TIERRA

June 3, 2021

BBE-Boggs Engineering, LLC
607 South Alexander Street, Suite 101
Plant City, Florida 33563

Attn: Steven C. Boggs, P.E.

RE: Geotechnical Engineering Services Report
Henderson Way and Park Road – BBE 20313
Hillsborough County, Florida
Tierra Project No. 6511-21-153

Mr. Boggs:

Tierra, Inc. has completed a geotechnical engineering study for the above referenced project. The results of the study are provided herein.

Should there be any questions regarding this report, please do not hesitate to contact our office at (813) 989-1354. Tierra would be pleased to continue providing geotechnical services throughout the implementation of the project. We look forward to working with you and your organization on this and future projects.

Respectfully Submitted,

TIERRA, INC.

Juan M. Navarrete II, E.I.
Geotechnical Engineer Intern

Kevin H. Scott, P.E.
Senior Geotechnical Engineer
Florida License No. 65514

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PROJECT DESCRIPTION

Project Information

The proposed project is located southeast of the intersection at Henderson Way and Park Road in Plant City, Florida. The project consists of a new commercial development with metal commercial buildings, associated paved parking and drive areas and stormwater management. Based on the preliminary concept layout, the project will include 4 buildings varying in size from approximately 23,750 SF to 24,966 SF.

Final structural and grading information were not available at the time of this report; however, maximum column loads are anticipated to be less than 50 kips and maximum wall loads are anticipated to be less than 5 kips per lineal foot. We anticipate that finished grades will be within 2 feet of the existing site grades. Once final loads and grading information become available, Tierra should be given the opportunity to review the final design information and amend the recommendations herein, if necessary.

Scope of Services

The objective of our study was to obtain information concerning subsurface conditions at the site in order to base engineering estimates and recommendations in each of the following areas:

1. Feasibility of utilizing shallow spread foundation systems to support of the proposed development structures. Suitability of a slab-on-grade.

2. Design parameters required for the proposed structure foundation systems, including allowable bearing pressures, foundation levels and soil compaction recommendations.

3. General location and description of potentially deleterious materials discovered in the borings which may interfere with construction progress and structure performance, including existing fills or surficial organics.

4. Identification of groundwater levels and estimate of the Seasonal High Groundwater Table (SHGWT) at selected locations.

5. General pavement section parameters and construction considerations.

Based on a review of the provided information, we performed the following services:

1. Reviewed published soils and topographic information. This published information was obtained from the Hillsborough County Soil Survey published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service

(NRCS) and the “Plant City East, Florida” quadrangle map published by the United States Geological Survey (USGS).

2. Conducted a visual reconnaissance of the project site and coordinated utility clearances for the subsurface investigation.

3. Performed twenty (20) hand auger borings.

4. Performed four (4) field permeability tests within the proposed pond areas.

5. Performed twenty-four (24) Standard Penetration Test (SPT) borings.

6. Measured groundwater levels at the boring locations. Estimated the SHGWT at selected boring locations.

7. Visually examined recovered soil samples in the laboratory.

8. Prepared this Geotechnical Engineering Services Report providing a summary of the course of study pursued, the field data generated, subsurface conditions encountered and our engineering recommendations in each of the pertinent topic areas.

The scope of our services did not include an evaluation for sinkhole potential or an environmental assessment for determining the presence or absence of wetlands or hazardous or toxic materials in the soil, bedrock, groundwater, or air, on or below or around this site. The scope of our services did not include an evaluation with regards to sinkhole potential. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items or conditions are strictly for the information of our client.

REVIEW OF PUBLISHED DATA

General Site Information

Based on the “Plant City East, Florida” United States Geological Survey (USGS) Quadrangle Map, the natural ground elevation at the project site ranges from approximately +140 to +150 feet, National Geodetic Vertical Datum of 1929 (NGVD 29).

Hillsborough County Soil Survey

Based on a review of the USDA/NRCS Soil Survey of Hillsborough County, it appears that there are two (2) soil-mapping units noted within the vicinity of the project site. The general soil descriptions are presented in the following table, as described in the Soil Survey.

SUMMARY OF USDA SOIL SURVEY HILLSBOROUGH COUNTY, FLORIDA									
USDA Map Symbol and Soil Name	Depth (in)	Soil Classification		Permeability (in/hr)		pH	Seasonal High Water Table		
		USCS	AASHTO	Low	High		Depth (feet)	Months
(4) Arents	0-10	SP, SP-SM	A-1-b, A-2-4, A-3	6.0	20.0	6.6-8.4	1.5-3.0	Jun-Nov
	10-32	SP, SP-SM	A-2-4, A-3	6.0	20.0	5.6-8.4		
	32-60	SP, SP-SM	A-2-4, A-3	6.0	20.0	5.6-6.5		
(51) Haplaquents, clayey	0-80	CH	A-7	0.0	0.1	5.6-7.3	+1.0-0.0	Jan-Dec

Based on the USDA Soil Survey information, the site is in the vicinity of previous mining activities. Soil Units 4 (Arents) and 51 (Haplaquents) are typically related to past phosphate mining activities. However, a review of aerial photographs from 1938, 1948, 1957 and 1968 did not reveal evidence of mining activities at the subject site. In addition, the borings did not encounter soil conditions typical for previously mined sites.

It should be noted that information contained in the USDA/NRCS Soil Survey may not be reflective of current subsurface conditions, particularly if recent development in the project vicinity has modified existing soils or surface/subsurface drainage.

SUBSURFACE CONDITIONS

General

The subsurface conditions at the project site were explored using a total of twenty (20) hand auger borings performed to depths ranging from approximately 5 to 6 feet and twenty-four (24) SPT borings performed to depths ranging from approximately 20 to 40 feet below the existing grades. The borings were located in the field by a representative of Tierra and recorded coordinates were obtained from our hand-held Global Positioning System (GPS) devices. The approximate boring locations are presented on the **Boring Location Plan** sheet in the **Appendix**. If an accurate determination of the boring locations and elevations are required, then Tierra recommends the boring locations be survey located by the project surveyor.

The hand auger borings were performed by manually twisting and advancing a bucket auger into the ground, typically in 6-inch increments. The soil samples were classified in the field and transported to our laboratory for review.

The SPT borings were performed with the use of a mechanical drill rig using Bentonite Mud rotary drilling procedures. The soil sampling for the SPT borings was performed in accordance with American Society for Testing and Materials (ASTM) Test designation D-1586. Within the majority of the SPT borings performed, SPT resistance N-values were taken continuously to a depth of approximately 10 feet and on intervals of 5 feet thereafter to the boring termination depths. Within some of the SPT borings performed, the initial 4 feet were advanced by hand auger to verify utility clearances. SPT resistance N-values were then taken to a depth of approximately 10 feet and on intervals of 5 feet thereafter to the boring termination depths.

The soil strata encountered in the borings performed are summarized in the following table:

Stratum Number	Soil Description	USCS Symbol
1	Gray to Brown Sand to Sand with Silt	SP/SP-SM
2	Light Gray to Light Brown Silty Sand	SM
3	Light Gray to Light Brown to Blue-Gray Clayey Sand	SC
4	Light Gray to Blue-Gray to Green-Gray to Orange-Brown Sandy Clay to Clay	CL/CH
5	Weathered Limestone	---(1)
6	Blue-Gray to Green-Gray to Orange-Brown Indurated Sandy Clay to Clay	CL/CH
---(1) USCS does not provide nomenclature for natural limestone.		

The subsurface soil stratification is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The soil profiles included in the **Appendix** should be reviewed for specific information at individual boring locations. These profiles include soil descriptions and stratifications. The stratifications shown on the boring profiles represent the conditions only at the actual boring location. Variations may occur and should be expected between boring locations. The stratifications represent the approximate boundary between subsurface materials and the actual transition may be gradual.

Groundwater Information

During our field exploration, the groundwater table was encountered at depths ranging from approximately 3 to 7 feet below existing grades. Groundwater levels are depicted adjacent to the corresponding soil profiles on the **Soil Profiles** sheet in the **Appendix**.

Within some of the hand auger borings performed, the groundwater table was not encountered prior to the boring termination depth; therefore, Groundwater Not Encountered (GNE) is depicted adjacent to these soil profiles.

Within some of the SPT borings performed, the groundwater table was not apparent prior to the introduction of drilling fluid; therefore, Groundwater Not Apparent (GNA) is depicted adjacent to these soil profiles.

Based on the subsurface conditions encountered, the SHGWT is estimated to range from approximately ½ foot to 2½ feet below existing grades. The estimated SHGWT levels are presented on the **Soil Profiles** sheet in the **Appendix**.

It should be noted that groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences (i.e. existing swales, drainage ponds, underdrains, and areas of covered soils, such as paved parking lots).

Field Permeability Tests

Tierra performed four (4) field permeability tests (open-end pipe hydraulic conductivity tests; U.S. Bureau of Reclamation Test Designation E-18, 1974) within the proposed pond areas. The test were performed at depths ranging from approximately 2½ to 3 feet below the existing ground surface within Stratum 1 soils. The boring locations are depicted in the **Appendix**. The results of the permeability testing are included in the **Appendix**.

It is important to note that the results provided are the measured hydraulic conductivity rates of the in-situ soil conditions encountered at the time of our field activities. No reduction, limiting value, or factors of safety have been applied to these rates. The project drainage engineer should apply an appropriate factor of safety for design and evaluation purposes.

EVALUATION AND RECOMMENDATIONS

General

Based on the results of our field exploration, the subsurface soils encountered within the borings performed at the project site appear suitable for the proposed improvements. Engineering evaluations and recommendations for the proposed improvements provided in the following sections of this report are based on the subsurface conditions encountered in the borings performed. If the final design criteria deviates from what is stated in this report, Tierra should be given the opportunity to review the new information and amend our recommendations, if necessary.

On Site Soil Suitability

The suitability of soils for reuse in construction should be evaluated against the project engineering fill requirements. Variations in the subsurface stratification should be expected between borings. All fill should be placed in accordance with current County specifications.

In general, the soils of Stratum 1 (SP/SP-SM) and Stratum 2 (SM) may be moved and used for grading purposes, site leveling, general engineering fill, structural fill and backfill in other areas, provided the fill is free of organic materials, clay, debris or any other material deemed unsuitable for construction and evaluated against engineering fill requirements.

However, Stratum 2 may retain excess moisture and become difficult to dry and compact. Stratum 2 should only be used above the water table level existing at the time of construction.

Stratum 3 (SC) and Strata 4 and 5 (CL/CH) are not recommended for use as fill materials due to their plastic nature.

Site Preparation

Prior to construction, the location of any existing underground utilities within the construction area should be established. Material suitable for re-use may be stockpiled; however, any material stockpiled for re-use shall be tested for conformance to material specifications as indicated in the following sections of this report. Provisions should then be made to relocate any interfering utility lines within the construction area to appropriate locations and backfilling the excavation with compacted structural fill. In this regard, it should be noted that if abandoned underground pipes are not properly removed or plugged, they might serve as conduits for subsurface erosion, which subsequently may result in excessive settlement.

The site should be cleared of surface vegetation, existing structures (including foundations), pavement and any apparent deleterious materials. As a minimum, it is recommended that the clearing operations extend to the depth needed to remove material considered deleterious at least 5 feet beyond the proposed development area. Deleterious materials to be removed may include roots, stumps, organic soils and/or structure remnants including existing foundations, brick, concrete or other buried debris. Buried debris, if left in place, can provide conduits for erosion resulting in excessive settlement of overlying soils over time. Fill placement and subgrade preparation recommendations are presented in the “Construction Considerations” section of this report.

Foundation Recommendations

Based on our evaluation and analyses, the Stratum 1 soils should be capable of supporting the anticipated structural loads on shallow foundations after proper subgrade preparation and surface compaction. The foundations and floor slabs should bear on compacted natural soils or properly placed and compacted cohesionless (sand)/structural fill. The existing near surface sandy soils should be improved by compaction after clearing operations to improve foundation support and reduce total and differential settlement.

Based on the anticipated construction and loading conditions presented herein, preliminary field results indicate shallow foundations may be designed for a net maximum allowable bearing pressure of 2,000 psf after proper site preparation. The foundation and floor slabs should bear on properly placed and compacted cohesionless (sand) structural fill or properly compacted sandy soils encountered at the site. Foundations should be embedded so that the bottoms of the foundations are a minimum of 18 inches below adjacent grades. Strip or wall footings should be a minimum of 24 inches wide and pad or column footings should be a minimum of 30 inches wide. The minimum footing sizes should be used regardless of whether or not the foundation loads and allowable bearing pressures dictate a smaller size. These minimum footing sizes tend to provide adequate bearing area to develop bearing capacity and account for minor variations in the bearing materials. Footings should be constructed in a dry fashion. Footing excavations should be covered during rain events. Uncovered excavations may become oversaturated and difficult to compact during rain events. Surface run-off water should be drained away from the excavations and not allowed to pond within any foundation or floor slab areas. It is important that the structural elements be centered on the footings such that the load is transferred evenly unless the footings are proportioned for eccentric loads.

Settlement

The settlement of shallow foundations supported on compacted sand fill and/or natural sandy soils should occur rapidly after loading. Thus, the expected settlement should occur during construction as dead loads are imposed. Provided the recommended site preparation operations are properly performed and the recommendations previously stated are utilized, the total settlement of wall and isolated column footings should not exceed approximately ¾ inch. Differential settlement is estimated to be on the order of 1/480 (¾ inch per 30 feet). Differential settlement of this magnitude is usually considered tolerable for the anticipated construction; however, the tolerance of the proposed structure to the predicted total and differential settlement should be confirmed by the structural engineer. If final loading conditions differ from the loads presented above, Tierra should be given the opportunity to review and amend (if necessary) our recommendations.

Floor Slabs

The proposed floor slabs may be safely supported as a slab-on-grade provided any deleterious materials are removed and replaced with controlled structural fill. It is also recommended that the floor slab bearing soils be covered by a lapped polyethylene sheeting in order to minimize the potential for floor dampness which can affect the performance of flooring such as glued tile and carpet (if any are used). This membrane should consist of a minimum six (6) mil single layer of non-corroding, non-deteriorating sheeting material placed to minimize seams and to cover all of the soil below the building floor. This membrane should be cut in a cross shape for pipes or other penetrations; the membrane should extend to within one-half inch of pipes or other penetrations. Seams of the membrane should be lapped at least 12 inches. Punctures or tears in the membrane should be repaired with the same or compatible material.

Drainage Design

Based on the results of the field testing and our engineering judgment, Tierra recommends the attached **Geotechnical Parameters for Pond Design** table be used for stormwater pond design.

Pavement Considerations

Actual pavement section thickness should be provided by the design civil engineer based on traffic loads, volume, and the owner's design life requirements. The following sections represent minimum thicknesses representative of typical load and construction practices and as such periodic maintenance should be anticipated. All pavement materials and construction procedures should conform to the appropriate City or County requirements.

In general, following the completion of the recommended clearing and grading operations, the compacted fill and natural shallow sandy soils should be acceptable for construction and support of a flexible (limerock, crushed concrete, or shell base) type pavement section or rigid (concrete) pavement section.

Any fill utilized to elevate the cleared pavement areas to subgrade elevation should consist of relatively clean (maximum 12% passing #200 sieve sizes) sands uniformly compacted to a minimum depth of 12 inches to a minimum density of 95% of the modified Proctor maximum dry density. In flexible pavement areas we recommend 12 inches of Type B stabilized subgrade (LBR = 40) below the base course. Traffic should not be allowed on the subgrade as the base is placed to avoid rutting. The subgrade should be checked for soundness and be true to line and grade prior to the placement of the base course.

The choice of pavement base type will depend on final pavement grades in relation to the seasonal high groundwater levels presented in this report. If a minimum separation of 18 inches between the bottom of the base and the seasonal high groundwater level is obtained, then a limerock, shell, or crushed concrete base can be utilized. A crushed concrete base should be utilized if the separation between final grade and the seasonal high groundwater is a minimum of 12 inches and less than 18 inches. Base material elevations should not be designed for saturated conditions. If the designer wishes to have base material closer than 12 inches to the SHGWT, then an underdrain system should be utilized that will maintain the 12 inches of separation. The SHGWT should be re-established relative to a known elevation prior to setting final grades. Limerock, shell and crushed concrete base material should meet Florida Department of Transportation (FDOT) requirements including compaction to a minimum density of 98% of the modified Proctor maximum dry density and a minimum Limerock Bearing Ratio (LBR) of 100%. Crushed concrete should be graded in accordance with FDOT Standard Specification Section 901-5. As a guideline for pavement design, we recommend that the base course be a minimum of 6 inches. Before paving, the base should be checked for soundness.

The asphaltic concrete structural course should consist of at least one and one-half (1½) inches of Type S or SP asphaltic concrete material. The asphaltic concrete should meet standard FDOT material requirements and placement procedures as outlined in the current FDOT Standard Specifications.

As an alternate to the above referenced flexible pavement design, a rigid (concrete) pavement design could be used. The concrete should have a minimum compressive strength of 4,000 psi at 28 days when tested in accordance with ASTM C-39. Based on our experience, a minimum thickness of five (5) inches should be utilized for standard duty applications and a minimum thickness of six (6) inches should be utilized for heavy-duty applications. The steel reinforcement within the concrete pavement should be designed by the project civil engineer. The subgrade soils should be compacted to a minimum density of 95% of the modified Proctor maximum dry density.

CONSTRUCTION CONSIDERATIONS

General

It is recommended that Tierra be retained to provide observation and testing of construction activities involved in the foundation earthwork, and related activities of this project. Tierra cannot accept any responsibility for any conditions, which deviate from those described in this report, if not engaged to provide construction observation and testing for this project.

Fill Placement and Subgrade Preparation

The following are our recommendations for overall site preparation and mechanical densification work for the project based on the proposed construction and our test boring results. These recommendations should be used as a guideline for the project general specifications prepared by the design engineer.

1. Following the clearing operations, the proposed paved areas should be proofrolled. The proofrolling may consist of compaction with a large diameter, heavy vibratory drum roller (if not within 50 feet of existing structures). The vibratory drum roller should have a static drum weight on the order of eight (8) to ten (10) tons and should be capable of exerting a minimum impact force of 36,000 pounds (DYNAPAC CA-250 or equivalent is expected to provide acceptable results). **Vibratory rollers should not be used within 50 feet of any existing structures. Areas within 50 feet of existing structures should be compacted using a fully loaded 2 cubic yard capacity front-end loader or equivalent or through non-vibratory means.**

2. Careful observations should be made during proofrolling to help identify any areas of soft yielding soils that may require over excavation and replacement. The backfilling may be done with a well-compacted, suitable fill such as clean sand (i.e. less than 12% passing the No. 200 sieve), gravel, or crushed FDOT No. 57 or FDOT No. 67 stone.

3. The proofrolling equipment should make a minimum of eight (8) overlapping passes over the structure and pavement areas with the successive passes aligned perpendicular. It is recommended that within the building and pavement areas, the natural ground, to a minimum depth of one (1) foot below stripped grade, be compacted to a dry density of at least 95% of the Modified Proctor maximum dry density.

4. Following satisfactory completion of the initial compaction, the structure and pavement areas may be brought up to finished subgrade levels, if needed, using structural fill. Imported fill should consist of fine sand with less than 12% passing the No. 200 sieve, free of rubble, organics, clay, debris and other unsuitable material. Fill should be tested and approved prior to acquisition. Approved sand fill should be placed in loose lifts not exceeding 12 inches in thickness and should be compacted to a minimum density of 95% of the Modified Proctor maximum dry density. Density tests to confirm compaction should be performed in each fill lift before the next lift is placed.

5. Prior to beginning compaction, soil moisture contents may need to be controlled in order to facilitate proper compaction. If additional moisture is necessary to achieve compaction objectives, then water should be applied in such a way that it will not cause erosion or removal of the subgrade soils. Moisture content within the percentage range needed to achieve compaction is recommended prior to compaction of the natural ground and fill.

6. After proofrolling and compaction, the building foundation excavations can begin. Foundation excavations should be observed by the geotechnical engineer or a representative to explore the extent of any loose, soft, or otherwise undesirable materials. If the foundation excavations appear suitable as load bearing materials, the bottom of the foundation excavations should be compacted to a minimum density of 95% of the Modified Proctor maximum dry density for a minimum depth of one (1) foot below the bottom of the footing depth, as determined by field density compaction tests.

7. If soft pockets are encountered in the footing excavations, the unsuitable materials should be removed and the proposed footing elevation may be re-established by backfilling. This backfilling may be done with a well-compacted, suitable fill such as clean sand, gravel, or crushed FDOT No. 57 or FDOT No. 67 stone. Sand backfill should be compacted to a minimum density of 95% of the Modified Proctor maximum dry density.

8. Immediately prior to reinforcing steel placement, it is suggested that the bearing surfaces of footing and floor slab areas be compacted using hand operated mechanical tampers. In this manner, any localized areas, which have been loosened by excavation operations, should be adequately re-compacted.

9. Backfill soils placed adjacent to footings or walls should be carefully compacted with a light rubber-tired roller or vibratory plate compactor to avoid damaging the footings or walls. Approved sand fills to provide foundation embedment constraint should be placed in loose lifts not exceeding 6 inches and should be compacted to a minimum density of 95% of the Modified Proctor maximum dry density.

A representative from our firm should be retained to provide on-site observation of earthwork and ground modification activities. Density tests should be performed in the top one (1) foot of compacted existing ground and each fill lift. It is important that Tierra be retained to observe that the subsurface conditions are as we have discussed herein, and that fill placement is in accordance with our recommendations.

Drainage and Groundwater Concerns

The groundwater levels presented in this report are the levels that were measured at the time of our field activities. Fluctuation should be anticipated. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on the construction procedure.

Water should not be allowed to collect in the foundation excavations, on the floor slab areas, or on prepared subgrades of the construction either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, groundwater, or surface runoff. Positive site drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

Excavations

The contractor is solely responsible for designing and constructing stable, temporary excavations and should shore, slope, or bench the sides of the excavations as required to maintain stability of both the excavation sides and bottom in accordance with OSHA 29 CFR, Part 1926, Subpart P as well as the “Trench Safety Act” in Chapter 90-96 of the Florida Statutes. The contractors “responsible persons”, as defined in 29 CFR Part 1926, should evaluate the soil exposed in the excavations as part of the contractor’s safety procedures. In no case should slope height, slope inclination, or excavation depth, including utility trench excavation depth, exceed those specified in all local, state, and federal safety regulations.

We are providing this information solely as a service to BBE – Boggs Engineering, LLC and their clients. Tierra does not assume responsibility for construction site safety or the contractor’s or other party’s compliance with local, state, and federal safety or other regulations.

REPORT LIMITATIONS

The analyses, conclusions and recommendations contained in this report are professional opinions based on the site conditions and project layout described herein and further assume that the conditions observed in the exploratory borings are representative of the subsurface conditions throughout the site, i.e., the subsurface conditions elsewhere on the site are the same as those disclosed by the borings. If, during construction, subsurface conditions different from those encountered in the exploratory borings are observed or appear to be present, we should be advised at once so that we can review these conditions and reconsider our recommendations where necessary.

This report was prepared for the exclusive use of BBE – Boggs Engineering, LLC and their clients for evaluating the design of the project as it relates to the geotechnical aspects discussed herein. It should be made available to prospective contractors for information on factual data only and not as a warranty of subsurface conditions included in this report. Unanticipated soil conditions may require that additional expense be made to attain a properly constructed project. Therefore, some contingency fund is recommended to accommodate such potential extra costs.

APPENDIX

Boring Location Plan

Soil Profiles

Geotechnical Parameters for Pond Design

BORING LOCATION PLAN

0 100'

PLAN SCALE

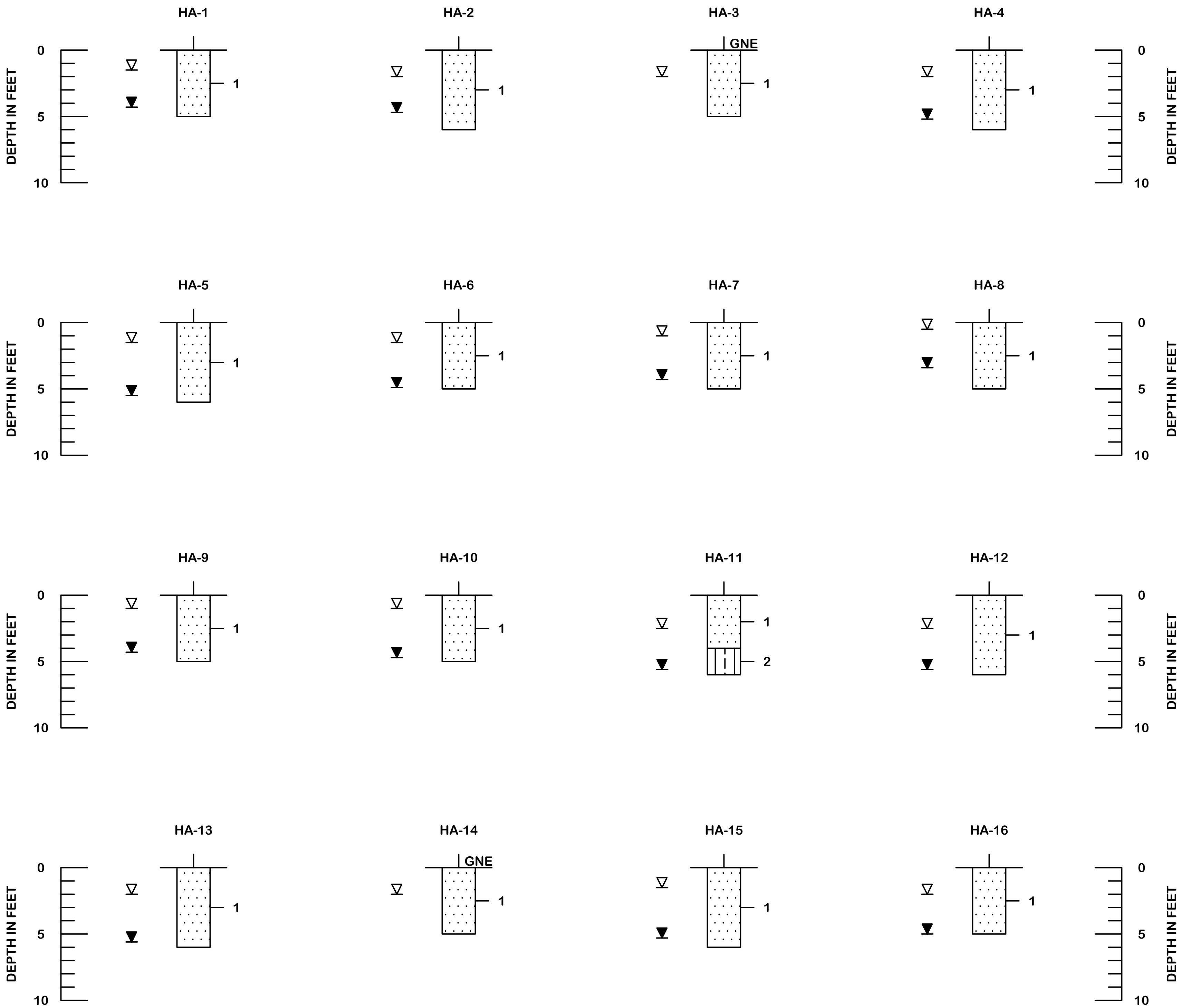
LEGEND

- APPROXIMATE LOCATION OF AUGER BORING
- APPROXIMATE LOCATION OF SPT BORING

DRAWN BY: BMG CHECKED BY: JN	APPROVED BY: KHS DATE: JUNE 2021	ENGINEER OF RECORD: KEVIN H. SCOTT, P.E. FLORIDA LICENSE NO.: 65514	TIERRA 7351 Temple Terrace Highway Tampa, Florida 33637 Phone: 813-989-1354 Fax: 813-989-1355 FL Cert. No.: 6486	SCALE: NOTED	PROJECT NUMBER: 6511-21-153	GEOTECHNICAL ENGINEERING SERVICES HENDERSON WAY & PARK ROAD HILLSBOROUGH COUNTY, FLORIDA

SHEET 1

SOIL PROFILES



LEGEND

1 GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)

2 LIGHT GRAY TO LIGHT BROWN SILTY SAND (SM)

3 LIGHT GRAY TO LIGHT BROWN TO BLUE-GRAY CLAYEY SAND (SC)

4 LIGHT GRAY TO BLUE-GRAY TO GREEN-GRAY TO ORANGE-BROWN SANDY CLAY TO CLAY (CL/CH)

5 WEATHERED LIMESTONE

6 BLUE-GRAY TO GREEN-GRAY TO ORANGE-BROWN INDURATED SANDY CLAY TO CLAY (CL/CH)

SP UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW.

N SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)

GNE GROUNDWATER TABLE NOT ENCOUNTERED

GNA GROUNDWATER NOT APPARENT DUE TO DRILLING METHOD USED

∇ ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

▼ GROUNDWATER LEVEL ENCOUNTERED DURING INVESTIGATION

HA HAND AUGERED TO VERIFY UTILITY CLEARANCES

50/4 NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

⇦100 LOSS OF CIRCULATION OF DRILLING FLUID (100%)

AUTOMATIC HAMMER	
GRANULAR MATERIALS-RELATIVE DENSITY	SPT (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT (BLOWS/FT.)
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

DRAWN BY: BMG
CHECKED BY: JN
APPROVED BY: KHS
DATE: JUNE 2021
ENGINEER OF RECORD: KEVIN H. SCOTT, P.E.
FLORIDA LICENSE NO.: 65514

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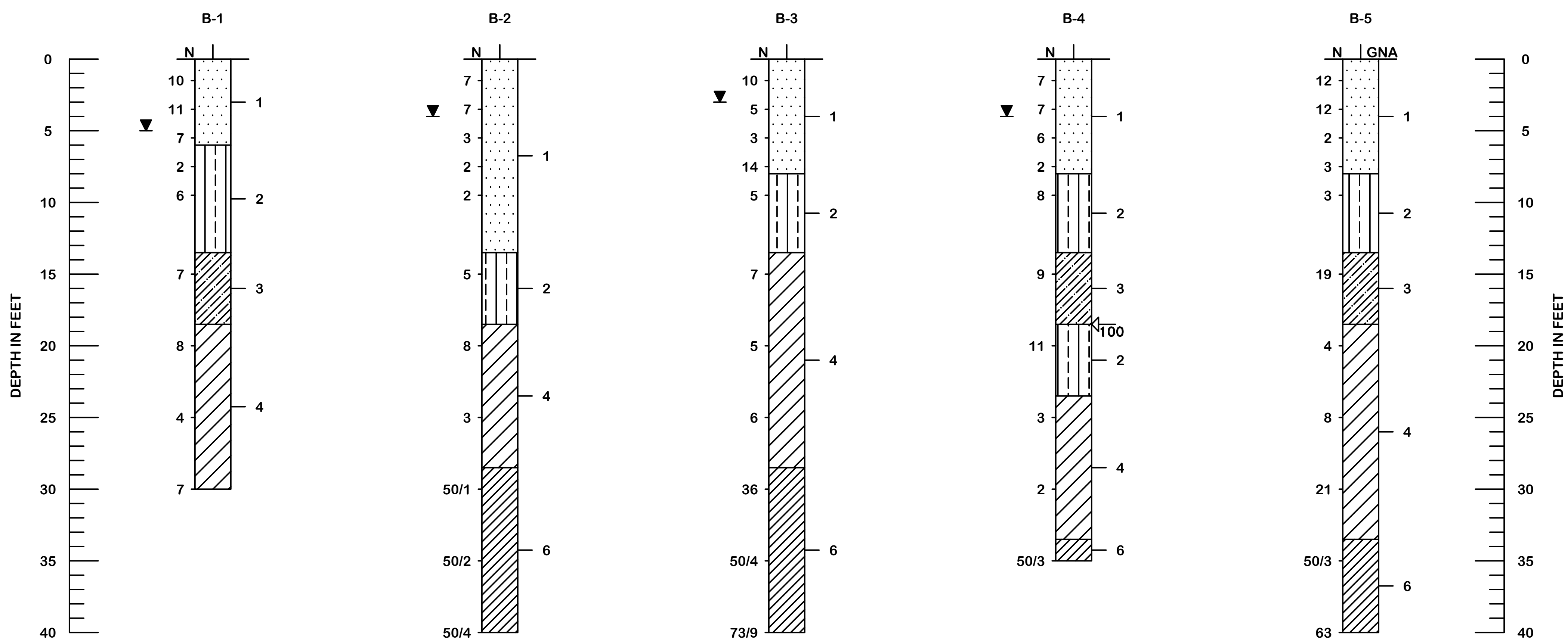
SCALE: NOTED
PROJECT NUMBER: 6511-21-153

GEOTECHNICAL ENGINEERING SERVICES
HENDERSON WAY & PARK ROAD
HILLSBOROUGH COUNTY, FLORIDA

SOIL PROFILES



LEGEND

1	GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
2	LIGHT GRAY TO LIGHT BROWN SILTY SAND (SM)
3	LIGHT GRAY TO LIGHT BROWN TO BLUE-GRAY CLAYEY SAND (SC)
4	LIGHT GRAY TO BLUE-GRAY TO GREEN-GRAY TO ORANGE-BROWN SANDY CLAY TO CLAY (CL/CH)
5	WEATHERED LIMESTONE
6	BLUE-GRAY TO GREEN-GRAY TO ORANGE-BROWN INDURATED SANDY CLAY TO CLAY (CL/CH)
SP	UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW.
N	SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
GNE	GROUNDWATER TABLE NOT ENCOUNTERED
GNA	GROUNDWATER NOT APPARENT DUE TO DRILLING METHOD USED
▽	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
▼	GROUNDWATER LEVEL ENCOUNTERED DURING INVESTIGATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCES
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
◁100	LOSS OF CIRCULATION OF DRILLING FLUID (100%)

AUTOMATIC HAMMER	
GRANULAR MATERIALS-RELATIVE DENSITY	SPT (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT (BLOWS/FT.)
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

DRAWN BY: BMG
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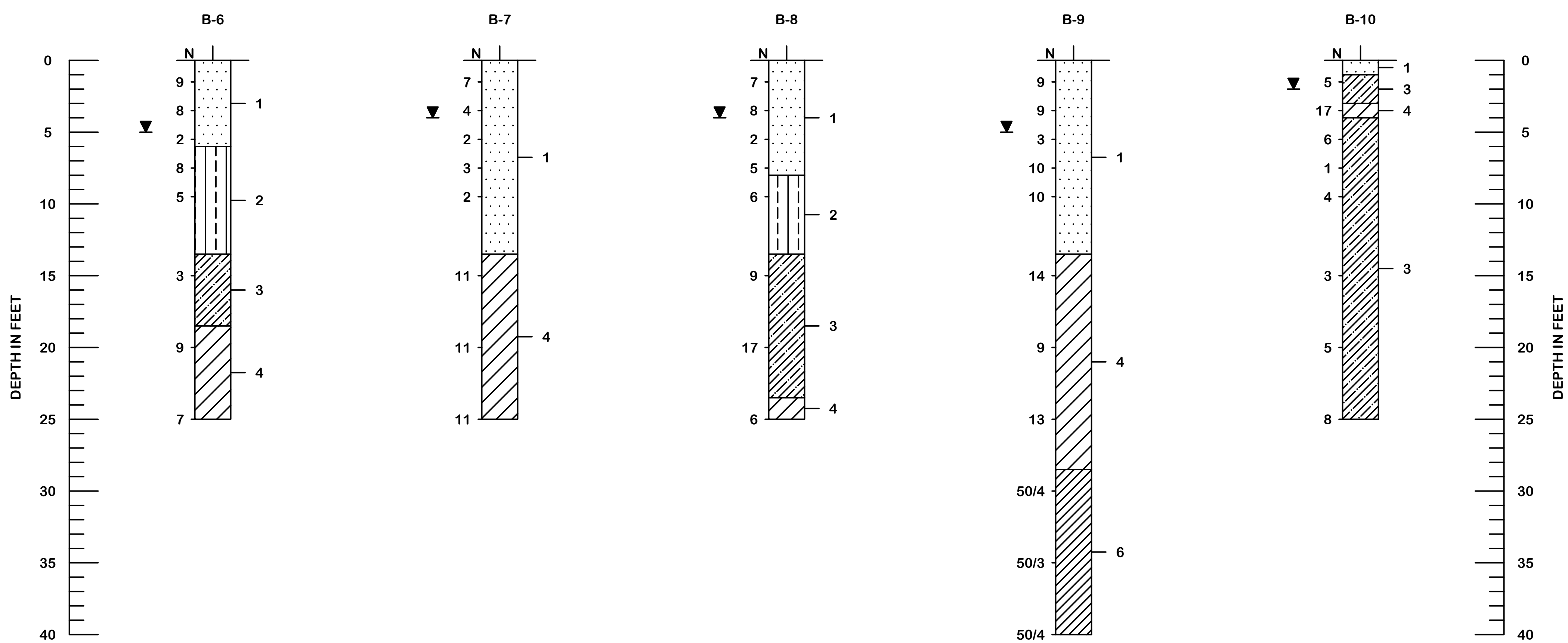
APPROVED BY: KHS
DATE: JUNE 2021
ENGINEER OF RECORD: KEVIN H. SCOTT, P.E.
FLORIDA LICENSE NO.: 65514

TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355
FL Cert. No.: 6486

SCALE: NOTED
PROJECT NUMBER: 6511-21-153

GEOTECHNICAL ENGINEERING SERVICES
HENDERSON WAY & PARK ROAD
HILLSBOROUGH COUNTY, FLORIDA

SOIL PROFILES



LEGEND

1 GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)

2 LIGHT GRAY TO LIGHT BROWN SILTY SAND (SM)

3 LIGHT GRAY TO LIGHT BROWN TO BLUE-GRAY CLAYEY SAND (SC)

4 LIGHT GRAY TO BLUE-GRAY TO GREEN-GRAY TO ORANGE-BROWN SANDY CLAY TO CLAY (CL/CH)

5 WEATHERED LIMESTONE

6 BLUE-GRAY TO GREEN-GRAY TO ORANGE-BROWN INDURATED SANDY CLAY TO CLAY (CL/CH)

SP UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW.

N SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)

GNE GROUNDWATER TABLE NOT ENCOUNTERED

GNA GROUNDWATER NOT APPARENT DUE TO DRILLING METHOD USED

▽ ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

▼ GROUNDWATER LEVEL ENCOUNTERED DURING INVESTIGATION

HA HAND AUGERED TO VERIFY UTILITY CLEARANCES

50/4 NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

⇦100 LOSS OF CIRCULATION OF DRILLING FLUID (100%)

AUTOMATIC HAMMER	
GRANULAR MATERIALS-RELATIVE DENSITY	SPT (BLOWS/FT.)
VERY LOOSE	LESS THAN 3
LOOSE	3 TO 8
MEDIUM	8 TO 24
DENSE	24 TO 40
VERY DENSE	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT (BLOWS/FT.)
VERY SOFT	LESS THAN 1
SOFT	1 TO 3
FIRM	3 TO 6
STIFF	6 TO 12
VERY STIFF	12 TO 24
HARD	GREATER THAN 24

DRAWN BY: BMG	APPROVED BY: KHS	ENGINEER OF RECORD: KEVIN H. SCOTT, P.E.	TIERRA	SCALE: NOTED	PROJECT NUMBER: 6511-21-153	GEOTECHNICAL ENGINEERING SERVICES HENDERSON WAY & PARK ROAD HILLSBOROUGH COUNTY, FLORIDA	SHEET 4
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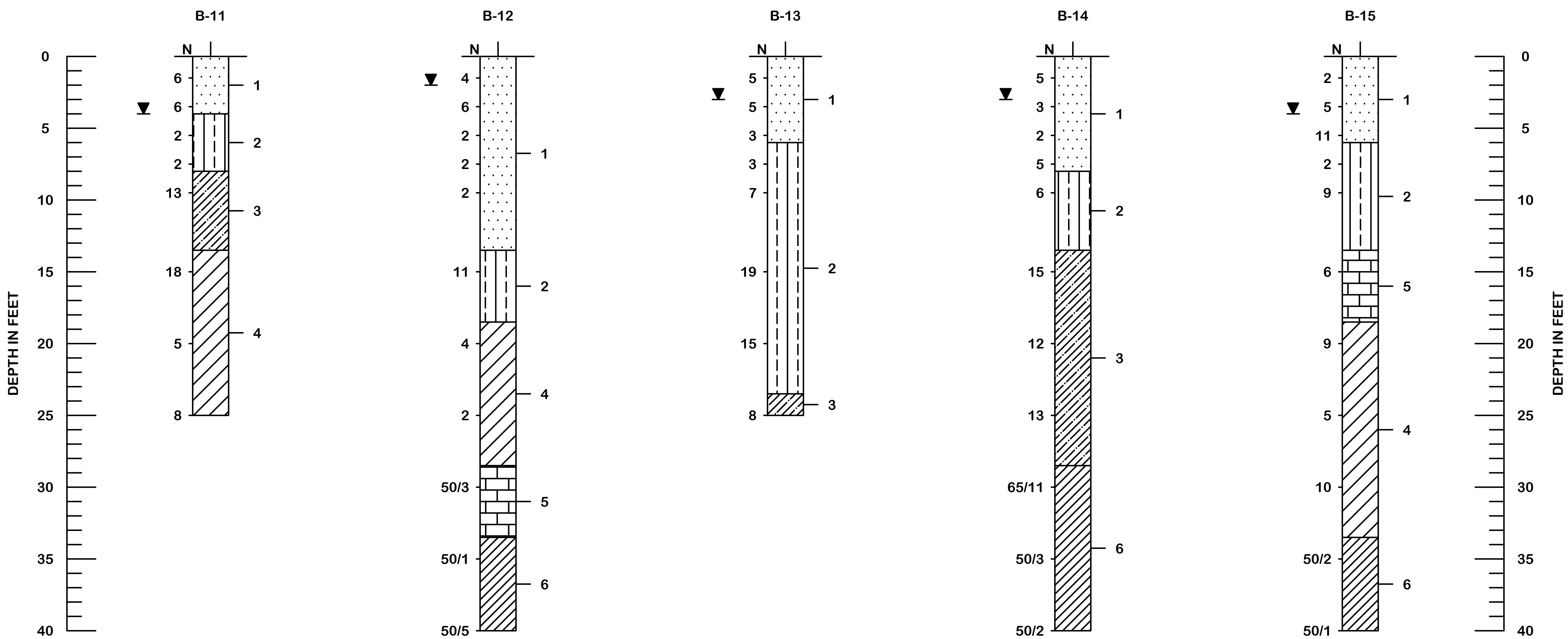

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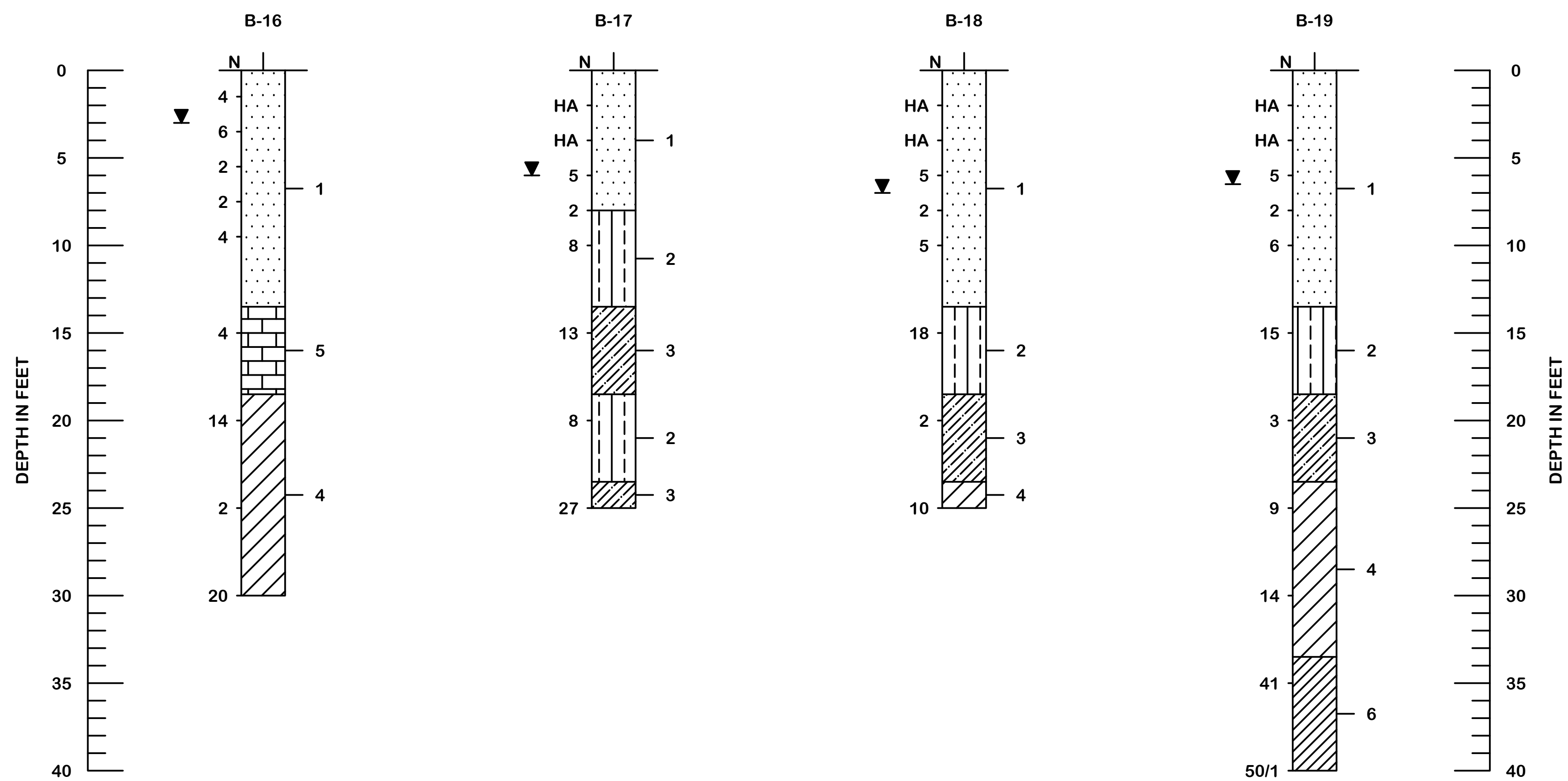
SOIL PROFILES



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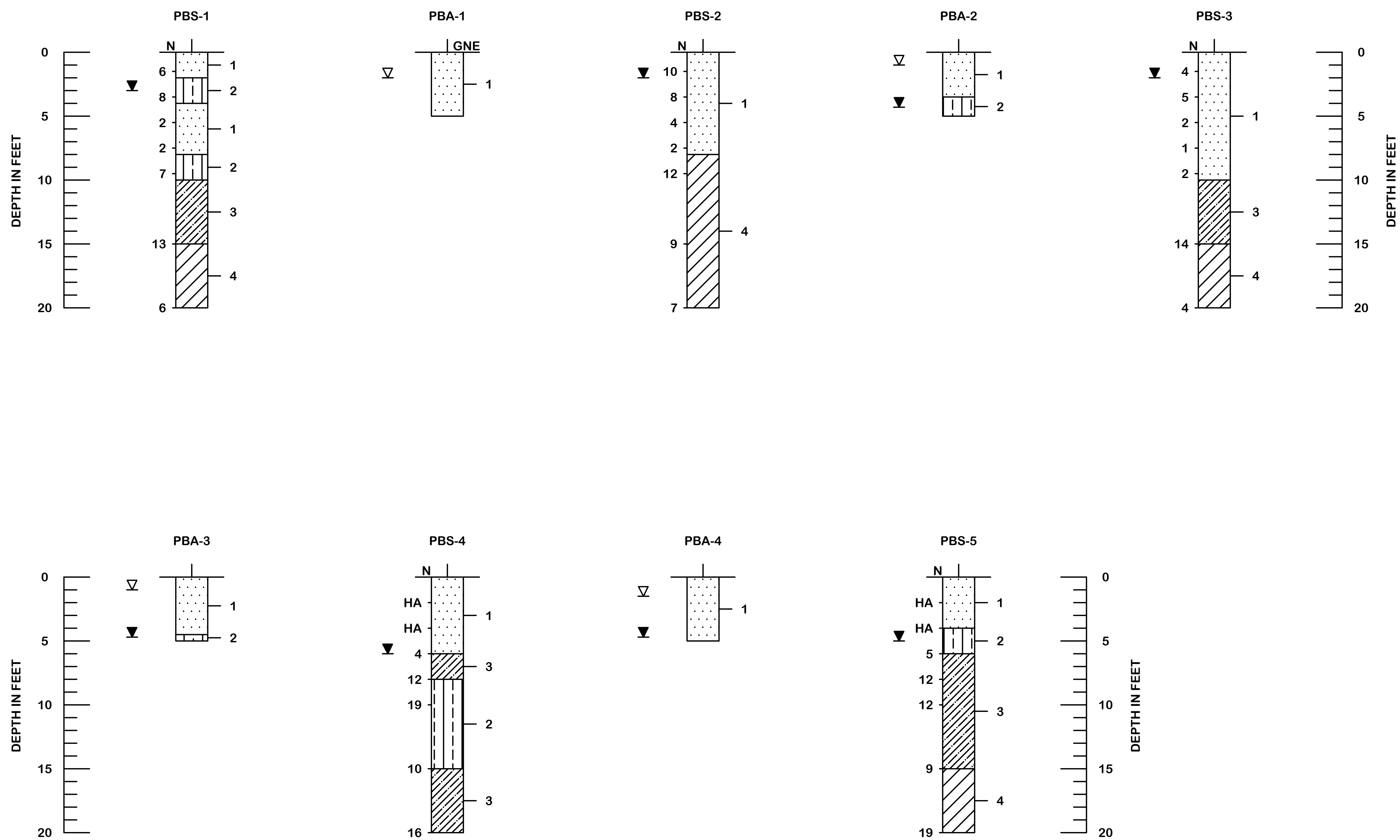
GEOTECHNICAL ENGINEERING SERVICES
HENDERSON WAY & PARK ROAD
HILLSBOROUGH COUNTY, FLORIDA

SHEET 6

SOIL PROFILES



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GEOTECHNICAL ENGINEERING SERVICES
HENDERSON WAY & PARK ROAD
HILLSBOROUGH COUNTY, FLORIDA

SHEET 7

Geotechnical Parameters for Pond Design
Henderson Way and Park Road Site
Hillsborough County, Florida
Tierra Project No.: 6511-21-153

Boring Location	Stratum Number	Test Depth (feet)	Encountered GWT Depth (feet)	Estimated SHGWT Depth (feet)	Insitu Vertical Unsaturated Hydraulic Conductivity (feet/day)[1]	Insitu Horizontal Saturated Hydraulic Conductivity (feet/day)[1]	Depth to Confining Layer (feet)[2]	Fillable Porosity (%)	Suction Head (inches)
PBA-1	1	2.5	GNE	2.0	33	33	>5	30	2
PBS-1	NP	NP	3.0	ND	NP	NP	10	30	2
PBA-2	1	2.5	4.3	1.0	33	33	8	30	2
PBS-2	NP	NP	2.0	ND	NP	NP	8	30	2
PBA-3	1	2.5	4.7	1.0	40	40	10	30	2
PBS-3	NP	NP	2.0	ND	NP	NP	10	30	2
PBA-4	1	3.0	3.5	1.5	40	40	6	30	2
PBS-4	NP	NP	6.0	ND	NP	NP	6	30	2
PBS-5	NP	NP	5.0	ND	NP	NP	6	30	2

(1) These rates are not factored and are only applicable to Stratum 1 soils. The design engineer should apply an appropriate factor of safety, as applicable.

(2) The depth to confining layer is taken as the depth to the top of the clayey soils (Strata 3 and 4) (SC/CL/CH).

ND- SHGWT estimate not determined at these locations.

NP- Field permeability test not performed at the these locations.