Drilling, Inc.
Drill Rig: CME 45

Elevation: NA
Logged By: SH

Depth to Water> **Initial** ▽ : **At Completion** ▼ : NE @ 10'

Depth/ Elevation (ft)	Soil Symbols	USCS	Description	Sample Type	Sample No.	Standard Penetration Test Blows	N	Penetration Resistance (10 20 30 40 60 80)
0								
		SC	Very Loose, gray, clayey SAND (-200=49.1%)		1	1 1 2	3	
			(liquid limit=40%, plasticity index=26)		2	2 3 3	6	
5		CL	Medium, gray, CLAY		3	3 3 3	6	
			Brown		4	2 2 3	5	
					5	2 3 3	6	
10								
			Soft, gray (-200=78.7%)		6	2 2 2	4	
15								
		SC	Medium-Dense, gray, clayey SAND		7	4 6 9	15	
20								
		CL	Stiff, light brown, CLAY with calcareous		8	3 5 5	10	
25			End of Boring					
30								
35								

This information pertains only to this boring and should not be interpreted as being indicative of the site.

FAULKNER ENGINEERING SERVICES, Inc.

DRILL HOLE LOG
BORING NO.: B-6

Project No.: 20-4570
Date: 1/23/2020

Project: Valhalla Pond
Client: Meritage Homes
Location: Hillsborough County, Florida
Driller: J&R Precision Drilling, Inc.
Drill Rig: CME 45
Depth to Water> Initial ▽ :

Elevation: NA
Logged By: SH
At Completion ▼ : NE @ 10'

Depth/ Elevation (ft)	Soil Symbols	USCS	Description	Sample Type	Sample No.	Standard Penetration Test Blows	N	Penetration Resistance 10 20 30 40 60 80
0		SC	Very Loose, gray, clayey SAND (-200=46.3%)		1	2 2 2	4	
		CL	Medium, gray, CLAY		2	2 3 3	6	
5					3	3 3 3	6	
					4	3 3 3	6	
			Soft		5	2 2 2	4	
10								
			Medium		6	2 3 3	6	
15								
			With cementation (-200=66.3%)		7	3 3 4	7	
20								
			Stiff, with calcareous		8	3 4 5	9	
25			End of Boring					
30								
35								

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-7

FAULKNER ENGINEERING SERVICES, Inc.

Project No.: 20-4570
Date: 1/23/2020

Project: Valhalla Pond
Client: Meritage Homes
Location: Hillsborough County, Florida
Driller: J&R Precision Drilling, Inc.
Drill Rig: CME 45
Depth to Water> **Initial** ▽ **:**

Elevation: NA
Logged By: SH
At Completion ▼ **:** 6.5'

Depth/ Elevation (ft)	Soil Symbols	USCS	Description	Sample Type	Sample No.	Standard Penetration Test Blows	N	Penetration Resistance (10 20 30 40 60 80)
0								
		SP-SM	Medium-Dense, brown, fine SAND with silt with rock fragments (-200=10.3%)		1	1 9 6	15	
		SP	Medium-Dense, light brown, fine SAND		2	8 10 11	21	
5			Loose, brown (-200=3.4%)		3	7 6 4	10	
	▼	SP-SM	Loose, brown, fine SAND with silt		4	4 4 5	9	
					5	4 5 5	10	
10								
					6	3 4 4	8	
15								
			Dark brown		7	2 3 3	6	
20								
		SC	Very Loose, brown, clayey SAND		8	2 2 2	4	
25			End of Boring					
30								
35								

This information pertains only to this boring and should not be interpreted as being indicative of the site.

DRILL HOLE LOG
BORING NO.: B-8

FAULKNER ENGINEERING SERVICES, Inc.

Project No.: 20-4570
Date: 1/23/2020

Project: Valhalla Pond
Client: Meritage Homes
Location: Hillsborough County, Florida
Driller: J&R Precision Drilling, Inc.
Drill Rig: CME 45
Depth to Water> **Initial** ▽ :

Elevation: NA
Logged By: SH
At Completion ▼ : NE @ 10'

Depth/ Elevation (ft)	Soil Symbols	USCS	Description	Sample Type	Sample No.	Standard Penetration Test Blows	N	Penetration Resistance 10 20 30 40 60 80
0								
		SC	Loose, gray, clayey SAND (-200=37.9%) (liquid limit=39%, plasticity index=20)		1	2 3 3	6	
		CL	Medium, gray, CLAY		2	3 3 3	6	
			With limestone fragments		3	2 2 3	5	
					4	3 4 4	8	
					5	4 4 4	8	
10								
					6	2 2 3	5	
15								
			Stiff (-200=63.6%)		7	4 5 6	11	
20								
			LIMESTONE		8	4 5 19	24	
25			End of Boring					
30								
35								

This information pertains only to this boring and should not be interpreted as being indicative of the site.

KEY TO SYMBOLS

Symbol Description

Strata symbols

Low plasticity clay

Clayey sand

Silt

Limestone

Silty sand

Poorly graded sand with silt

Poorly graded sand

Misc. Symbols

Water table at boring completion

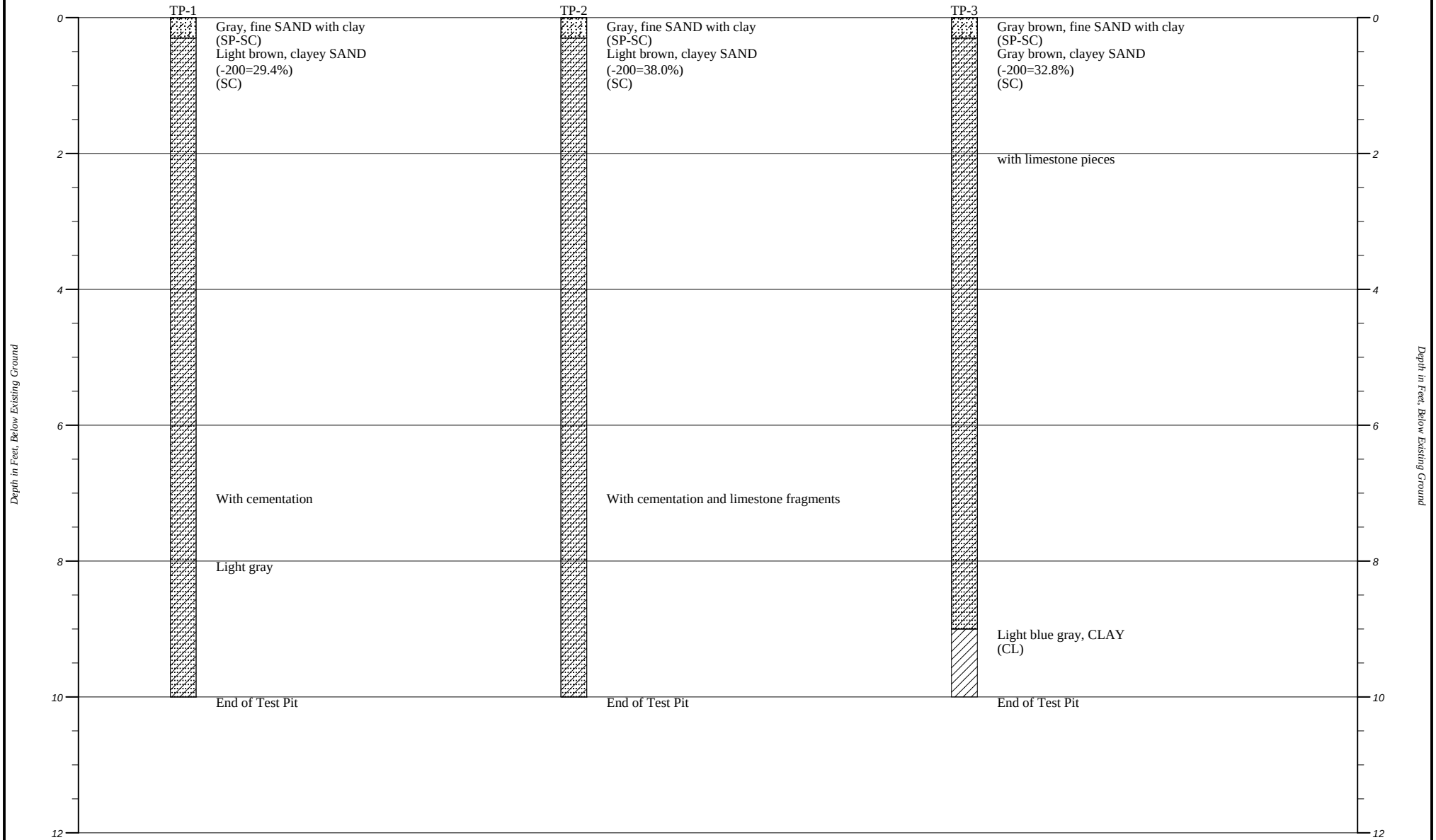
Soil Samplers

Standard penetration test

Notes:

1. Exploratory boring were performed using a 2-inch diameter split barrel sampler driven by a 140 lbs hammer (In accordance with ASTM D1586)

2. These logs are subject to the limitations, conclusions, and recommendations in this report.



Plan View

Strata symbols

- Poorly graded sand with clay
- Clayey sand
- Low plasticity clay

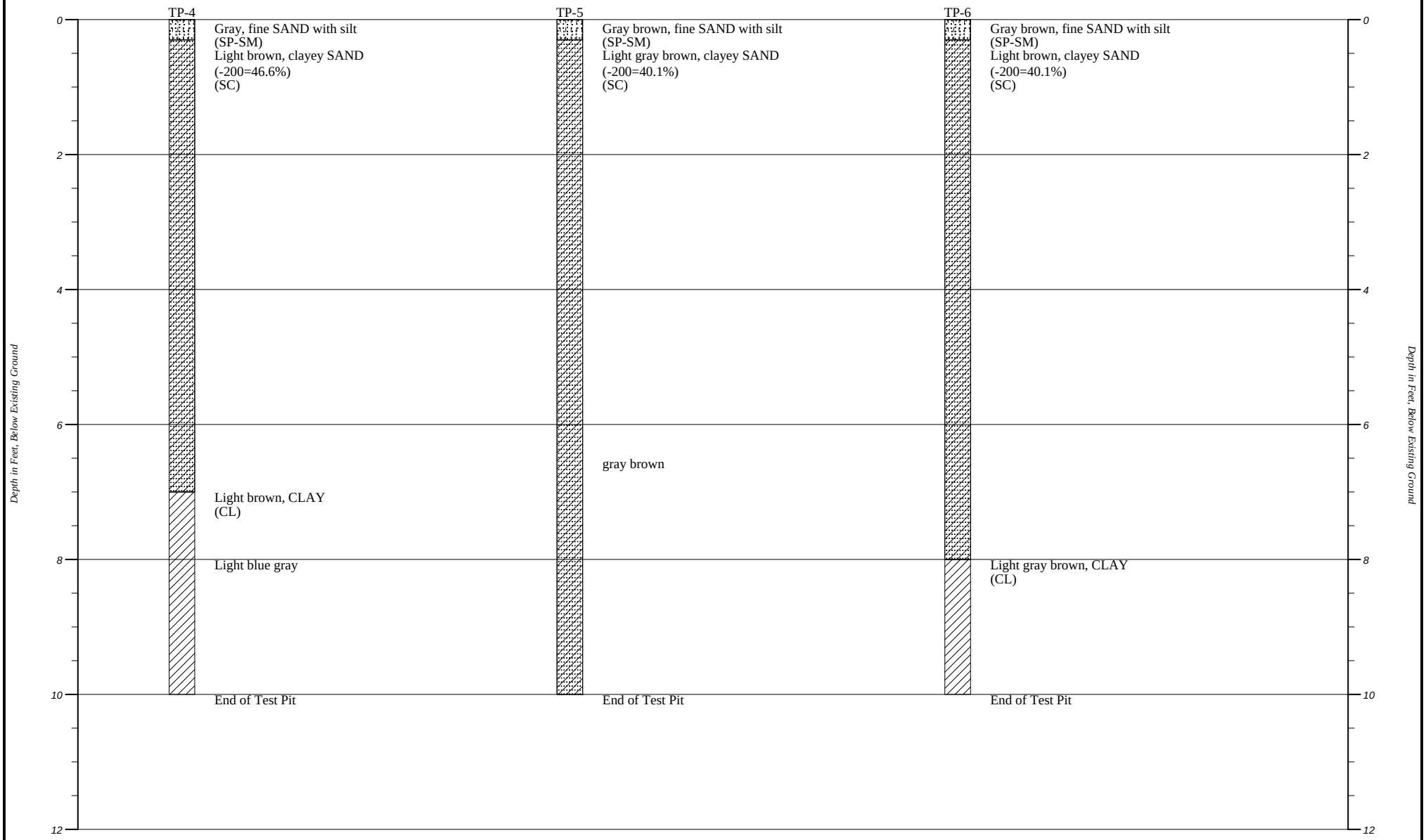
Faulkner Engineering Services, Inc.

TEST PIT SOIL PROFILE

HORIZONTAL SCALE:	DRAWN BY/APPROVED BY	DATE PERFORMED
VERTICAL SCALE: 1"=2'	SH/PK	2/4/2020

Valhalla Pond

PROJECT NO. 20-4570



Plan View

Strata symbols

- Poorly graded sand with clay
- Clayey sand
- Low plasticity clay
- Poorly graded sand with silt

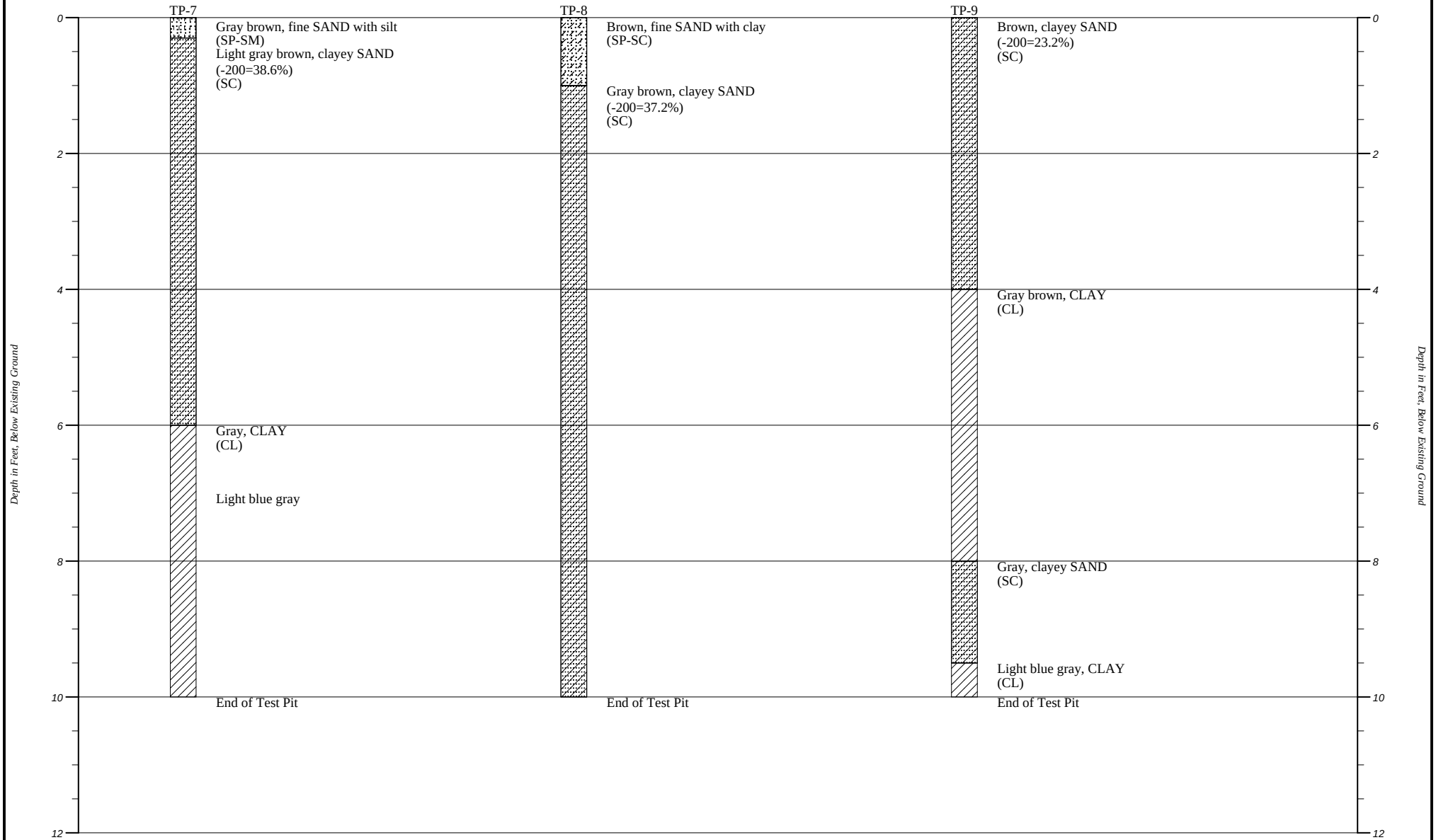
Faulkner Engineering Services, Inc.

TEST PIT SOIL PROFILE

HORIZONTAL SCALE:	DRAWN BY/APPROVED BY	DATE PERFORMED
VERTICAL SCALE: 1"=2'	SH/PK	2/4/2020

Valhalla Pond

PROJECT NO. 20-4570



Plan View

Strata symbols

- Poorly graded sand with clay
- Clayey sand
- Low plasticity clay
- Poorly graded sand with silt

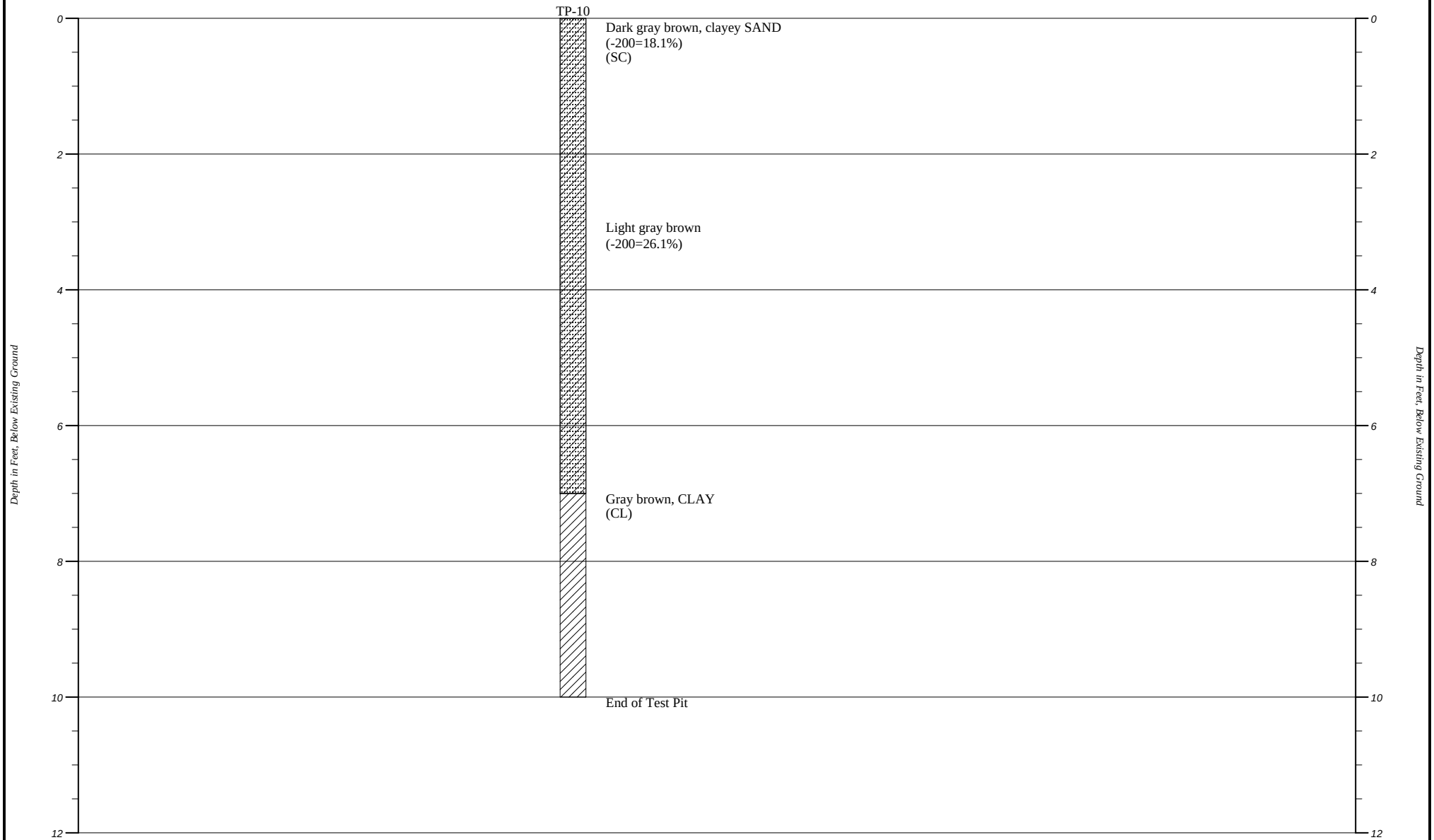
Faulkner Engineering Services, Inc.

TEST PIT SOIL PROFILE

HORIZONTAL SCALE:	DRAWN BY/APPROVED BY	DATE PERFORMED
VERTICAL SCALE: 1"=2'	SH/PK	2/4/2020

Valhalla Pond

PROJECT NO. 20-4570



Plan View

Strata symbols

- Poorly graded sand with clay
- Clayey sand
- Low plasticity clay
- Poorly graded sand with silt

Faulkner Engineering Services, Inc.

TEST PIT SOIL PROFILE

HORIZONTAL SCALE:	DRAWN BY/APPROVED BY SH/PK	DATE PERFORMED
VERTICAL SCALE: 1"=2'		2/4/2020

Valhalla Pond

PROJECT NO. 20-4570

APPENDIX C

Key to Soil Classification

UNIFIED SOIL CLASSIFICATION SYSTEM (USCS)

Major Division		Group Symbol	Laboratory Classification Data		Soil Description
			Finer than No. 200 Sieve %	Supplementary Requirements	
Coarse-Grained (Over 50% by Weight Coarser than No. 200 Sieve)	Gravelly Soils (Over Half of Coarse Fraction Larger than No. 4 Sieve)	GW	0 - 5*	$C_u \geq 4$ and $1 \leq C_c \leq 3$	Well-Graded Gravels, Sandy Gravels
		GP	0 - 5*	$C_u < 4$ and / or $1 > C_c > 3$	Gap-Graded or Uniform Gravels, Sandy Gravels
		GM	12 or More*	PI < 4 or Below A-Line	Silty Gravels, Silty Sandy Gravels
		GC	12 of More*	PI ≥ 7 and On or Above A-Line	Clayey Gravels, Clayey Sandy Gravels
	Sandy Soils (Over Half of Coarse Fraction Larger than No. 4 Sieve)	SW	0 - 5*	$C_u \geq 6$ and $1 \leq C_c \leq 3$	Well-Graded Sands, Gravelly Sands
		SP	0 - 5*	$C_u < 6$ and / or $1 > C_c > 3$	Gap-Graded or Uniform Sands, Gravelly Sands
		SM	12 or More*	PI < 4 or Below A-Line	Silty Sands, Silty Gravelly Sands
		SC	12 of More*	PI ≥ 7 and On or Above A-Line	Clayey Sands, Clayey Gravelly Sands
Fine-Grained (Over 50% by Weight Finer than No. 200 Sieve)	LOW Compressibility (Liquid Limit Less Than 50)	ML	Plasticity Chart		Silts, Very Fine Sands, Silty or Clayey Fine Sands, Micaceous Silts
		CL	Plasticity Chart		Low Plasticity Clays, Sandy or Silty Clays
		OL	Plasticity Chart, Organic Odor or Color		Organic Silts and Clays of Low Plasticity
	HIGH Compressibility (Liquid Limit Greater Than 50)	MH	Plasticity Chart		Micaceous Silts, Diatomaceous Silts, Volcanic Ash
		CH	Plasticity Chart		Highly Plastic Clays and Sandy Clays
		OH	Plasticity Chart, Organic Odor or Color		Organic Silts and Clays of High Plasticity
Soils with Fibrous Organic Matter		PT	Fibrous Organic Matter, Will Char, Burn, or Glow		Peat, Sandy Peats, and Clayey Peat

*For Soils having 5 to 12 percent passing the No. 200 Sieve, use a dual symbol such as GW-GC.