# REPORT OF GEOTECHNICAL EXPLORATION
# MISCELLANEOUS STRUCTURES

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## COUNTY LINE ROAD AT GRAND HAMPTON DRIVE
## TRAFFIC SIGNALS
## HILLSBOROUGH COUNTY, FLORIDA
## CIP 69600319

**AREHNA PROJECT NO. B-22-011.02**

**January 16, 2024**

**(Revised April 26, 2024)**

Prepared For:
**AECOM**
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Tampa, FL 33607

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January 16, 2024
(Revised April 26, 2024)

Mr. Andrew K. Lloyd, PE
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Tampa, FL 33607

Email: Andrew.Lloyd@aecom.com

Subject: **Report of Geotechnical Exploration – Miscellaneous Structures**
**County Line Road at Grand Hampton Drive Traffic Signals**
County Line Rd. and Grand Hampton Dr
Hillsborough County, Florida
CIP 69600319
AREHNA Project B-22-011.02

AREHNA Engineering, Inc. (AREHNA) is pleased to submit this report of our geotechnical exploration for the proposed project. Services were conducted in general accordance with a Continuing Services Agreement dated August 23, 2023 and AREHNA supplemental agreement dated November 28, 2023.

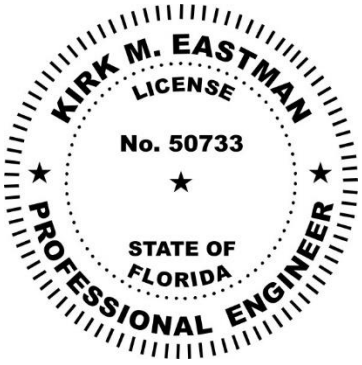
This report presents our understanding of the project, outlines our exploratory procedures, documents the field data obtained, and provides geotechnical recommendations pertaining to design and construction of the new traffic signal mast arm poles at the intersection of County Line Road and Grand Hampton Drive.

AREHNA appreciates the opportunity to have assisted AECOM on this project. Should you have any questions with regards to this report, or if we can be of any further assistance, please contact this office.

Best Regards,

**AREHNA ENGINEERING, INC.**
**FLORIDA BOARD OF PROFESSIONAL ENGINEERS CERTIFICATE OF AUTHORIZATION NO. 28410**

Sean Seibert, EI
Engineer Intern




This item has been digitally signed and sealed by:

Kirk M Eastman
2024.04.26 14:16:51 -04'00'

Kirk M. Eastman, P.E.
Senior Geotechnical Engineer
Florida Registration 50733
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.

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# 1.0 PROJECT INFORMATION

## 1.1 SITE DESCRIPTION AND PROJECT CHARACTERISTICS

The project is located at the intersection of County Line Road and Grand Hampton Drive in Hillsborough County, Florida. The project consists of constructing four (4) new traffic signal poles. One pole is proposed for each quadrant of the subject intersection. We understand two (2) traffic signal poles located on the northeast and southwest quadrant are planned to be temporary timber strain poles. The remaining two (2) traffic signal poles located on the northwest and southeast quadrants are planned to be permanent mast arm structures.

This report presents our recommendations for the proposed traffic signal pole construction including our understanding of the project, a review of existing subsurface information, an outline of our exploratory procedures, summary of field and laboratory data obtained as well as our recommendations for site preparation, design, and construction.

## 1.2 SCOPE OF WORK

The primary purpose of the field exploration program was to determine the subsurface conditions for use in generating geotechnical design parameters for the planned traffic signal structures. In this regard, engineering assessments for the following items were formulated:

- General location and description of potentially deleterious materials encountered in the boring which may have an impact on the proposed project.
- Identification of the existing groundwater levels and estimated normal seasonal high groundwater fluctuations.
- Provide recommended design soil parameters and geotechnical recommendations for drilled shaft foundation design for mast arm structures.
- Provide recommended design soil parameters and geotechnical recommendations for temporary timber strain poles.

The following services were performed to achieve the above-outlined objective:

- Requested utility location services from Sunshine 811.

- Performed four (4) Standard Penetration Test (SPT) boring near the proposed traffic signal pole locations to depths of 40 to 45 feet below the existing ground surface.
- Visually classified and stratified soil samples in the laboratory using the Unified Soil Classification System (USCS) and conducted a laboratory testing program including natural moisture content (ASTM D-2974), single sieve percent finer than #200 sieve gradation (ASTM D-1140), and Atterberg Limits (ASTM D-4318 & ASTM D-3282) on selected soil samples.
- This report presents the results of the field exploration and engineering analysis signed and sealed by a professional engineer specializing in geotechnical engineering.

## 2.0 FIELD EXPLORATION AND LABORATORY TESTING

### 2.1 FIELD EXPLORATION

The SPT borings (B-01 through B-04) were performed to depths of 40 to 45 feet below the existing ground surface (bgs). The boring locations were established in the field using Global Positioning System (GPS) equipment with an accuracy of ±10 feet based on the proposed pole location provided by AECOM. The borings on the north side of County Line Road (B-01 & B-02) were offset approximately 16 feet south of the proposed pole locations because of limited drill rig access due to the wooded area and a high-priority gas line running parallel to the tree line. Borings B-03 and B-04, on the southeast and southwest corners of the intersection, were offset approximately 5 feet east, and 2 feet south, respectively, from the proposed pole locations due to underground utility conflicts. The approximate boring location and approximate boring coordinates are provided on the **Report of Core Borings Sheets** in **Appendix A**. The soil profiles are on **Report of Core Borings Sheets** are plotted to elevation based on topography data provided by AECOM.

The SPT borings were performed with the use of a Truck Mounted Drill Rig equipped with an automatic hammer using Bentonite "Mud" drilling procedures. Samples were collected and Standard Penetration Test resistances were measured continuously for the upper 10 feet and at approximate intervals of 5 feet, thereafter. The upper four feet were manually hand augered to avoid any potential conflict with unmarked underground utilities. The soil sampling was performed in general accordance with ASTM Test Designation D-1586, entitled "Penetration Test and Split-Barrel Sampling of Soils." Upon completion of drilling, the boreholes were backfilled with cement grout.

Representative samples from the borings were sealed in glass jars, labeled and transferred to AREHNA'S Tampa office for appropriate classification by a geotechnical professional. Please note, samples will be retained for 90 days and then disposed of, unless other arrangements have been made.

### 2.2 LABORATORY TESTING

The soil samples were transported to AREHNA's soils laboratory and were classified by a Geotechnical Professional using the Unified Soil Classification System (USCS) in general accordance with the ASTM Test Designation D-2488. Our laboratory testing program included natural moisture content tests (ASTM D-2974), single sieve percent finer than #200 sieve (ASTM D-1140), and Atterberg Limits (ASTM D-4318 & ASTM D-

3282). The laboratory test results are summarized on **Table 2** in **Appendix B** and presented on the **Report of Core Borings** sheets in **Appendix A**.

# 3.0 SUBSURFACE CONDITIONS

## 3.1 USGS TOPOGRAPHIC DATA

The topographic survey map published by the United States Geological Survey was reviewed for ground surface features at the proposed project location (image on the right of **Sheet 1** in **Appendix A**). Based on this review, the natural ground surface elevations at the project site are approximately between +45 to +50 feet National Geodetic Vertical Datum of 1929 (NGVD 29). Topographic data provided by AECOM was reviewed and elevations were estimated at the boring locations between +50 to +51 feet North American Vertical Datum of 1988 (NAVD 88). Elevations referenced in this report should be considered approximate; The boring locations were not survey at the time of this report.

## 3.2 USDA NATURAL RESOURCES CONSERVATION SERVICE DATA

The "Soil Survey of Hillsborough County, Florida," (current online WebSoil Survey) published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) was reviewed for general near-surface soil information within the general project vicinity (see **USDA Vicinity Map** in **Appendix A**). The information indicates that the soils at the project site consist of the following soil unit:

**Table 3.2.1 Summary of USDA Soil Survey**

| Soil Unit Number | Soil Name | Depth Below Natural Grade to High Water Table (feet) |
|---|---|---|
| 29 | Myakka fine sand, 0 to 2 percent slopes | 0.5 – 1.5 |

The USDA Soil Survey map for the project site is presented on **Sheet 1** in **Appendix A** (image to the left) and a detailed data table for this map unit is provided as **Table 1** in **Appendix B**.

## 3.3 SUBSURFACE CONDITIONS

A pictorial representation of the subsurface conditions encountered in the borings is shown on the Boring Profiles on the **Report of Core Borings Sheets** in **Appendix A**. The profiles and the following soil conditions highlight the general subsurface stratification. When reviewing the boring records and the subsurface soil profiles, it should be understood that soil conditions may vary between, and away from, boring locations.

The SPT Borings (B-01 through B-04) generally encountered loose to medium dense sands with varying amounts of fines (SP, SP-SM, SM, SC) from the existing ground surface to depths of approximately 27 to 45 feet bgs. Beneath the sandy soils with varying fines, boring B-02 encountered hard limestone at a depth of 37 feet to the boring termination depth of 40 feet bgs. Beneath the sandy soils with varying fines, boring B-03 encountered very stiff silt (MH) from 32 to 37 feet bgs, followed by very stiff clay (CH) from 37 to 42 feet bgs. Boring B-03 next encountered hard limestone to the boring termination depth of 45 feet bgs. Boring B-04 encountered firm stiff (MH) below the initial sandy soil strata from depths of 27 to 32 feet bgs, underlain by hard limestone to the boring termination depth of 45 feet bgs. We note that borings B-03 and B-04 encountered a 100% loss of circulation at depths of 36 and 35 feet bgs, respectively. Circulation was not regained before terminating the borings.

### 3.4 GROUNDWATER CONDITIONS

The groundwater level was encountered at approximate depths of 5.8 to 8 feet bgs in borings B-03 and B-04. The groundwater level was not apparent in boring B-01. Drilling fluid was utilized in the SPT borings in order to advance the boreholes. The addition of fluid makes it difficult to obtain accurate groundwater measurements when the drilling fluid is introduced into the hole prior to encountering the groundwater table. As a result, GNA (Groundwater Not Apparent) is shown adjacent to this soil profile. The groundwater level was also not apparent in boring B-02 due to clayey soils encountered within the top 10 feet of the boring. GNA is also shown adjacent to this soil profile.

Fluctuation in groundwater levels should be expected due to seasonal climatic changes, construction activity, rainfall variations, surface water runoff, and other site-specific factors. Since groundwater level variations are anticipated, design drawings and specifications should accommodate such possibilities and construction planning should be based on the assumption that variations will occur. The groundwater level is presented graphically adjacent to the soil profiles on **Report of Core Borings Sheets** in **Appendix A**.

### 3.5 ESTIMATED SEASONAL HIGH WATER LEVEL

The Seasonal High Water Table (SHWT) is the highest average depth of soil saturation during the wet season in a normal year (South West Florida Water Management District, SWFMD). Based on SWFWMD guidelines, the procedures for estimating SHWT elevations include an examination of county soil surveys and field verification by observation and identification of indicators within the soil profile. However, with the close

proximity of the roadway and other improvements, the shallow soils are disturbed and no historical indicators of a SHWT were detected in the samples collected. The ground elevations at the borings were estimated from topographic data provided by AECOM. All borings, soil strata, and water tables in this report are referenced by depth below the existing ground surface.

Based on the USDA Soil Survey, field observations and our experience in the area, the estimated seasonal high water table should be expected at approximate depths of 6.5 feet bgs at the pole locations along the north of County Line Road and 5.5 feet bgs at the pole locations along the south side of County Line Road. It should be noted that rainwater or surface runoff will tend to temporarily perch on top the shallow clayey soil near the existing ground surface at poles along the north side of County Line Road.

## 4.0 ENGINEERING EVALUATION AND RECOMMENDATIONS

It is our understanding that drilled shaft foundations will be used for the proposed traffic signal mast arm poles. For the temporary strain poles, it is our understanding the foundations will consist of the embedded portion of the timber pole surrounded by compacted No. 57 Stone backfill. In our evaluation for the subject project, we have addressed the following geotechnical design and construction considerations:

- Support of the proposed traffic signal mast arm drilled shaft foundations.
- Recommendations for the installation of temporary timber strain poles.

### 4.1 RECOMMENDED GEOTECHNICAL PARAMETERS: MAST ARMS

We understand that the proposed mast arm poles will be designed by the Structural Engineer based on the FDOT Standard Index 649-031 (Standard Mast Arm Assemblies). According to the FDOT Standard Plans Index 649-031, the mast arm poles are supported by drilled shaft foundations, which are pre-designed based upon the following soil criteria:

- Classification = Cohesionless (Fine Sand)
- Friction Angle = 30 degrees or greater
- Unit Weight = 50 pcf or greater (assumed submerged)
- N-blowcount ≥ 15

**Based on the results of the mast arm traffic signal borings B-01 and B-03, the structure locations generally do not meet the established criteria and will require a special site-specific design.** Recommended soil parameters for the proposed mast arm foundations are provided in **Appendix C**. The parameters include average design values for soil type, soil unit weight, and angle of friction based on shaft tip depth beneath the surface. These parameters are based on our previous experience with projects utilizing similar structures in similar materials, as well as previous laboratory testing on similar materials and correlations with SPT N-values. In addition, the average SPT N-value of the boring (along the length of the shaft) should be used, and we recommend a design groundwater level at the ground surface (saturated condition).

## 4.2 TEMPORARY TIMBER STRAIN POLE INSTALLATION RECOMMENDATIONS

We understand that the proposed temporary timber strain poles will be designed by the Structural Engineer based on the FDOT Standard Specifications Section 102-9.12. As per the project plans, the temporary poles will include a guy wire/soil anchor system. The timber pole foundation will consist of the 12.5 feet embedded portion of the pole surrounded by compacted No. 57 Stone backfill.

Recommended soil parameters for the proposed pole foundations are presented on **Table 3** in **Appendix C**. The parameters include soil type, soil unit weight, and angle of friction. These parameters are based on our previous experience with projects utilizing similar structures in similar materials, as well as previous laboratory testing on similar materials and correlations with SPT N-values.

## 4.3 CONSTRUCTION CONSIDERATIONS

### 4.3.1 Mast Arm Poles

The drilled shafts for the mast arm pole structures should be installed in accordance with Florida Department of Transportation (FDOT) Standard Specifications, Design Standards, and contract documents. We recommend the following plan note on adverse site conditions be included in the plans for the miscellaneous structure drilled shafts:

> ***The limestone layer corresponds to a rock formation that typically offers high resistance to excavation. Special equipment and breaking tools may be required to excavate. This material is also difficult to dewater due to its porosity and permeability. Steps shall be taken to mitigate difficult drilled shaft installation and minimize the vibrations through the use of specialized equipment and/or procedures. This material was encountered in boring B-03 from an approximate depth of 42 feet to the boring termination depth of 45 feet below existing grades.***

Foundations should not be tipped/embedded within one shaft diameter above very loose/soft soils with automatic hammer N-values of less than 2 blows per foot (N < 2 bpf) to reduce the risk of excessive settlement of the shaft and the potential for instability of the shaft bottom during construction.

If the shaft tip elevation is determined to be within one shaft diameter above very loose/soft soils (N-value of less than 2) based on the design calculations only, the shaft should be extended below the very loose/soft soils into denser underlying material.

Nearby existing structures at the signal location consist of electric poles and strain poles. The existing pole foundations should be protected in accordance with Section 7-11.1 of the SSRBC. If the proposed foundation is located within three shaft diameters of the existing poles, use of temporary casing method is recommended in order to protect the existing pole foundations. In addition, the individual capacity of each foundation (existing pole foundation and new drilled shaft) may be reduced for center to center spacing less than 3 diameters.

### 4.3.2 Temoprary Timber Strain Poles

The temporary timber strain poles should be installed in accordance with FDOT Standard Specifications, Design Standards, and contract documents. We recommend the following plan note on adverse site conditions be included in the plans for the temporary timber strain poles:

> ***The limestone layer corresponds to a rock formation that typically offers high resistance to excavation. Special equipment and breaking tools may be required to excavate. This material is also difficult to dewater due to its porosity and permeability. Steps shall be taken to mitigate difficult timber pole installation and minimize the vibrations through the use of specialized equipment and/or procedures. This material was encountered in boring B-02 from an approximate depth of 37 feet to the boring termination depth of 40 feet below existing grades and in boring B-04 from an approximate depth of 32 feet to the boring termination depth of 45 feet, below existing grades.***

## 5.0 ENVIRONMENTAL CLASSIFICATION

Environmental corrosion parameter tests were not performed for the proposed structures. As per the FDOT Soils & Foundation Handbook, the miscellaneous structures should be designed for the most aggressive conditions.

## 6.0 BASIS FOR RECOMMENDATIONS

The evaluations and recommendations submitted in this report are based upon the data obtained from the soil borings performed at the locations indicated. Regardless of the thoroughness of a geotechnical exploration, there is always a possibility that conditions between borings will be different from those at specific boring locations and that conditions will not be as anticipated by the designers or contractors. In addition, the construction process itself may alter soil conditions. AREHNA is not responsible for the conclusions, opinions or recommendations made by others based on the data presented in this report.

The assessment of site environmental conditions or the presence of contaminants in the soil, rock, surface water or groundwater of the site was beyond the scope of this exploration. Any statements in this report regarding odors, staining of soils, or other unusual conditions observed are strictly for the information of AECOM and Hillsborough County.

This report was prepared exclusively for AECOM and Hillsborough County by AREHNA. The quality of information, conclusions and estimates contained herein is consistent with the level of effort involved in AREHNA's services and based on: i) information available at the time of preparation, ii) data supplied by outside sources and iii) the assumptions, conditions and qualifications set forth in this report. This report is intended to be used by AECOM and Hillsborough County only. Any other use of, or reliance on, this report by any third party is at that party's sole risk.

**APPENDIX A**

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USDA & USGC Vicinity Maps – Sheet 1

Report of Core Borings – Sheets 2 and 3

## USDA SOIL SURVEY MAP



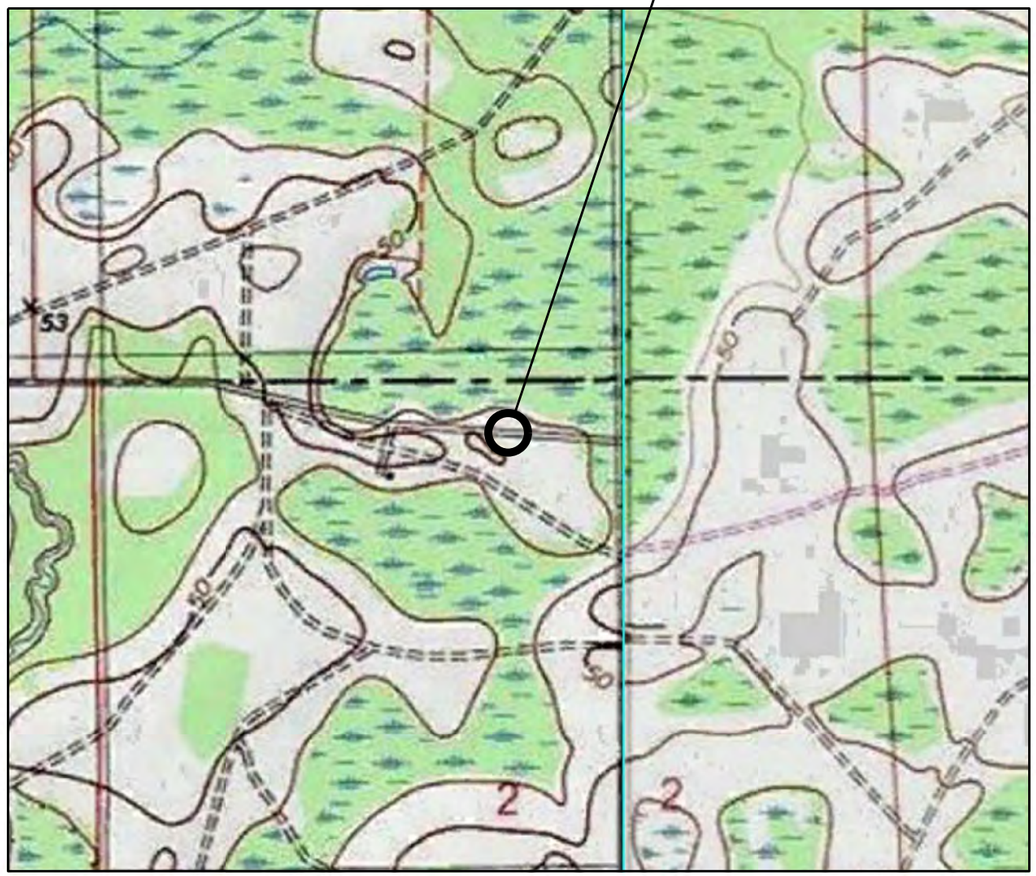

REFERENCE: USDA SOIL SURVEY OF HILLSBOROUGH COUNTY, FLORIDA

TOWNSHIP: 27 S
RANGE: 19 E
SECTION: 2

0 250 1000
Feet

N

## USGS TOPOGRAPHIC MAP




REFERENCE: "LUTZ, FLORIDA" USGS QUADRANGLE MAP

TOWNSHIP: 27 S
RANGE: 19 E
SECTION: 2

0 250 1000
Feet

N

| REVISIONS | | | |
|---|---|---|---|
| DATE | DESCRIPTION | DATE | DESCRIPTION |
| | | | |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601 E. KENNEDY BLVD.
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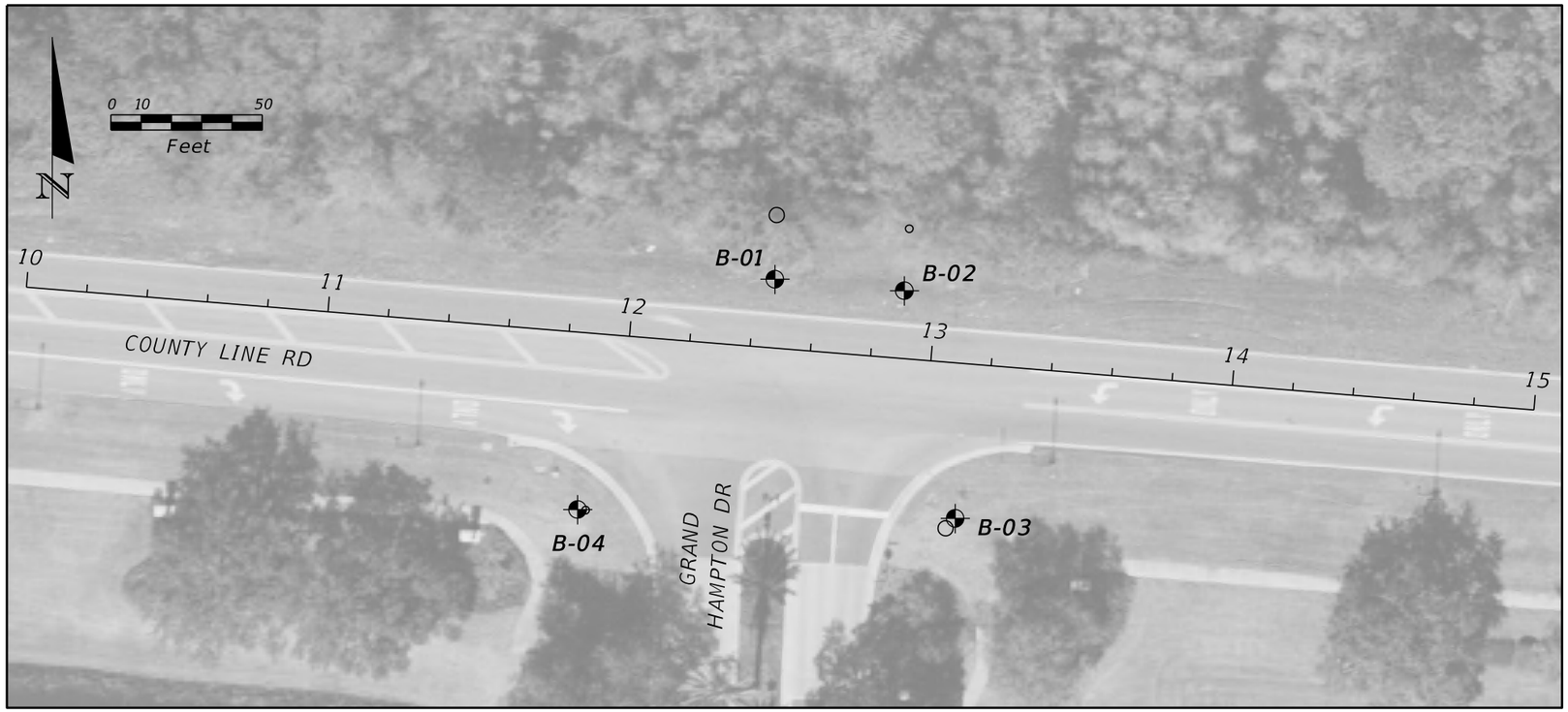
| COUNTY LINE RD AT GRAND HAMPTON DR | CIP NO. | SHT. NO. |
|---|---|---|
| USDA & USGS VICINITY MAPS | 69600319 | 1 |




## LEGEND

- SAND
- CLAY
- SILTY SAND
- SILT
- CLAYEY SAND
- LIMESTONE

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

HA — HAND AUGER

▽ — GROUNDWATER TABLE

GNA — GROUNDWATER TABLE NOT APPARENT

N — NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).

50/4 — NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

T00 — LOSS OF CIRCULATION OF DRILLING FLUID (%)

NMC — NATURAL MOISTURE CONTENT (%)

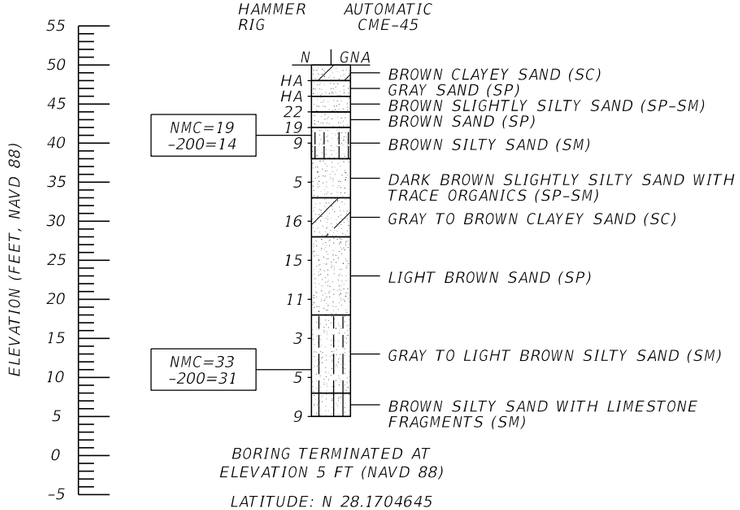
-200 — FINES PASSING THE #200 STANDARD SIEVE (%)

LL — LIQUID LIMIT (%)

PI — PLASTICITY INDEX (%)

⌖ — APPROXIMATE SPT BORING LOCATION

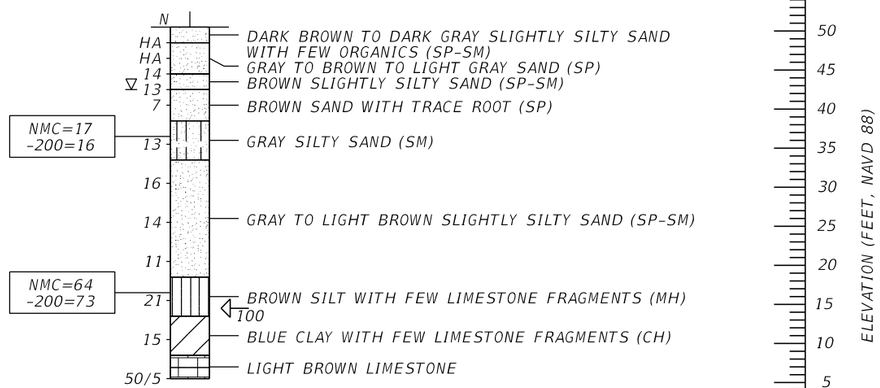
BOR # B-01
STA. 12+46
REF. ℄ COUNTY LINE RD
OFF. 23 LT
ELEV. 50 FT
DATE 12/26/2023
DRILLER M. SEIBERT
HAMMER AUTOMATIC
RIG CME-45




BORING TERMINATED AT ELEVATION 5 FT (NAVD 88)

LATITUDE: N 28.1704645
LONGITUDE: W 82.3772596

BOR # B-03
STA. 13+12
REF. ℄ COUNTY LINE RD
OFF. 51 RT
ELEV. 50.5 FT
DATE 12/27/2023
DRILLER M. SEIBERT
HAMMER AUTOMATIC
RIG CME-45




BORING TERMINATED AT ELEVATION 5.5 FT (NAVD 88)

LATITUDE: N 28.1702476
LONGITUDE: W 82.3770738




| | SAFETY HAMMER | AUTOMATIC HAMMER |
|---|---|---|
| GRANULAR MATERIALS- RELATIVE DENSITY | SPT N-VALUE (BLOWS/FT.) | SPT N-VALUE (BLOWS/FT.) |
| VERY LOOSE | LESS THAN 4 | LESS THAN 3 |
| LOOSE | 4 to 10 | 3 to 8 |
| MEDIUM DENSE | 10 to 30 | 8 to 24 |
| DENSE | 30 to 50 | 24 to 40 |
| VERY DENSE | GREATER THAN 50 | GREATER THAN 40 |
| SILTS AND CLAYS CONSISTENCY | SPT N-VALUE (BLOWS/FT.) | SPT N-VALUE (BLOWS/FT.) |
| VERY SOFT | LESS THAN 2 | LESS THAN 1 |
| SOFT | 2 to 4 | 1 to 3 |
| FIRM | 4 to 8 | 3 to 6 |
| STIFF | 8 to 15 | 6 to 12 |
| VERY STIFF | 16 to 30 | 12 to 24 |
| HARD | GREATER THAN 30 | GREATER THAN 24 |

NOTE:

THE LIMESTONE LAYER CORRESPONDS TO A ROCK FORMATION THAT TYPICALLY OFFERS HIGH RESISTANCE TO EXCAVATION. SPECIAL EQUIPMENT AND BREAKING TOOLS MAY BE REQUIRED TO EXCAVATE. THIS MATERIAL IS ALSO DIFFICULT TO DEWATER DUE TO ITS POROSITY AND PERMEABILITY. STEPS SHALL BE TAKEN TO MITIGATE DIFFICULT DRILLED SHAFT INSTALLATION AND MINIMIZE THE VIBRATIONS THROUGH THE USE OF SPECIALIZED EQUIPMENT AND/OR PROCEDURES. THIS MATERIAL WAS ENCOUNTERED IN BORING B-03 FROM AN APPROXIMATE DEPTH OF 42 FEET TO THE BORING TERMINATION DEPTH OF 45 FEET BELOW EXISTING GRADES.

MAST ARM POLES

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

| REVISIONS | | | |
|---|---|---|---|
| DATE | DESCRIPTION | DATE | DESCRIPTION |
| | | | |

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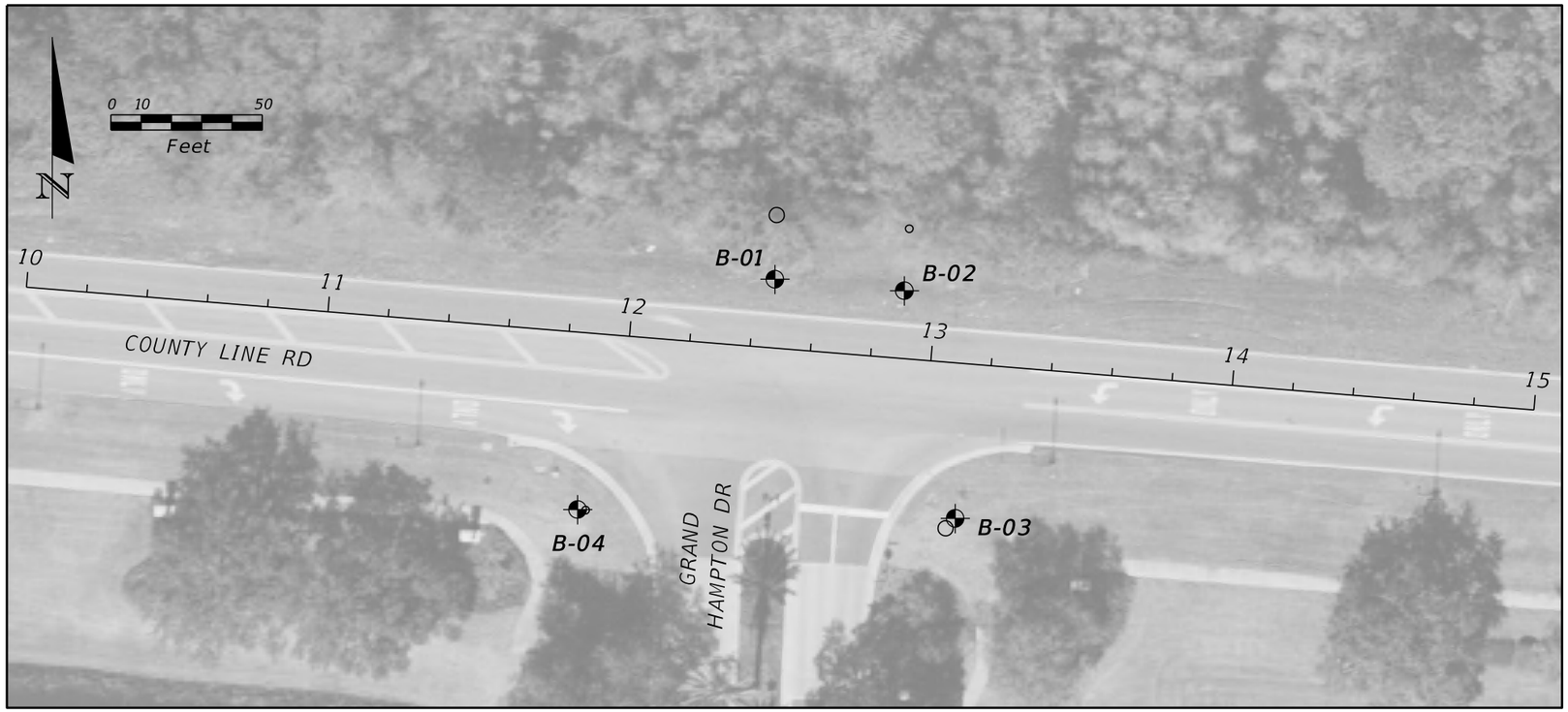


## LEGEND

SAND
CLAY
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LIMESTONE

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

HA HAND AUGER

▽ GROUNDWATER TABLE

GNA GROUNDWATER TABLE NOT APPARENT

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T00 LOSS OF CIRCULATION OF DRILLING FLUID (%)

NMC NATURAL MOISTURE CONTENT (%)

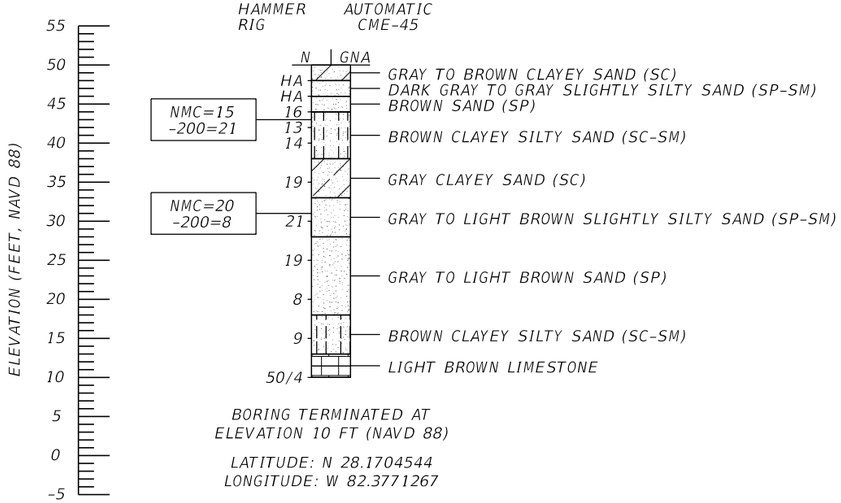
-200 FINES PASSING THE #200 STANDARD SIEVE (%)

LL LIQUID LIMIT (%)

PI PLASTICITY INDEX (%)

APPROXIMATE SPT BORING LOCATION

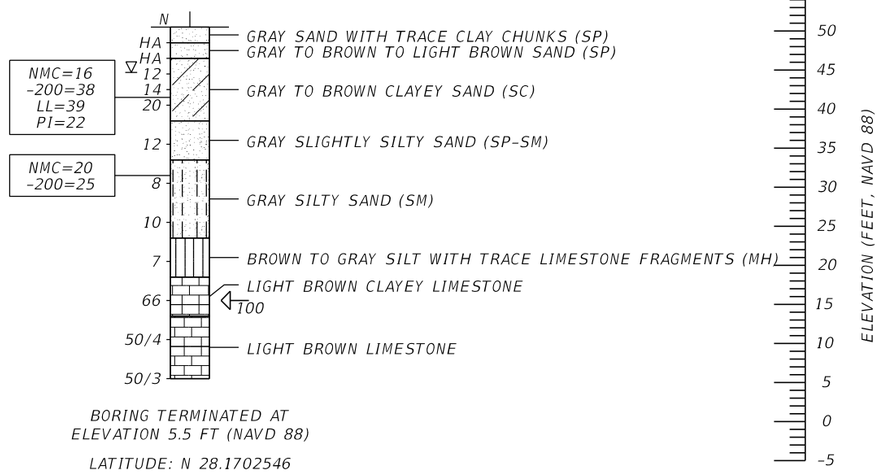
BOR # B-02
STA. 12+89
REF. ℄ COUNTY LINE RD
OFF. 22 LT
ELEV. 50 FT
DATE 12/26/2023
DRILLER M. SEIBERT
HAMMER AUTOMATIC
RIG CME-45




BORING TERMINATED AT ELEVATION 10 FT (NAVD 88)

LATITUDE: N 28.1704544
LONGITUDE: W 82.3771267

BOR # B-04
STA. 11+88
REF. ℄ COUNTY LINE RD
OFF. 58 RT
ELEV. 50.5 FT
DATE 12/27/2023
DRILLER M. SEIBERT
HAMMER AUTOMATIC
RIG CME-45




BORING TERMINATED AT ELEVATION 5.5 FT (NAVD 88)

LATITUDE: N 28.1702546
LONGITUDE: W 82.3774613




| | SAFETY HAMMER | AUTOMATIC HAMMER |
|---|---|---|
| GRANULAR MATERIALS- RELATIVE DENSITY | SPT N-VALUE (BLOWS/FT.) | SPT N-VALUE (BLOWS/FT.) |
| VERY LOOSE | LESS THAN 4 | LESS THAN 3 |
| LOOSE | 4 to 10 | 3 to 8 |
| MEDIUM DENSE | 10 to 30 | 8 to 24 |
| DENSE | 30 to 50 | 24 to 40 |
| VERY DENSE | GREATER THAN 50 | GREATER THAN 40 |
| SILTS AND CLAYS CONSISTENCY | SPT N-VALUE (BLOWS/FT.) | SPT N-VALUE (BLOWS/FT.) |
| VERY SOFT | LESS THAN 2 | LESS THAN 1 |
| SOFT | 2 to 4 | 1 to 3 |
| FIRM | 4 to 8 | 3 to 6 |
| STIFF | 8 to 15 | 6 to 12 |
| VERY STIFF | 16 to 30 | 12 to 24 |
| HARD | GREATER THAN 30 | GREATER THAN 24 |

NOTE:

THE LIMESTONE LAYER CORRESPONDS TO A ROCK FORMATION THAT TYPICALLY OFFERS HIGH RESISTANCE TO EXCAVATION. SPECIAL EQUIPMENT AND BREAKING TOOLS MAY BE REQUIRED TO EXCAVATE. THIS MATERIAL IS ALSO DIFFICULT TO DEWATER DUE TO ITS POROSITY AND PERMEABILITY. STEPS SHALL BE TAKEN TO MITIGATE DIFFICULT TIMBER POLE INSTALLATION AND MINIMIZE THE VIBRATIONS THROUGH THE USE OF SPECIALIZED EQUIPMENT AND/OR PROCEDURES. THIS MATERIAL WAS ENCOUNTERED IN BORING B-02 FROM AN APPROXIMATE DEPTH OF 37 FEET TO THE BORING TERMINATION OF 40 FEET BELOW EXISTING GRADES AND IN BORING B-04 FROM AN APPROXIMATE DEPTH OF 32 FEET TO THE BORING TERMINATION DEPTH OF 45 FEET BELOW EXISTING GRADES.

TEMPORARY TIMBER STRAIN POLES

THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.

| REVISIONS | | | |
|---|---|---|---|
| DATE | DESCRIPTION | DATE | DESCRIPTION |
| | | | |

KIRK M. EASTMAN, P.E.
P.E. LICENSE NUMBER 50733
AREHNA ENGINEERING, INC.
5012 W. LEMON STREET
TAMPA, FL 33609

Hillsborough County Florida

PUBLIC WORKS DEPARTMENT
TECHNICAL SERVICES DIVISION
601 E. KENNEDY BLVD.
TAMPA, FLORIDA 33602

COUNTY LINE RD AT GRAND HAMPTON DR

REPORT OF CORE BORINGS

CIP NO. 69600319

SHT. NO. 3

**APPENDIX B**

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Summary of USDA Soil Survey – Table 1

Summary of Laboratory Test Results – Table 2

**TABLE 1**
**SUMMARY OF USDA SOIL SURVEY**
COUNTY LINE ROAD AT GRAND HAMPTON DRIVE SIGNAL IMPROVEMENTS
HILLSBOROUGH COUNTY, FLORIDA
CIP 69600319
AREHNA Project No.: B-22-011.02

| USDA Soil Type | Depth (inches) | USDA Soil Description | AASHTO | USCS | Permeability (in/hr) | Seasonal High Groundwater | | | Risk of Corrosion | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Depth (feet) | Duration (months) | Kind | Steel | Concrete |
| Myakka fine sand, 0 to 2 percent slopes (29) | 0 - 6 | Fine sand | A-2-4, A-3 | SP-SM, SM | 0.6 - 6 | 0.5 - 1.5 | Jun - Nov | Apparent | High | High |
| | 6 - 20 | Sand, fine sand | A-2-4, A-3 | SP-SM, SM | | | | | | |
| | 20 -36 | Fine sand, sand | A-2-4, A-3 | SP-SM, SM | | | | | | |
| | 36 - 80 | Fine sand, sand | A-2-4, A-3 | SP-SM, SM | | | | | | |

**TABLE 2**

**SUMMARY OF LABORATORY TEST RESULTS**

COUNTY LINE ROAD AT GRAND HAMPTON DRIVE SIGNAL IMPROVEMENTS

HILLSBOROUGH COUNTY, FLORIDA

CIP 69600319

AREHNA PROJECT NO. B-22-011.02

| Boring No. | Sample Depth (feet) | AASHTO Classification | Sieve Analysis | Atterberg Limits | | Natural Moisture Content (%) |
|---|---|---|---|---|---|---|
| | | | #200 | Liquid Limit | Plasticity Index | |
| B-01 | 8 - 10 | SM | 14 | - | - | 19 |
| B-01 | 38.5 - 40 | SM | 31 | - | - | 33 |
| B-02 | 6 - 8 | SC-SM | 21 | - | - | 15 |
| B-02 | 18.5 - 20 | SP-SM | 8 | - | - | 20 |
| B-03 | 13.5 - 15 | SM | 16 | - | - | 17 |
| B-03 | 33.5 - 35 | MH | 73 | - | - | 64 |
| B-04 | 8 - 10 | SC | 38 | 39 | 22 | 16 |
| B-04 | 18.5 - 20 | SM | 25 | - | - | 20 |

**APPENDIX C**

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Recommended Design Soil Parameters for Mast Arm Foundations

Recommended Design Soil Parameters for Temporary Timber Strain Poles – Table 3

**APPENDIX C (Continued)**

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Recommended Design Soil Parameters for Mast Arm Foundations

**AREHNA Engineering, Inc.**
5012 W. Lemon Street
Tampa, FL 33609

Project Name: County Line Rd at Grand Hampton Dr Traffic Signals
Project Number: B-22-011.02

Boring No.: B-01
Boring GSE (ft, NAVD): 50
Prepared by/Date: SPS/1-2-2024
Checked by/Date: KE/1-10-2024

**Mast Arm Structures - Equivalent Soil Parameters Estimation (Cohesionless)**

| Soil Description | Modeled as | Depth (ft.) | | SPT N (automatic hammer), bpf | SPT N (manual hammer), bpf | Internal Friction Angle, ϕ (Degrees) | Total Soil Unit Weight, γ (pcf) | Effective (Submerged) Soil Unit Weight, γ' (pcf) |
|---|---|---|---|---|---|---|---|---|
| | | From | To | | | | | |
| Clayey Sand | SC | 0 | 2 | 5 | 6.2 | 25 | 105 | 42.6 |
| Sand | SP | 2 | 4 | 5 | 6.2 | 30 | 105 | 42.6 |
| Sand with silt | SP-SM | 4 | 6 | 22 | 27.3 | 35 | 115 | 52.6 |
| Sand | SP | 6 | 8 | 19 | 23.6 | 34 | 115 | 52.6 |
| Silty Sand | SM | 8 | 13 | 9 | 11.2 | 31 | 112 | 49.6 |
| Sand with silt | SP-SM | 13 | 15 | 5 | 6.2 | 30 | 105 | 42.6 |
| Clayey Sand | SC | 15 | 20 | 16 | 19.8 | 33 | 115 | 52.6 |
| Sand | SP | 20 | 25 | 15 | 18.6 | 33 | 115 | 52.6 |
| Sand | SP | 25 | 30 | 11 | 13.6 | 31 | 112 | 49.6 |
| Silty Sand | SM | 30 | 35 | 3 | 3.7 | 29 | 102 | 39.6 |
| Silty Sand | SM | 35 | 40 | 5 | 6.2 | 30 | 105 | 42.6 |
| Silty Sand | SM | 40 | 45 | 9 | 11.2 | 31 | 112 | 49.6 |

**Mast Arm Structures - Recommended Design Soil Parameters (Cohesionless)**

Version 1.10 (Created By/ Date: ALA/09-18-15 & Checked By/Date: CJR/09-21-15)

Note: Unless noted below, we recommend the design groundwater level at the ground surface. If existing grades need to be raised, assume the following soil parameters for the new sand fill: Internal Friction Angle of 30 degrees, Total Unit Weight of 105 pcf, and Effective (Submerged) Soil Unit Weight of 42.6 pcf, and SPT of 10 bpf.

| Boring No. | Location (Station & Offset/ Baseline) | Drilled Shaft Length (ft) | Equivalent SPT N (manual hammer), bpf | Equivalent Average Internal Friction Angle, ϕ (Degrees) | Equivalent Total Soil Unit Weight, γ (pcf) | Equivalent Effective (Submerged) Soil Unit Weight, γ' (pcf) | Comment |
|---|---|---|---|---|---|---|---|
| **B-01** | **See Report of Core Borings** | **12** | **14** | **31** | 112.4 | **50** | Special Design Required |
| | | **14** | **13** | **31** | 112.4 | **50** | Special Design Required |
| | | **16** | **13** | **31** | 112.4 | **50** | Special Design Required |
| | | **18** | **14** | **31** | 112.4 | **50** | Special Design Required |
| | | **20** | **15** | **31** | 112.4 | **50** | Use Index 649-030 |
| | | **25** | **15** | **31** | 112.4 | **50** | Use Index 649-030 |
| | | **30** | **15** | **31** | 112.4 | **50** | See Note 1 |
| | | **35** | **14** | **31** | 112.4 | **50** | Special Design Required |
| | | **40** | **13** | **31** | 112.4 | **50** | Special Design Required |
| | | **45** | **12** | **31** | 112.4 | **50** | Special Design Required |

**Notes:**

1. The average soil strength properties meet or exceed the minimum required soil criteria shown on the FDOT Standard Plans Instructions for Index 649-030. However, the foundation embedment depths shown in Standard Plans Index 649-030 are different than the depth evaluated and a special design may be required.

2. Foundations should not be tipped/embedded within one shaft diameter above very loose/soft soils with automatic hammer N-values of less than 2 blows per foot (N < 2 bpf) to reduce the risk of excessive settlement of the shaft and the potential for instability of the shaft bottom during construction.

3. Assume unsupported length from 0 to 2 feet depth from ground surface due to organic soils. Shaft Length shown in the table below refers to supported shaft length.

**AREHNA Engineering, Inc.**
5012 W. Lemon Street
Tampa, FL 33609

Project Name: County Line Rd at Grand Hampton Dr Traffic Signals
Project Number: B-22-011.02

Boring No.: B-03
Boring GSE (ft, NAVD): 50.5
Prepared by/Date: SPS/1-2-2024
Checked by/Date: KE/1-10-2024

**Mast Arm Structures - Equivalent Soil Parameters Estimation (Cohesionless)**

| Soil Description | Modeled as | Depth (ft.) | | SPT N (automatic hammer), bpf | SPT N (manual hammer), bpf | Internal Friction Angle, ϕ (Degrees) | Total Soil Unit Weight, γ (pcf) | Effective (Submerged) Soil Unit Weight, γ' (pcf) |
|---|---|---|---|---|---|---|---|---|
| | | From | To | | | | | |
| Sand with silt | SP-SM | 0 | 2 | 5 | 6.2 | 30 | 105 | 42.6 |
| Sand | SP | 2 | 4 | 5 | 6.2 | 30 | 105 | 42.6 |
| Sand | SP | 4 | 6 | 14 | 17.4 | 32 | 112 | 49.6 |
| Sand with silt | SP-SM | 6 | 8 | 13 | 16.1 | 32 | 112 | 49.6 |
| Sand | SP | 8 | 13 | 7 | 8.7 | 30 | 112 | 49.6 |
| Silty Sand | SM | 13 | 15 | 13 | 16.1 | 32 | 112 | 49.6 |
| Sand with silt | SP-SM | 15 | 20 | 16 | 19.8 | 33 | 115 | 52.6 |
| Sand with silt | SP-SM | 20 | 25 | 14 | 17.4 | 32 | 112 | 49.6 |
| Sand with silt | SP-SM | 25 | 30 | 11 | 13.6 | 31 | 112 | 49.6 |
| Silt | MH | 30 | 35 | 21 | 26.0 | 35 | 115 | 52.6 |
| Fat Clay | CH | 35 | 40 | 15 | 18.6 | ----- | 140 | 77.6 |
| Limestone | NA | 40 | 45 | 100 | 124.0 | 38 | 130 | 67.6 |

**Mast Arm Structures - Recommended Design Soil Parameters (Cohesionless)**

Version 1.10 (Created By/ Date: ALA/09-18-15 & Checked By/Date: CJR/09-21-15)

Note: Unless noted below, we recommend the design groundwater level at the ground surface. If existing grades need to be raised, assume the following soil parameters for the new sand fill: Internal Friction Angle of 30 degrees, Total Unit Weight of 105 pcf, and Effective (Submerged) Soil Unit Weight of 42.6 pcf, and SPT of 10 bpf.

| Boring No. | Location (Station & Offset/ Baseline) | Drilled Shaft Length (ft) | Equivalent SPT N (manual hammer), bpf | Equivalent Average Internal Friction Angle, ϕ (Degrees) | Equivalent Total Soil Unit Weight, γ (pcf) | Equivalent Effective (Submerged) Soil Unit Weight, γ' (pcf) | Comment |
|---|---|---|---|---|---|---|---|
| **B-03** | **See Report of Core Borings** | **12** | **11** | **31** | 112.4 | **50** | Special Design Required |
| | | **14** | **11** | **31** | 112.4 | **50** | Special Design Required |
| | | **16** | **12** | **31** | 112.4 | **50** | Special Design Required |
| | | **18** | **13** | **31** | 112.4 | **50** | Special Design Required |
| | | **20** | **13** | **31** | 112.4 | **50** | Special Design Required |
| | | **25** | **14** | **32** | 112.4 | **50** | Special Design Required |
| | | **30** | **14** | **32** | 112.4 | **50** | Special Design Required |
| | | **35** | **16** | **32** | 112.4 | **50** | See Note 1 |
| | | **40** | **16** | **28** | 112.4 | **50** | Special Design Required |
| | | **45** | **28** | **29** | 112.4 | **50** | Special Design Required |

**Notes:**

1. The average soil strength properties meet or exceed the minimum required soil criteria shown on the FDOT Standard Plans Instructions for Index 649-030. However, the foundation embedment depths shown in Standard Plans Index 649-030 are different than the depth evaluated and a special design may be required.

2. Foundations should not be tipped/embedded within one shaft diameter above very loose/soft soils with automatic hammer N-values of less than 2 blows per foot (N < 2 bpf) to reduce the risk of excessive settlement of the shaft and the potential for instability of the shaft bottom during construction.

3. Assume unsupported length from 0 to 2 feet depth from ground surface due to organic soils. Shaft Length shown in the table below refers to supported shaft length.

**APPENDIX C (Continued)**

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Recommended Design Soil Parameters for Temporary Timber Strain Poles – Table 3

**TABLE 3**

**RECOMMENDED DESIGN SOIL PARAMETERS FOR TEMPORARY TIMEBER STRAIN POLES**

COUNTY LINE ROAD AT GRAND HAMPTON DRIVE SIGNAL IMPROVEMENTS

HILLSBOROUGH COUNTY, FLORIDA

CIP 69600319

AREHNA Project No.: B-22-011.02

| BORING NUMBER | DEPTH (FEET) | SPT "N" AVERAGE | SOIL CLASSIFICATION | APPROXIMATE SOIL UNIT WEIGHT (PCF) | | COHESION (PSF) | SOIL ANGLE OF FRICTION (DEGREES) | EARTH PRESSURE COEFFICIENT | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | ɣ SAT | ɣ SUB | | | Ka | Kp |
| B-02 | 0-12 | 14 | SC, SP-SM, SP, SC-SM | 105 | 42.6 | - | 31 | 0.323 | 3.099 |
| | 12-27 | 20 | SC, SP-SM, SP | 110 | 47.6 | - | 32 | 0.307 | 3.255 |
| | 27 - 37 | 9 | SP, SC-SM | 105 | 42.6 | - | 30 | 0.336 | 2.976 |
| | 37-40 | 100 | LIMESTONE | 135 | 72.6 | 12,000 | - | 1.000 | 1.000 |
| B-04 | 0 - 17 | 15 | SP, SC, SP-SM | 105 | 42.6 | - | 31 | 0.320 | 3.124 |
| | 17 - 27 | 9 | SM | 105 | 42.6 | - | 30 | 0.336 | 2.976 |
| | 27 - 32 | 7 | MH | 110 | 47.6 | 875 | - | 1.000 | 1.000 |
| | 32 - 45 | 89 | LIMESTONE | 135 | 72.6 | 11,120 | - | 1.000 | 1.000 |