Appendix B – Environmental Survey Reports

FINAL REPORT
GEOPHYSICAL INVESTIGATION
FLORIDA NATIONAL CEMETERY SITE
BUSHNELL, FL

Prepared for Mabbett & Associates, Inc.
North Smithfield, RI

Prepared by GeoView, Inc.
St. Petersburg, FL

1.0 Introduction

A geophysical investigation was conducted within a planned area of considered expansion for the Florida National Cemetery located at 6502 SW 102nd Avenue in Bushnell, Florida. The investigation was conducted over period of several days from September 27 to October 12, 2019.

The purpose of the investigation was to help characterize near-surface geological conditions and to identify subsurface geological features related to potential karst activity within the study area. The investigation was performed both on the land and across a pond which is located in the northwest portion of the site (Figure 1 [Appendix 1]).

2.0 Description of Geophysical Investigation

The land-based portion of the GPR survey was conducted along a series of transects spaced an average of 100 feet (ft) apart. The study was performed along paths that were cleared prior to the geophysical investigation. The clearing of the paths was completed using a large tractor-mounted brush hog. The clearing of the paths was directed and coordinated by GeoView. The water-based portion of the study was performed using an airboat.

The GPR data was collected with a Mala radar system using a 250 MHz antenna. For the land-based portion of the study a time range setting of 188 nano seconds (ns) was used. This equipment configuration provided an estimated depth of investigation which ranged from 10 to 30 ft below land surface (bls) across the site. For the water-based portion of the study the same 250 MHz antenna was used with a time range setting of 188 or 235 ns. This equipment configuration provided an estimated depth of investigation of 10 to 15 ft below the bottom of the pond sediments.

The GPR data was collected for the land-based portion of the study by towing the instrumentation using an all-terrain vehicle. The portion of the study across the pond was performed using an airboat. Pictures of the equipment configurations are provided in Appendix 2.

The positions of the geophysical transect lines were recorded using a Trimble GeoXH Global Positioning System (GPS). A Wide Area Augmentation System (WAAS) was used to augment GPS with additional signals for increasing the reliability, integrity, accuracy and availability of the GPS signal. By using WAAS, an accuracy of less than 1-2 ft in the horizontal dimension was achieved. A description of the GPR technique and the methods employed for geological characterization studies is provided in Appendix 4.

3.0 Identification of Possible Karst Features Using GPR Methods

The features observed on GPR data that are most commonly associated with karst activity are:

- A downwarping of GPR reflector sets, that are associated with suspected lithological contacts, towards a common center. Such features typically have a bowl or funnel shaped configuration and can be associated with a deflection of overlying sediment horizons caused by the migration of sediments into voids in the underlying limestone. If the GPR reflector sets are sharply downwarping and intersect, they can create a "bow-tie" shaped GPR reflection feature, which often designates the apparent center of the GPR anomaly.
- A localized significant increase in the depth of the penetration and/or amplitude of the GPR signal response. The increase in GPR signal penetration depth or amplitude is often associated with either a localized increase in sand content at depth or decrease in soil density.
- An apparent discontinuity in GPR reflector sets, that are associated with suspected lithological contacts. The apparent discontinuities and/or disruption of the GPR reflector sets may be associated with the downward migration of sediments.

The greater the severity of these features or a combination of these features the greater the likelihood that the identified feature is a karst feature. It is not possible based on the GPR data alone to determine if an identified feature is a karst feature or, more important, whether that feature is potentially active.

4.0 Survey Results

4.1 Discussion of GPR Survey Results (Land-Based)

The exploration depth of the GPR signal across the land-based portion of the study ranged from approximately 10 to 30 ft bls. A dominant GPR reflector was observed across much of the study area that ranged from approximately 2 to 20 ft bls. It is suspected that this reflector set is associated with a lithological contact between a surficial sand stratum and underlying clay or possibly limestone stratum.

4.1.1 Description of GPR-Identified Geological Features

Multiple GPR-identified geological features were identified at the site (Figure 1). The GPR-identified geological features are characterized as Type A and

Type B. Type A anomalies are considered to be the most significant and Type B anomalies are considered to be the least significant.

GPR anomalies that were observed on only one GPR transect are represented using an ellipse. GPR anomalies that were observed on adjacent transects are represented as area which was created by connecting the boundaries of the individual ellipses. It is noted that the spacing between the GPR transects was too course to be able to provide an accurate estimate of the actual size (plan view dimensions) of the identified geological features.

A total of five Type A anomalies were identified across the project site. Type A GPR geological features are characterized by an observed 10 to 17 ft downwarping of the previously referenced GPR reflector set and a localized major increase in the penetration depth of the GPR signal. The apparent centers of the features are characterized as the area of maximum downwarping of the previously referenced GPR reflectors and/or maximum exploration depth of the GPR signal.

A total of 56 Type B anomalies were identified across the project site. Type B GPR geological features are typically associated with an observed downwarping of 3 to 12 ft in the referenced GPR reflector set. A moderate localized increase in the exploration depth of the GPR signal was also observed within these areas. The Type B anomalies are similar in character to the Type A anomalies but are not as severe in terms of downwarping of the GPR reflector sets and increase in the exploration depth of the GPR signal.

Examples of Type A and B of GPR anomalies are provided in Appendix 3. A description of the GPR technique, methods employed for geological characterization studies and associated limitations are provided in Appendix 4.

4.2 Discussion of GPR Survey Results (Pond)

Maximum water depth of the pond is estimated to be 10 to 13 ft. The exploration depth of the GPR signal below the bottom of the pond bottom ranged from approximately 10 to 15 ft. Multiple GPR reflector sets were observed in the GPR data collected across the pond. The upper most reflector is most likely associated with the pond-bottom sediments that have been relatively recently deposited. This reflector is underlain by a dominant continuous reflector at a range of 0.5 to 7 to 8 ft below the bottom of the pond. This reflector most likely corresponds to a transition to more competent sandy or clayey sediments. This second reflector is underlain by a third and fourth reflector (where observed) which most likely represent lithological transitions at depth. The GPR signal penetrated deep into the pond sediments (minimum of 10 to 15 ft), this would indicate that the near-bottom sediments under the pond have a high sand content.

A large Type A anomaly was observed in the center of the pond. The anomaly is characterized by both a 5 to 7 ft increase in the depth of the pond and an associated downwarping of 12 to 15 ft of the dominant GPR reflector set. The boundaries and the apparent center of the Type A anomaly are provided on Figure 1. Multiple Type B anomalies were identified near the perimeter of the pond. The Level B anomalies are characterized by a well-defined downwarping of the GPR reflector sets that underlies the GPR reflector associated with the bottom of the pond. In some of the anomaly areas an associated localized downwarping in the bottom of the pond was also observed. Examples of GPR anomalies observed within the pond are provided in Appendix 3.

4.3 Recommendation of Geotechnical Testing

It is not possible, based on the geophysical results to determine whether these identified features have a potential for collapse or subsidence. It is recommended that up to 23 of the identified GPR anomalies be further evaluated using geotechnical test borings. The location of the recommended boring locations are provided on Figure 1 and the associated coordinates for the recommended test locations are provided in Table 1. The following criterion used to select the recommended test locations:

- All Type A anomalies
- A selection of Type B anomalies to provide a representative overview of conditions across the entire project site.
- Placement of borings in areas of planned future development rather than areas that will be left as open space.
- Preference was given to larger anomaly areas that were identified on multiple GPR transects.

4.3 Summary

1. Karst-related geological features appear to be present at the project site.
2. Based on the location of the Type A GPR anomaly in the middle of the pond and Type B anomalies along the perimeter, it is suspected that the pond is most likely a karst-related geological feature.
3. It is not possible based upon the GPR results to determine whether the identified features have a potential for collapse or subsidence. It is recommended that up to 23 of the identified GPR anomalies be further evaluated using geotechnical test borings to determine any impacts on future site development.

Table 1 –Coordinates of Anomalies Recommended for Future Geotechnical Testing

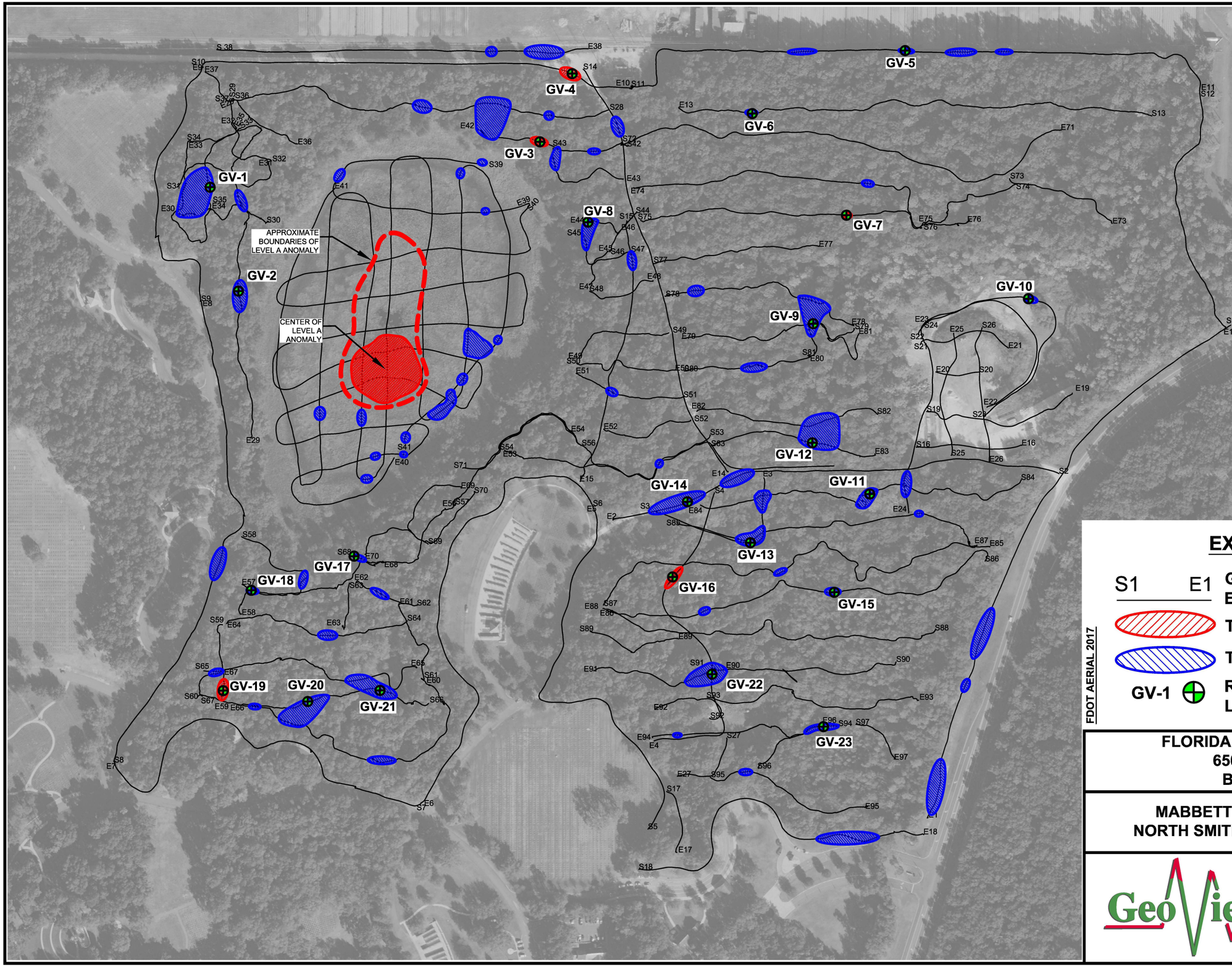
Designation of Test Location	*Anomaly Type*	*Northing* [1/]	*Easting* [1/]	*Latitude*	*Longitude*
GV-1	Type B	1555603.93	587254.71	28.6129081	-82.21478197
GV-2	Type B	1555326.84	587330.47	28.61214639	-82.2145443
GV-3	Type A	1555725.34	588135.43	28.61324634	-82.21203767
GV-4	Type A	1555906.81	588221.55	28.61374586	-82.21177025
GV-5	Type B	1555968.39	589110.94	28.61391952	-82.20899857
GV-6	Type B	1555800.6	588702.52	28.61345608	-82.2102706
GV-7	Type A	1555529.2	588954.1	28.61271086	-82.209485
GV-8	Type B	1555510.6	588263.79	28.61265636	-82.21163642
GV-9	Type B	1555239.75	588865.34	28.61191435	-82.20976007
GV-10	Type B	1555306.39	589440.42	28.61210039	-82.20796807
GV-11	Type B	1554784.81	589016.47	28.61066384	-82.20928656
GV-12	Type B	1554921.42	588863.07	28.61103883	-82.2097654
GV-13	Type B	1554654.53	588697.47	28.61030399	-82.21028006
GV-14	Type B	1554764.05	588529.48	28.6106044	-82.21080423
GV-15	Type B	1554522.2	588921.81	28.60994113	-82.20958015
GV-16	Type A	1554563.14	588489.75	28.61005164	-82.21092695
GV-17	Type B	587638.74	28.61020037	-82.21357957	587638.74

1/* US State Plane, Florida West 0101, NAD83 (Conus), feet

GV-18	Type B	587364.69	28.6099477	-82.21443318	587364.69
GV-19	Type A	587289.72	28.60921159	-82.21466534	587289.72
GV-20	Type B	587515.36	28.60913284	-82.21396194	587515.36
GV-21	Type B	587708.14	28.60921544	-82.21336128	587708.14
GV-22	Type B	588595.08	28.60933918	-82.21059725	588595.08
GV-23	Type B	588892.91	28.60895398	-82.20966826	588892.91

1/* US State Plane, Florida West 0101, NAD83 (Conus), feet

APPENDIX 1
FIGURE



EXPLANATION

S1 E1 — GPR TRANSECTS WITH START & END POINTS

TYPE A GPR ANOMALY

TYPE B GPR ANOMALY

GV-1 — RECOMMEND GEOTECHNICAL TEST LOCATION (GEOVIEW)

FDOT AERIAL 2017

FLORIDA NATIONAL CEMETERY SITE
6502 SW 102nd AVENUE
BUSHNELL, FLORIDA

MABBETT & ASSOCIATES, INC.
NORTH SMITHFIELD, RHODE ISLAND

PROJECT: 30278
DATE: 10/22/19

GeoView

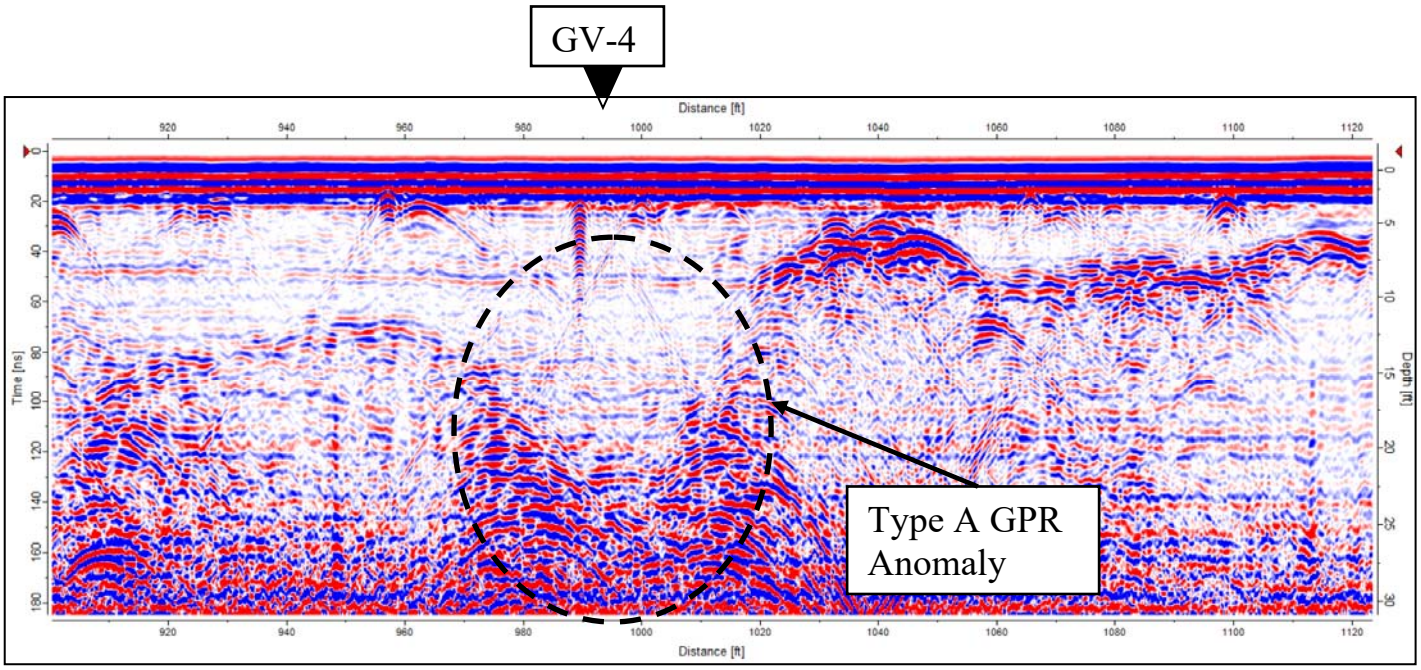
FIGURE 1
SITE MAP SHOWING RESULTS OF GEOPHYSICAL INVESTIGATION

APPENDIX 2
PHOTOGRAPHS OF GEOPHYSICAL FIELD EQUIPMENT

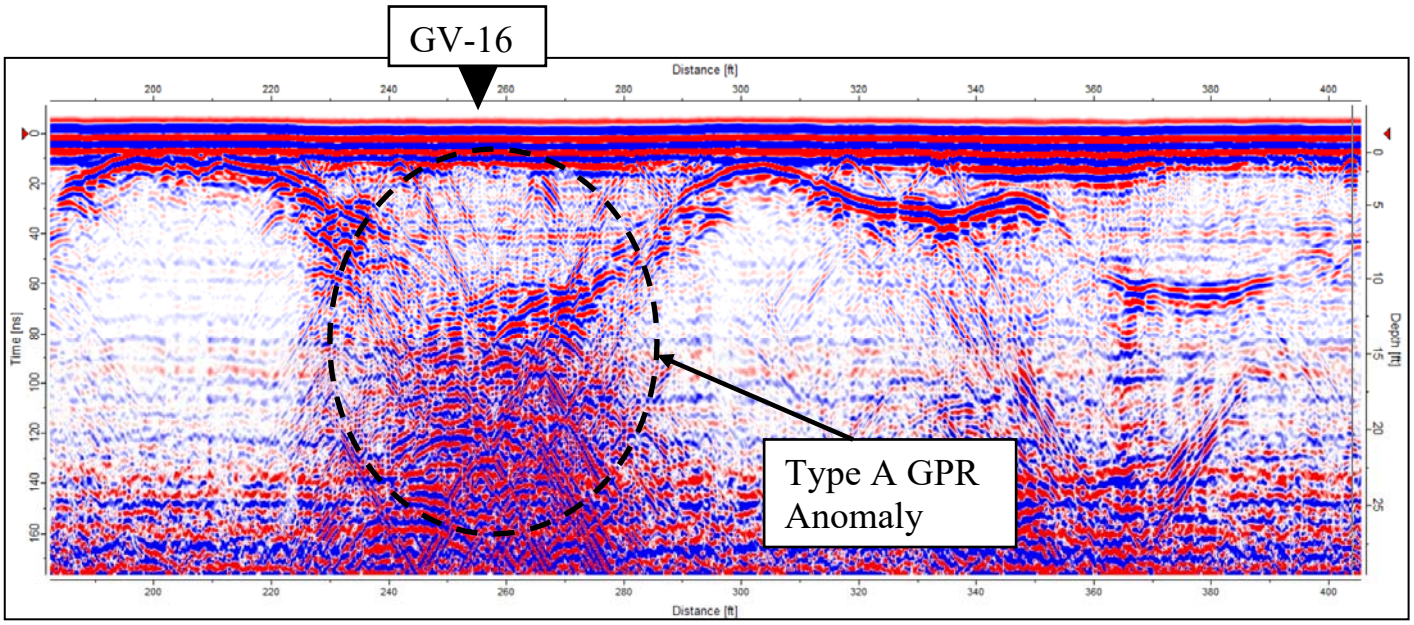
Equipment Set Up for GPR Survey Across Pond

Equipment Set Up for Land-Based GPR Survey

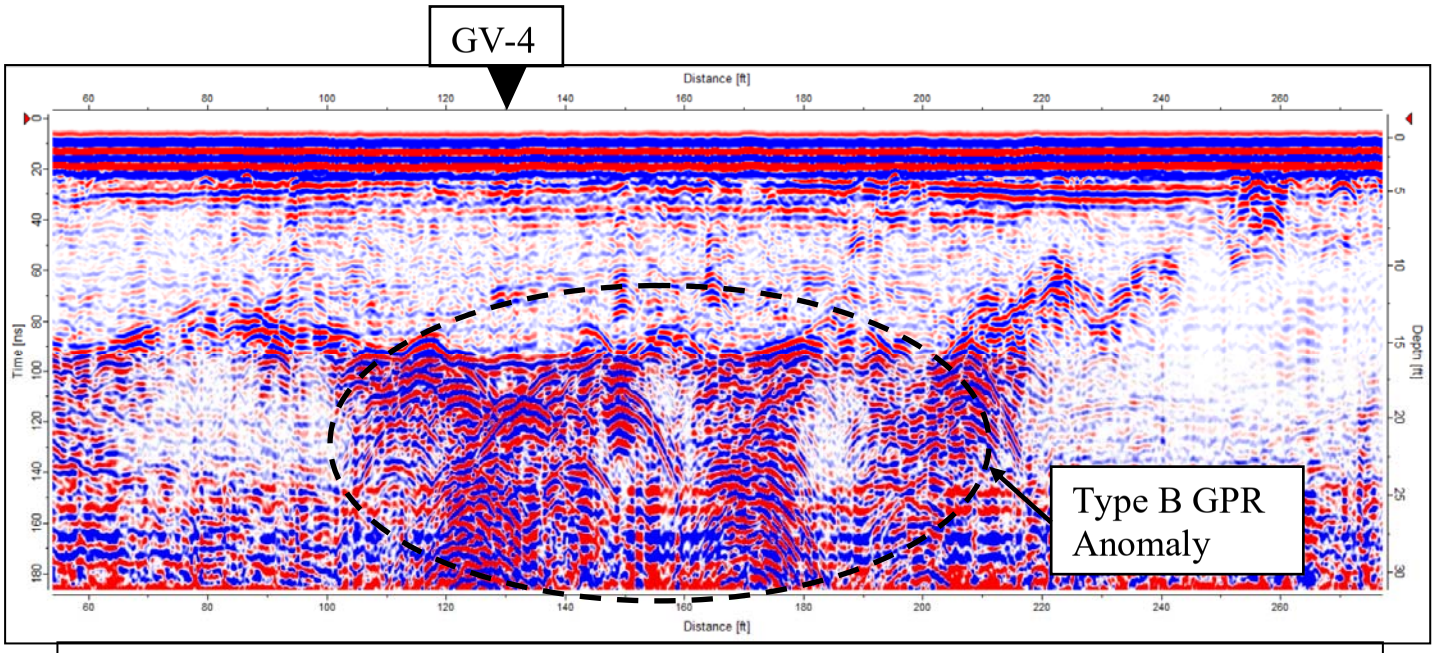
APPENDIX 3
EXAMPLES OF GPR ANOMALY LEVELS



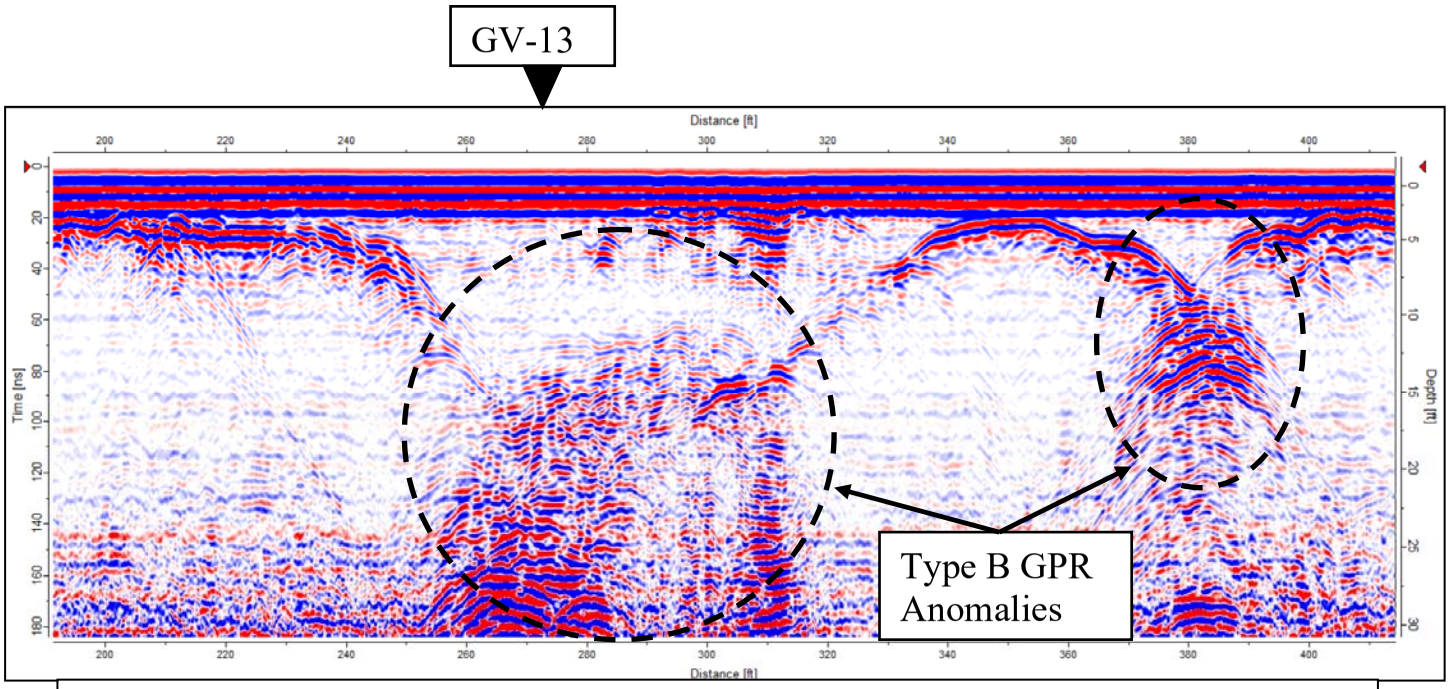
GPR Transect 10 Showing Example of Type A GPR Anomaly and Testing Location



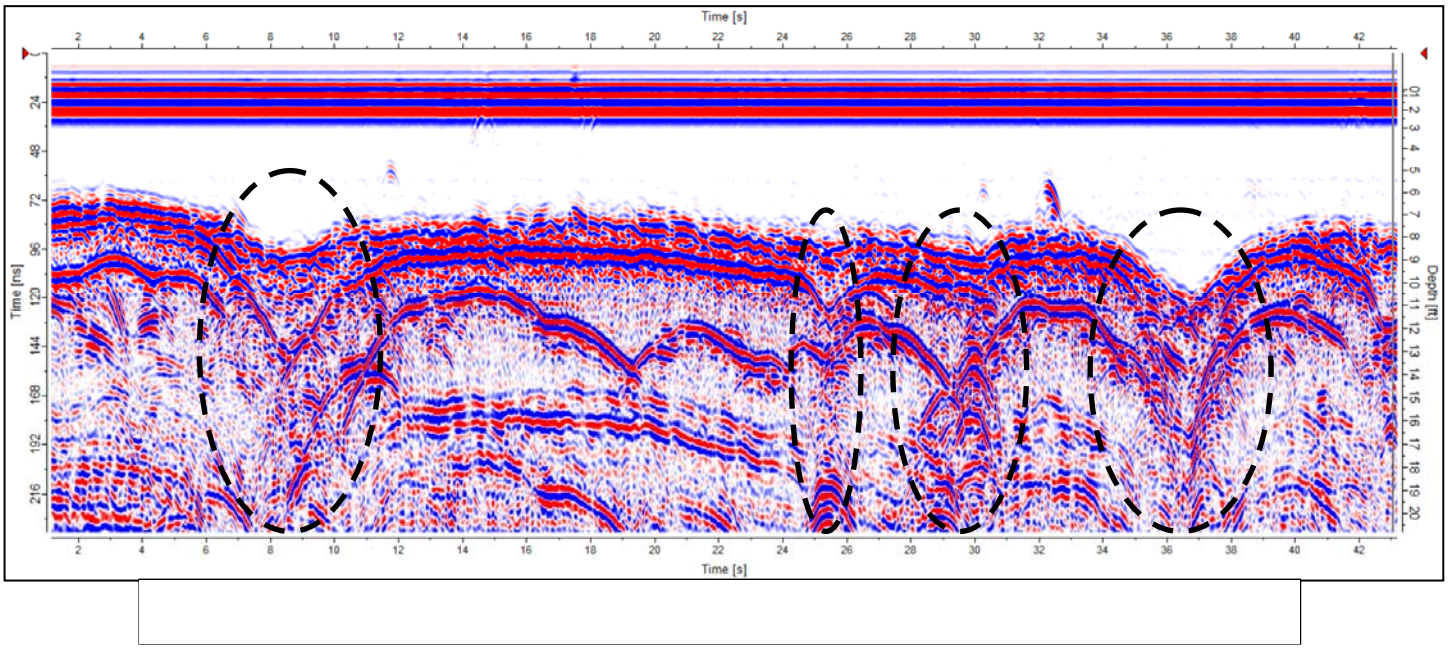
GPR Transect 4 Showing Example of Type A GPR Anomaly and Testing Location

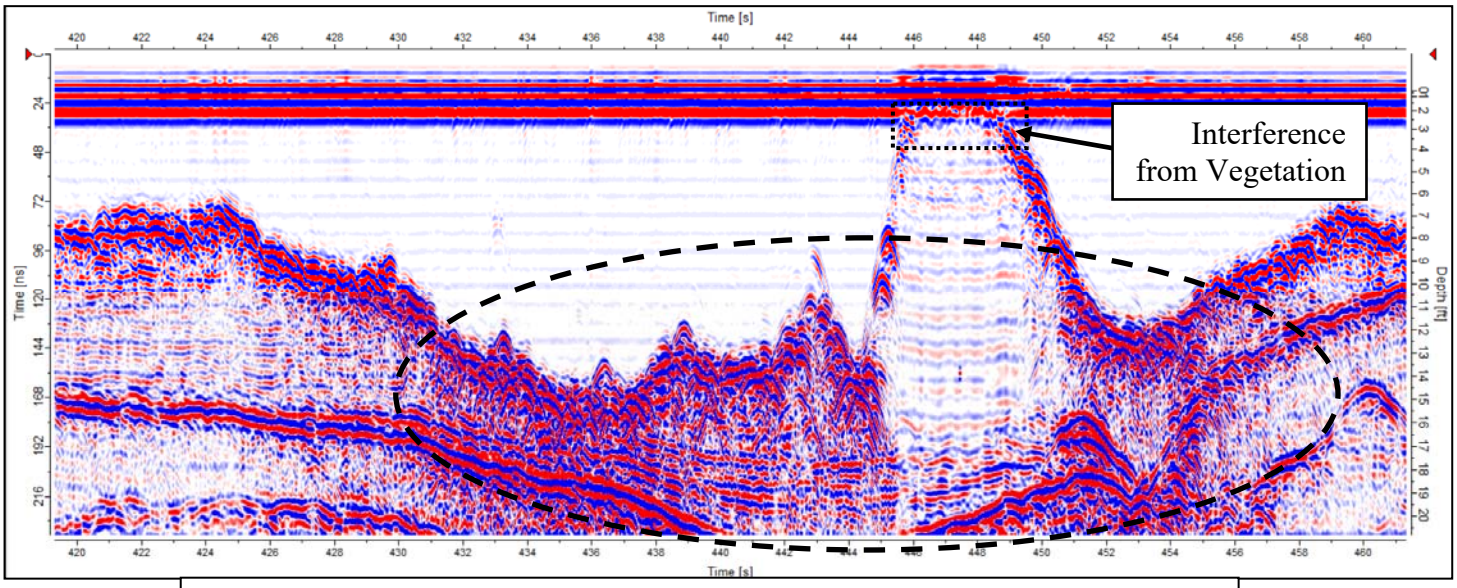


GPR Transect 66 Showing Example of Type B GPR Anomaly and Testing Location



GPR Transect 3 Showing Example of Type B GPR Anomalies and Testing Location





GPR Transect In Pond Showing Example of Type A GPR Anomaly

APPENDIX 4
DESCRIPTION OF GEOPHYSICAL METHODS, SURVEY METHODOLOGIES AND LIMITATIONS

A2.1 On Site Measurements

The positions of the geophysical transect lines were recorded using a Trimble GeoXH Global Positioning System (GPS). These GPS systems typically have an accuracy of 1 to 3 ft.

A2.2 Ground Penetrating Radar

Ground Penetrating Radar (GPR) consists of a set of integrated electronic components that transmits high frequency (200 to 1500 megahertz [MHz]) electromagnetic waves into the ground and records the energy reflected back to the ground surface. The GPR system consists of an antenna, which serves as both a transmitter and receiver, and a profiling recorder that both processes the incoming signal and provides a graphic display of the data. The GPR data can be reviewed as both printed hard copy output or recorded on the profiling recorder's hard drive for later review. GeoView uses a Mala GPR system.

A GPR survey provides a graphic cross-sectional view of subsurface conditions. This cross-sectional view is created from the reflections of repetitive short-duration electromagnetic (EM) waves that are generated as the antenna is pulled across the ground surface. The reflections occur at the subsurface contacts between materials with differing electrical properties. The electrical property contrast that causes the reflections is the dielectric permittivity that is directly related to conductivity of a material. The GPR method is commonly used to identify such targets as underground utilities, underground storage tanks or drums, buried debris, voids or geological features.

The greater the electrical contrast between the surrounding earth materials and target of interest, the greater the amplitude of the reflected return signal. Unless the buried object is metal, only part of the signal energy will be reflected back to the antenna with the remaining portion of the signal continuing to propagate downward to be reflected by deeper features. If there is little or no electrical contrast between the target interest and surrounding earth materials it will be very difficult if not impossible to identify the object using GPR.

The depth of penetration of the GPR signal is very site specific and is controlled by two primary factors: subsurface soil conditions and selected antenna frequency. The GPR signal is attenuated (absorbed) as is passes through earth materials. As the energy of the GPR signal is diminished due to attenuation, the

energy of the reflected waves is reduced, eventually to the level that the reflections can no longer be detected. As the conductivity of the earth materials increases, the attenuation of the GPR signal increases thereby reducing the signal penetration depth. In Florida, the typical soil conditions that severely limit GPR signal penetration are near-surface clays and/or organic materials.

The depth of penetration of the GPR signal is also reduced as the antenna frequency is increased. However, as antenna frequency is increased the resolution of the GPR data is improved. Therefore, when designing a GPR survey a tradeoff is made between the required depth of penetration and desired resolution of the data. As a rule, the highest frequency antenna that will still provide the desired maximum depth of penetration should be used. For outside areas, a low-frequency (250 MHz) antenna is used. This allows for maximum signal penetration and thereby maximum depth from which information will be obtained.

A GPR survey is conducted along survey lines (transects) that are measured paths along which the GPR antenna is moved. An integrated survey wheel electronically records the distance of the GPR system along the transect lines.

For geological characterization surveys, the GPR survey is conducted along a set of perpendicularly orientated transects. The survey is conducted in two directions because subsurface features such as sinkholes are often asymmetric. Spacing between the transects typically ranges from 10 to 50 ft. Closely spaced grids are used when the objective of the GPR survey is to identify all sinkhole features within a project site. Coarser grids are used when the objective is to provide a general overview of site conditions. After completion of a survey using a given grid spacing, additional more-closely spaced GPR transects are often performed to better characterize sinkhole features identified by the initial survey. This information can be used to provide recommended locations for geotechnical borings.

Depth estimates to the top of lithological contacts or sinkhole features are determined by dividing the time of travel of the GPR signal from the ground surface to the top of the feature by the velocity of the GPR signal. The velocity of the GPR signal is usually obtained from published tables of velocities for the type and condition (saturated vs. unsaturated) of soils underlying the site. The accuracy of GPR-derived depths typically ranges from 20 to 40 percent of the total depth.

Interpretation and Limitations of GPR data

The analysis and collection of GPR data is both a technical and interpretative skill. The technical aspects of the work are learned from both training and experience. Having the opportunity to compare GPR data collected in numerous

settings to the results from geotechnical studies performed at the same locations develops interpretative skills for geological characterization studies.

The ability of GPR to collect interpretable information at a project site is limited by the attenuation (absorption) of the GPR signal by underlying soils. Once the GPR signal has been attenuated at a particular depth, information regarding deeper geological conditions will not be obtained. In addition, GPR data can only resolve subsurface features that have a sufficient electrical contrast between the feature in question and surrounding earth materials. If an insufficient contrast is present, the subsurface feature will not be identified. GeoView can make no warranties or representations of geological conditions that may be present beyond the depth of investigation or resolving capability of the GPR equipment or in areas that were not accessible to the geophysical investigation.

Geotechnical Engineering Report

Florida National Cemetery Preliminary Geotechnical Exploration
Bushnell, Sumter County, Florida

December 17, 2019

Terracon Project No. H4195095

Prepared for:

Mabbett & Associates, Inc.

[Comments]

Prepared by:

Terracon Consultants, Inc.

Tampa, Florida

December 17, 2019

Mabbett & Associates, Inc.
40 Old Louisquisset Pile, Suite 200
[Comments] 02896

Attn: Mr. Andrew Glucksman, LEED AP
P: 781.275.6050, ext. 401
E: glucksman@mabbett.com

Re: Geotechnical Engineering Report
Florida National Cemetery Preliminary Geotechnical Exploration
6502 SW 102nd Ave
Bushnell, Sumter County, Florida
Terracon Project No. H4195095

Dear Mr. Glucksman:

We have completed the Geotechnical Engineering services for the above referenced project. This study was performed in general accordance with Terracon Proposal No. PH4195095 dated June 28, 2019. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning geotechnical aspects of development of this area of the cemetery.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,
Terracon Consultants, Inc.
Certificate of Authorization Number 8830

STEPHEN CHARLES KNAUSS
LICENSE
No. 28202
STATE OF
FLORIDA
PROFESSIONAL ENGINEER

12/17/19

Stephen C. Knauss, P.E., D.GE
Senior Engineer
Florida Registration No.: 28202

12/17/19

Douglas S. Dunkelberger, P.E.
Principal
Florida Registration No.: 33317

This report has been digitally signed and sealed by Stephen C. Knauss, P.E. on 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

REPORT TOPICS

INTRODUCTION 1
SITE CONDITIONS 1
PROJECT DESCRIPTION 2
GEOTECHNICAL CHARACTERIZATION 2
GEOTECHNICAL OVERVIEW 7
EARTHWORK 8
SHALLOW FOUNDATIONS 9
PAVEMENTS 9
GENERAL COMMENTS 10
FIGURES 11

Note: This report was originally delivered in a web-based format. **Orange Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the ***GeoReport*** logo will bring you back to this page. For more interactive features, please view your project online at client.terracon.com.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES
SITE LOCATION, SOIL SURVEY AND EXPLORATION PLANS
EXPLORATION RESULTS
SUPPORTING INFORMATION

Note: Refer to each individual Attachment for a listing of contents.

Geotechnical Engineering Report

Florida National Cemetery Preliminary Geotechnical Exploration
6502 SW 102nd Ave
Bushnell, Sumter County, Florida

Terracon Project No. H4195095
December 17, 2019

INTRODUCTION

This report presents the results of our subsurface exploration and geotechnical engineering services performed for the proposed expansion to the Florida National Cemetery located at 6502 SW 102nd Ave in Bushnell, Sumter County, Florida. The purpose of these services is to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil and rock conditions
- Groundwater conditions
- Site preparation and earthwork
- Dewatering considerations
- Excavation considerations

The geotechnical engineering Scope of Services for this project included the advancement of nineteen test borings to depths ranging from approximately 20 to 105 feet below existing site grades. In addition, five Double Ring Infiltration tests were conducted.

Maps showing the site and boring locations are shown in the **Site Location** and **Exploration Plan** sections, respectively. The results of the laboratory testing performed on soil samples obtained from the site during the field exploration are included on the boring logs in the **Exploration Results** section.

SITE CONDITIONS

The following description of site conditions is derived from our site visit in association with the field exploration and our review of publicly available geologic and topographic maps.

Item	Description
Parcel Information	The project is located at 6502 SW 102nd Ave in Bushnell, Sumter County, Florida. The overall area of the cemetery is about 515 acres with the area to be explored approximately 100 acres. See **Site Location**

Item	Description
Existing Improvements	The area explored is undeveloped. A few unpaved roads traverse the area.
Current Ground Cover	Ground cover includes mostly wooded areas with a relatively small area of bare earth where cemetery equipment and materials are stored. In addition, Sand Pond is a wet pond encompassing about 15 acres.
Existing Topography	Based on the LIDAR and USGS data as well as personal observations, the terrain is rolling with the elevation ranging from about +47 to +75 feet. Sand Pond is in a depressional area.

PROJECT DESCRIPTION

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Information was provided by Mabbett & Associates and included the RFP Scope: Supplement: B Criteria for Subsurface Investigation.
Project Description	The purpose of the exploration is to determine the suitability of the site for expansion of the cemetery.
Proposed Structures	Structures may include single-story buildings as well as columbaria.
Building Construction	Building construction has not been determined
Grading/Slopes	Grading would be expected to follow existing topography.
Below-Grade Structures	To be determined.
Free-Standing Retaining Walls	To be determined.
Below-Grade Areas	To be determined.
Pavements	To be determined.
Estimated Start of Construction	2021

GEOTECHNICAL CHARACTERIZATION

Sinkhole Potential

The USGS has prepared a map which identifies areas of sinkhole occurrence in Florida. The Sinkhole Type, Development, and Distribution in Florida map (prepared by the USGS, in cooperation with state agencies, 1985), divides Florida into four areas based on the type and

thickness of cover overlying soluble rock. These areas, designated I through IV, have varying potentials for sinkhole development

The Florida National Cemetery is within Area I. In Area I, the limestone is bare or thinly covered. Sinkholes are few, generally shallow and broad and develop gradually. Solution-type sinkholes dominate.

Based on its configuration, Sand Pond appears to be a sinkhole. A Ground Penetrating Radar (GPR) study conducted by GeoView indicated that it is a sinkhole. The GPR study indicated that there were several locations on the site where the GPR study indicated a potential for sinkhole occurrence. Terracon conducted borings at a number of these locations. This work will be discussed later in this report.

Soil Survey

The Soil Survey of Sumter County, Florida as prepared by the United States Department of Agriculture (USDA), Natural Resource Conservation Service - NRCS, identifies the soil types at the subject site to include the following:

Map Unit Symbol	Map Unit Name	Soil types	Depth to Seasonal High Groundwater (in)
4	Candler sand, 0 to 5 percent slopes	Sand to 80 inches	>80
5	Candler sand, 5 to 8 percent slopes	Sand to 80 inches	>80
13	Tavares fine sand, 0 to 5 percent slopes	Sand to 80 inches	42 to 60
18	Okeelanta muck	Muck to 38 inches Sand to 80 inches	0
23	Ona-Ona, wet, fine sand, 0 to 2 percent slopes	Sand to 80 inches	6 to 18
27	Sumterville fine sand, boulder subsurface, 0 to 5 percent slopes	Sand to 29 inches Sandy clay to 80 inches	18 to 36
39	Mabel fine sand, boulder subsurface, 0 to 5 percent slopes	Sand to 16 inches Sandy clay loam to 24 inches Clay to 30 inches Clay loam to 80 inches	18 to 36

Map Unit Symbol	Map Unit Name	Soil types	Depth to Seasonal High Groundwater (in)
40	Millhopper sand, boulder subsurface, 0 to 5 percent slopes	Sand to 45 inches Sandy clay loam to 80 inches	42 to 72
51	Pits-Dumps	Not described	Not described
99	Water	-	-

It should be noted that the Soil Survey is not intended as a substitute for site-specific geotechnical exploration; rather it is a useful tool in planning a project scope in that it provides information on soil types likely to be encountered. Boundaries between adjacent soil types on the Soil Survey maps are approximate.

Subsurface Conditions

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of site preparation and foundation options. Conditions encountered at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** section and the GeoModel can be found in the **Figures** section of this report.

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModels in the Figures.

Model Layer	Layer Name	General Description	Density/Consistency
1	**SAND**	Poorly graded Sand (SP), Poorly graded Sand with clay (SP-SC) and Poorly graded Sand with silt (SP-SM)	Very loose to very dense
2	**CLAYEY SAND**	Clayey Sand (SC)	Very loose to medium dense
3	**CLAY**	Plastic and Highly Plastic Clay (CL and CH) Highly plastic clay is sometimes referred to as “fat” clay	Soft to very stiff

Model Layer	Layer Name	General Description	Density/Consistency
4	LIMESTONE	Limestone formation of varying degrees of hardness. Generally, samples as calcareous clayey sand with limestone fragments	

Graphical presentation of the GeoModels is presented in the Figures section of this report. Four models running in an east-west direction and one in the north-south direction are provided. Please note that while the vertical information is to scale, the horizontal scale varies.

Groundwater

The depth to groundwater was measured at each boring location. However, there were a number of borings where groundwater was not detected within 10 feet of the ground surface below which drilling fluids mask the depth to groundwater. The ground elevations used in our estimates were obtained by interpolating from Lidar maps. Their accuracy may be on the order of ±5 feet.

That groundwater conditions are summarized as follows:

Boring No.	Estimated Elevation (feet)	Depth to Groundwater (feet) at Time of Field Exploration	Estimated Depth to Seasonal High Groundwater (feet)	Estimated Elevation of the Seasonal High Groundwater (feet)
GV-1X	+68	Not encountered to 10 feet	>6	Below +62
GV-4	+57	Not encountered to 10 feet	5	+52
GV-5	+60	Not encountered to 10 feet	5	+55
GV-6	+61	Not encountered to 10 feet	5	+56
GV-7	+70	Not encountered to 8 feet	5	+65
GV-8	+50	5	3	+45
GV-9	+70	Not encountered to 6 feet	3	+67
GV-10	+81	Not encountered to 8 feet	3	+78
GV-12	+70	Not encountered to 10 feet	>6	Below +64

Boring No.	Estimated Elevation (feet)	Depth to Groundwater (feet) at Time of Field Exploration	Estimated Depth to Seasonal High Groundwater (feet)	Estimated Elevation of the Seasonal High Groundwater (feet)
GV-13	+65	9.5	>6	Below +59
GV-14	+64	Not encountered to 10 feet	6	+58
GV-15	+70	Not encountered to 10 feet	3	+67
GV-16	+60	Not encountered to 10 feet	>6	Below +54
GV-17	+52	2.5	2	+50
GV-18	+51	6.5	3	+48
GV-19	+60	8	4	+56
GV-20	+52	Not encountered to 10 feet	4	+48
GV-22	+60	Not encountered to 8 feet	3	+57
GV-23	+65	Not encountered to 10 feet	>6	Below +59

It should be noted that in a number of borings clayey soils were present relatively close to the ground surface. Due to the low permeability of this type of soil and the need to backfill borings that penetrate limestone, it was not possible to allow the groundwater to stabilize in the boring at a level that could be expected for that type of soil. The estimated seasonal high groundwater levels were based on the depth to groundwater as well as the type of soils present in that boring and utilized the Soil Survey to assist in the evaluation and should be considered to be approximate. Should it be decided to develop this area for gravesites, we recommend that additional work be conducted to better evaluate the seasonal high groundwater level.

Double Ring Infiltration Tests

Double Ring Infiltration test were conducted adjacent to borings at five locations as selected by Mabbett. All the tests were conducted at a depth of two feet below the ground surface. The results of the tests are summarized below:

DRI-Test No.	Boring No.	Infiltration Rate (in/hr)	Depth to Groundwater at Time of Test (ft)
DRI-1	GV-6	20.5	>5
DRI-2	GV-13	13.1	>5
DRI-3	GV-12	23.1	>5
DRI-4	GV-20	12.8	>5
DRI-5	GV-23	14	>5

GEOTECHNICAL OVERVIEW

All of the borings except for GV-1X were drilled at locations were GeoView found anomalous conditions to be present. It would appear that many of the locations reflected the variability in the type and depth of the differing soils present. We have provided some GeoModels utilizing the boring results, and it can be seen that the depth to limestone, when encountered, was highly variable. Using the Lidar work we have developed estimated elevations that show that the elevation of the top of the limestone is highly variable. The following table presents our evaluation of the sinkhole potential at each of the boring locations. In preparing this table, we considered factors such as density/consistency of the soils, voids encountered and losses of circulation of drilling fluids. In general we considered that to be sinkhole activity, at least two of those factors had to be present.

Boring No.	Sinkhole Evaluation
GV-1x	No signs of sinkhole activity.
GV-4	No signs of sinkhole activity.
GV-5	No signs of sinkhole activity. Anomaly may be due to soil stratigraphy.
GV-6	No signs of sinkhole activity.
GV-7	No signs of sinkhole activity.
GV-8	No signs of sinkhole activity. Anomaly may be due to soil stratigraphy.
GV-9	No signs of sinkhole activity.

Boring No.	Sinkhole Evaluation
GV-10	No signs of sinkhole activity.
GV-12	Appears to be a “relic” sink.
GV-13	Appears to be a “relic” sink although it does not appear that it has migrated upward.
GV-14	Some solutioning in the limestone that may manifest itself sometime in the future as surface depression.
GV-15	Some solutioning in the limestone that may manifest itself sometime in the future.
Gv-16	No signs of sinkhole activity.
GV-17	No signs of sinkhole activity.
GV-18	No signs of sinkhole activity. Anomaly may be due to soil stratigraphy.
GV-19	No signs of sinkhole activity. Anomaly may be due to soil stratigraphy.
GV-20	No signs of sinkhole activity. Anomaly may be due to soil stratigraphy.
GV-22	No signs of sinkhole activity. Anomaly may be due to soil stratigraphy.
GV-23	Some solutioning in the limestone that may manifest itself sometime in the future.

Based on the results of our laboratory testing, expansive soils are present on this site. These soils are identified as being highly plastic clay. In general, they are at sufficient depth to not affect the use of the site for use of lightly loaded buildings and burial plots.

The **General Comments** section provides an understanding of the report limitations.

EARTHWORK

Earthwork is anticipated to include clearing and grubbing, excavations, and fill placement. The following sections provide preliminary recommendations for use in the preparation of specifications for the work. Recommendations include critical quality criteria, as necessary, to render the site in the state considered in our geotechnical engineering evaluation for foundations, floor slabs, and pavements.

Earthwork Construction Considerations

Shallow excavations for the development of the additional grave sites are anticipated to be accomplished with conventional construction equipment. In building areas, care should be taken to maintain the subgrade water content prior to construction of slabs-on-grade. Construction traffic over the completed subgrades should be avoided. The site should also be graded to prevent ponding of surface water on the prepared subgrades or in excavations. Water collecting over or adjacent to construction areas should be removed. If the subgrade desiccates, saturates, or is disturbed, the affected material should be removed, or the materials should be scarified, moisture conditioned, and recompacted prior to slab or pavement construction.

The groundwater table could affect over-excavation efforts, especially for over-excavation and replacement of lower strength soils. A temporary dewatering system consisting of sumps with pumps could be necessary to achieve the recommended depth of over-excavation.

As a minimum, excavations should be performed in accordance with OSHA 29 CFR, Part 1926, Subpart P, “Excavations” and its appendices, and in accordance with any applicable local, and/or state regulations.

Construction site safety is the sole responsibility of the contractor who controls the means, methods, and sequencing of construction operations. Under no circumstances shall the information provided herein be interpreted to mean Terracon is assuming responsibility for construction site safety, or the contractor's activities; such responsibility shall neither be implied nor inferred.

SHALLOW FOUNDATIONS

We anticipate that potential structures similar to those already in the cemetery can be supported by shallow spread foundations.

If unsuitable bearing soils are encountered at the base of the planned footing excavation, the excavation should be extended deeper to suitable soils, and the footings could bear directly on these soils at the lower level or on lean concrete backfill placed in the excavations. This would be the case where clayey soils were encountered close to the ground surface.

PAVEMENTS

It is anticipated that asphalt paved roadways similar to those already in the cemetery can be used. It appears that limerock can be used as the base material for most roadways. The exception to that would be if the final roadway grade were to be lowered to within two feet of the groundwater table in which case the limerock might be subjected to wetting and as a result would soften. In

that case an alternative roadway base that is less water sensitive like crushed concrete (recycled concrete) or asphalt (black base) could be used.

GENERAL COMMENTS

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration. Natural variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence or collaboration through this system are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client, and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly impact excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety, and cost estimating including, excavation support, and dewatering requirements/design are the responsibility of others. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

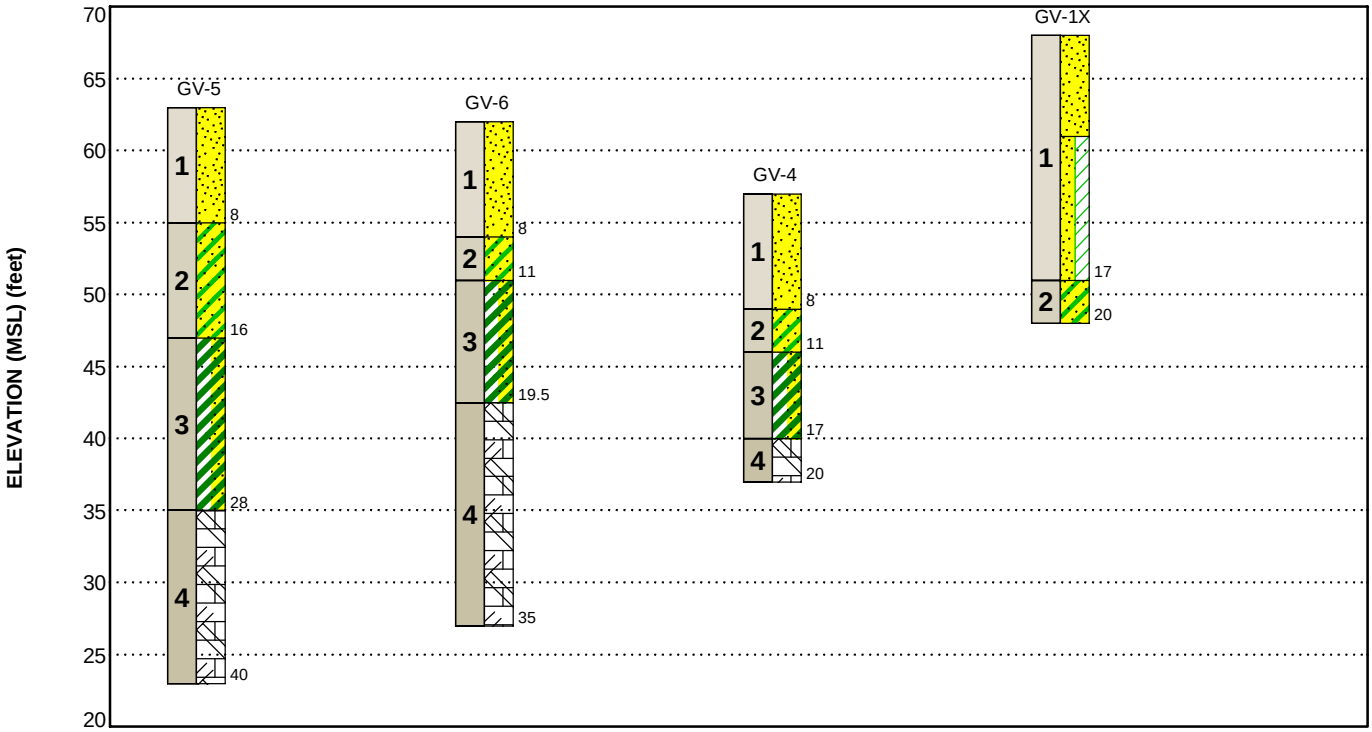
FIGURES

Contents:

GeoModels
East-west northern end of site
East-west northern half of site
East-west southern area of site
East-West southern end of site
North-south middle of site.

GEOMODEL

Florida National Cemetery ■ Bushnell, Florida
Terracon Project No. H4195095



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	SAND	Poorly graded Sand (SP), Poorly graded Sand with clay (SP-SC) and Poorly graded Sand with silt (SP-SM)
2	CLAYEY SAND	Clayey Sand (SC)
3	CLAY	Plastice and Highly Plastic Clay (CL and CH) Highly plastic clay is sometimes referred to "Fat" clay
4	LIMESTONE	Limestone formation of varying degree of hardness. Generally samples as calcareous clayey sand with limestone fragments

LEGEND

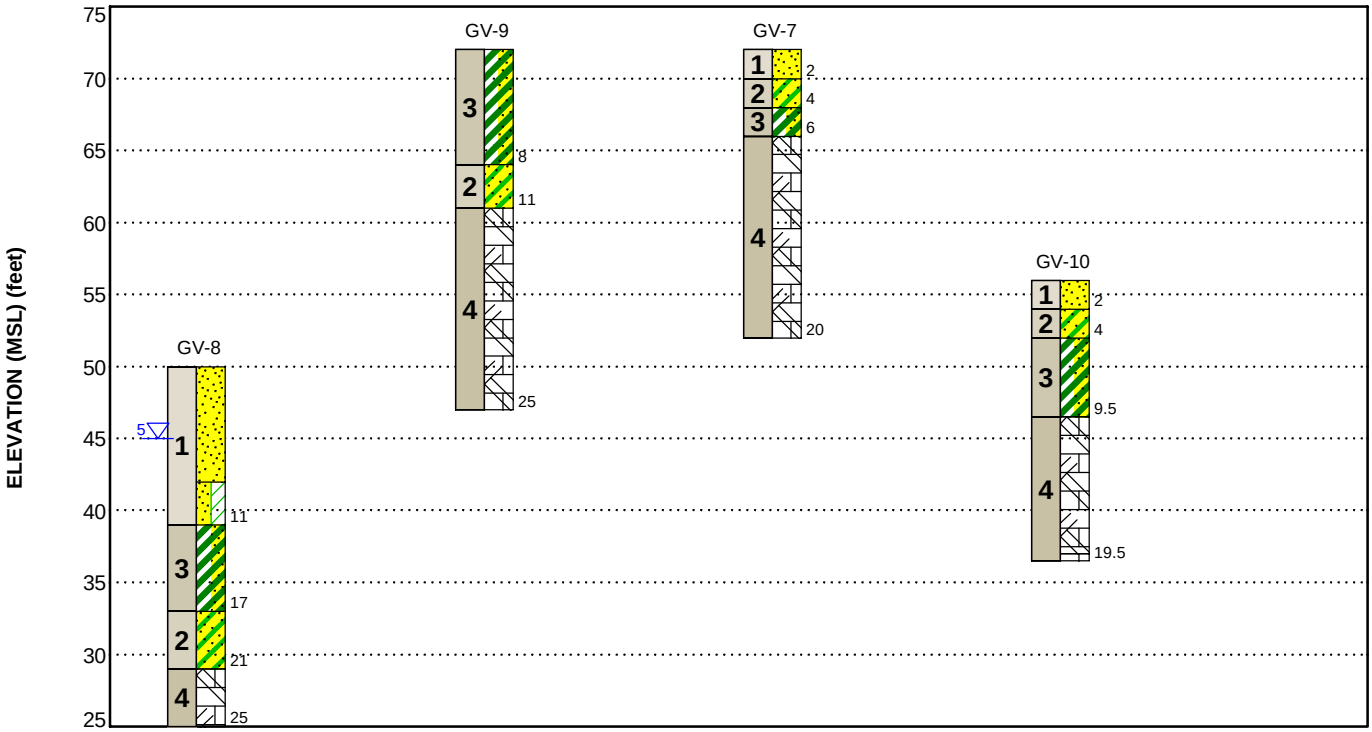
- Poorly-graded Sand
- Poorly-graded Sand with Clay
- Clayey Sand
- Fat Clay with Sand
- Weathered Limestone

▽ First Water Observation

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Florida National Cemetery ■ Bushnell, Florida
Terracon Project No. H4195095



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Model Layer	Layer Name	General Description
1	SAND	Poorly graded Sand (SP), Poorly graded Sand with clay (SP-SC) and Poorly graded Sand with silt (SP-SM)
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3	CLAY	Plastice and Highly Plastic Clay (CL and CH) Highly plastic clay is sometimes referred to "Fat" clay
4	LIMESTONE	Limestone formation of varying degree of hardness. Generally samples as calcareous clayey sand with limestone fragments

LEGEND

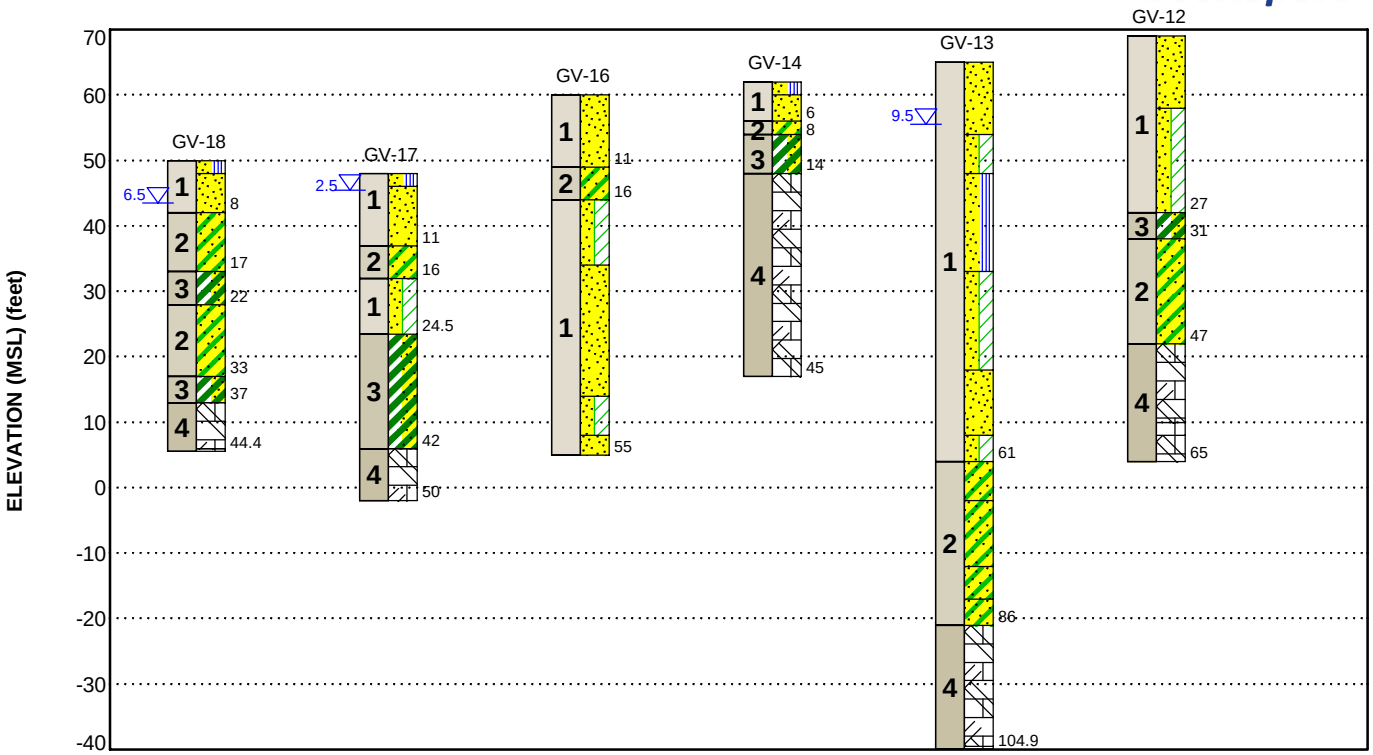
- Poorly-graded Sand
- Clayey Sand
- Fat Clay with Sand
- Weathered Limestone
- Poorly-graded Sand with Clay
- Limestone

First Water Observation

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Florida National Cemetery ■ Bushnell, Florida
Terracon Project No. H4195095



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3	CLAY	Plastice and Highly Plastic Clay (CL and CH) Highly plastic clay is sometimes referred to "Fat" clay
4	LIMESTONE	Limestone formation of varying degree of hardness. Generally samples as calcareous clayey sand with limestone fragments

LEGEND

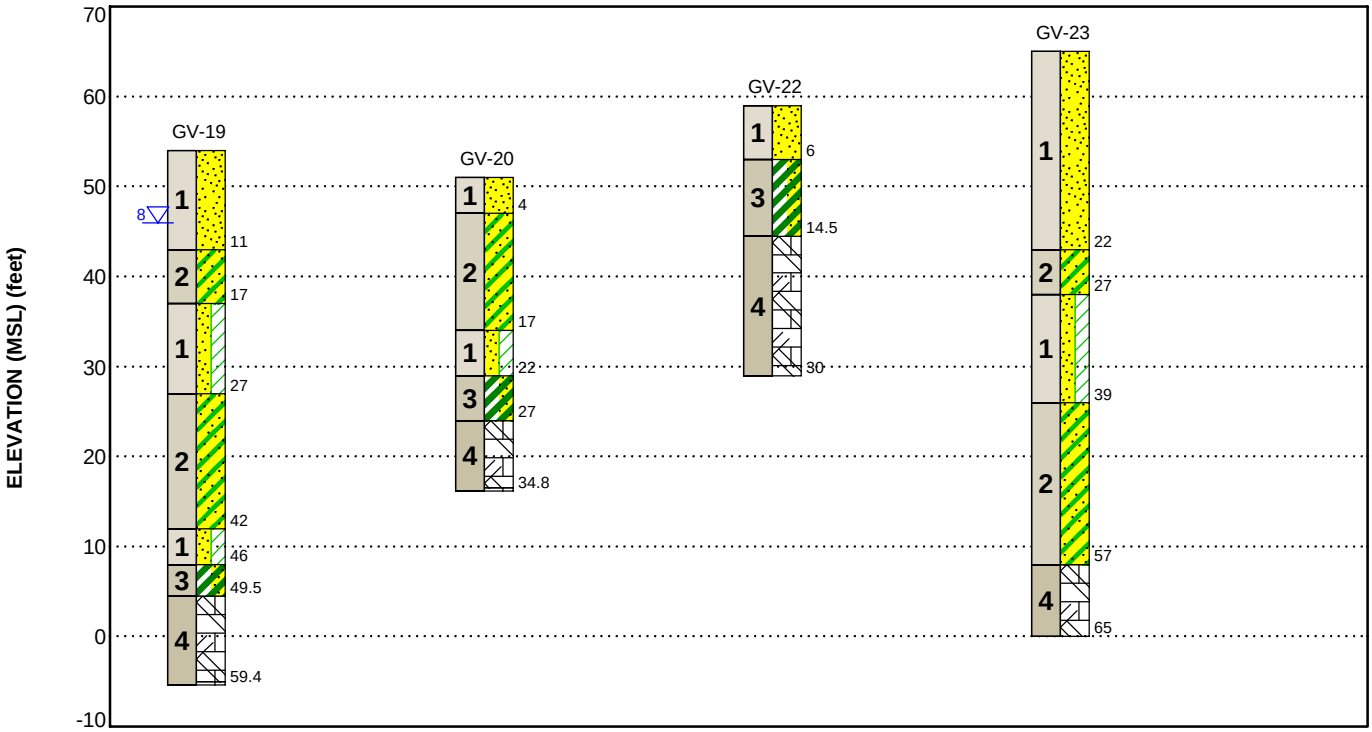
- Poorly-graded Sand
- Clayey Sand
- Poorly-graded Sand with Silt
- Poorly-graded Sand with Clay
- Weathered Limestone
- Fat Clay with Sand
- Limestone

First Water Observation

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Florida National Cemetery ■ Bushnell, Florida
Terracon Project No. H4195095



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Model Layer	Layer Name	General Description
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3	CLAY	Plastice and Highly Plastic Clay (CL and CH) Highly plastic clay is sometimes referred to "Fat" clay
4	LIMESTONE	Limestone formation of varying degree of hardness. Generally samples as calcareous clayey sand with limestone fragments

LEGEND

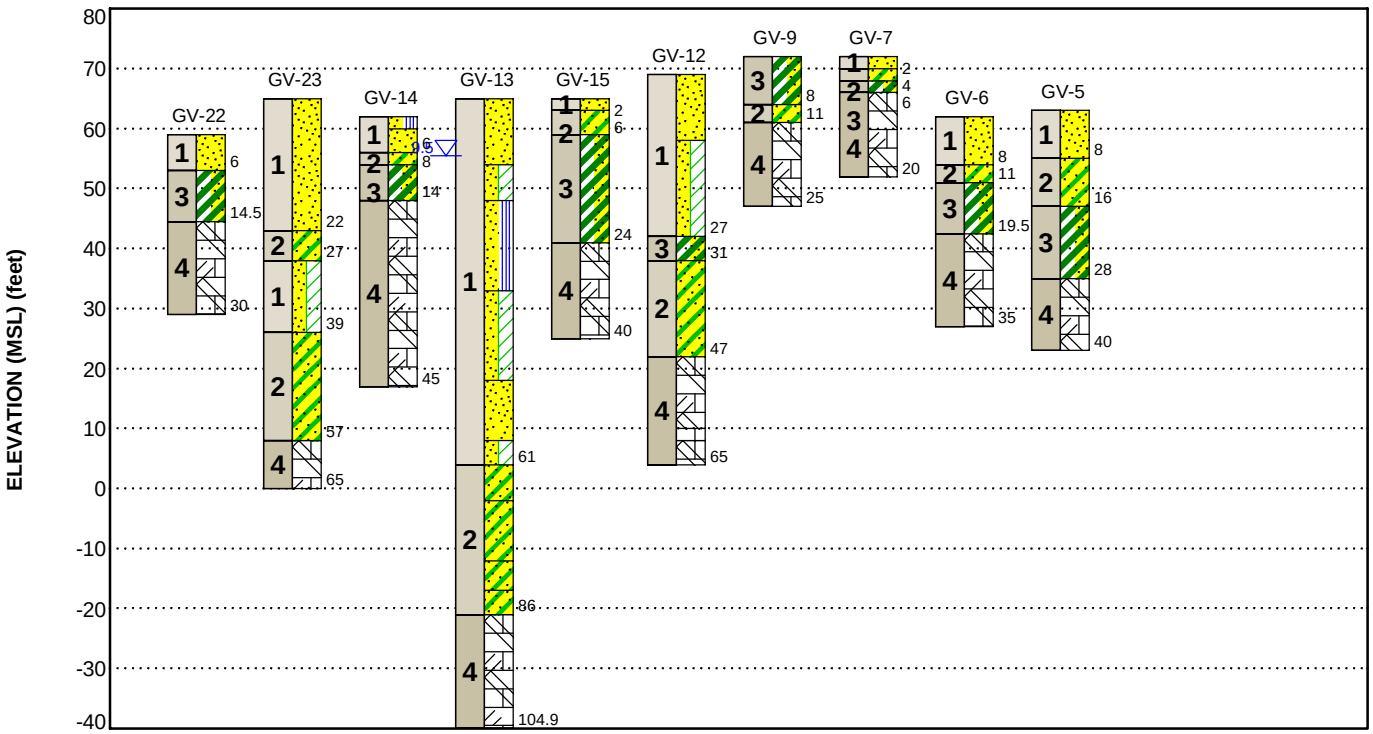
- Poorly-graded Sand
- Clayey Sand
- Poorly-graded Sand with Clay
- Fat Clay with Sand
- Weathered Limestone
- Limestone

First Water Observation

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

GEOMODEL

Florida National Cemetery ■ Bushnell, Florida
Terracon Project No. H4195095



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Model Layer	Layer Name	General Description
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4	LIMESTONE	Limestone formation of varying degree of hardness. Generally samples as calcareous clayey sand with limestone fragments

LEGEND

- Poorly-graded Sand
- Clayey Sand
- Fat Clay with Sand
- Weathered Limestone
- Poorly-graded Sand with Clay
- Limestone
- Poorly-graded Sand with Silt

First Water Observation

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

ATTACHMENTS

EXPLORATION AND TESTING PROCEDURES

Field Exploration

Number of Borings	Boring Depth (feet)	Planned Location
19	20 to 105	General area

Boring Layout and Elevations: With the exception of boring GV-1X, the borings were drilled at locations of anomalies as noted by a GPR survey conducted by GeoView. GeoView also stgaked those boring locations. Terracon personnel provided the boring layout for GV-1X. Coordinates were obtained with a handheld GPS unit (estimated horizontal accuracy of about ±10 feet). If elevations and a more precise boring layout are desired, we recommend borings be surveyed following completion of fieldwork.

Subsurface Exploration Procedures: We advanced the borings with a track-mounted rotary drill rig using slurry drilling methods. Five samples were obtained in the upper 10 feet of each boring and at intervals of 5 feet thereafter. In the split-barrel sampling procedure, a standard 2-inch outer diameter split-barrel sampling spoon was driven into the ground by a 140-pound automatic hammer falling a distance of 30 inches. The number of blows required to advance the sampling spoon for each six-inch penetration is recorded. The 2nd and 3rd six-increments are added together and reported as the Standard Penetration Test (SPT) resistance value. The SPT resistance values, also referred to as N-values, are indicated on the boring logs at the test depths. We observed and recorded groundwater levels during drilling and sampling. All borings were backfilled with bentonite chips after their completion.

The sampling depths, penetration distances, and other sampling information was recorded on the field boring logs. The samples were placed in appropriate containers and taken to our soil laboratory for testing and classification by a Geotechnical Engineer. Our exploration team prepared field boring logs as part of the drilling operations. These field logs included visual classifications of the materials encountered during drilling and our interpretation of the subsurface conditions between samples. Final boring logs were prepared from the field logs. The final boring logs represent the Geotechnical Engineer's interpretation of the field logs and include modifications based on observations and tests of the samples in our laboratory.

Other Testing: Five Double Ring Infiltration tests, DRI-1 through DRI-5, were performed in the vicinity of previously drilled borings. The DRI test procedure consisted of installing a 12-inch diameter steel ring and a 24-inch diameter steel ring concentrically into the ground. Water was then added to a desired head level of approximately 12 inches in both casings and held constant. The amount of infiltration observed in the inner ring versus time was then recorded. This procedure was repeated for a total of 3 hours or until a stabilized infiltration rate was achieved.

Laboratory Testing

The project engineer reviewed the field data and assigned laboratory tests to understand the engineering properties of the various soil strata, as necessary, for this project. Procedural standards noted below are for reference to methodology in general. In some cases, variations to methods were applied because of local practice or professional judgment. Standards noted below include reference to other, related standards. Such references are not necessarily applicable to describe the specific test performed.

- ASTM D2216 Standard Test Methods for Laboratory Determination of Water (Moisture) Content of Soil and Rock by Mass
- ASTM D4318 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils
- ASTM D1140 Standard Test Method for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing

The laboratory testing program included visual classification and assignment of laboratory tests of soil samples by an engineer. Based on the material's texture and plasticity, we described and classified the soil samples in accordance with the Unified Soil Classification System.

SITE LOCATION, SOIL SURVEY AND EXPLORATION PLANS

Contents:

Site Location Plan
Soil Survey
Exploration Plan

SITE LOCATION

Florida National Cemetery Preliminary Geotechnical Exploration ■ Bushnell, Sumter County, Flori
December 17, 2019 ■ Terracon Project No. H4195095

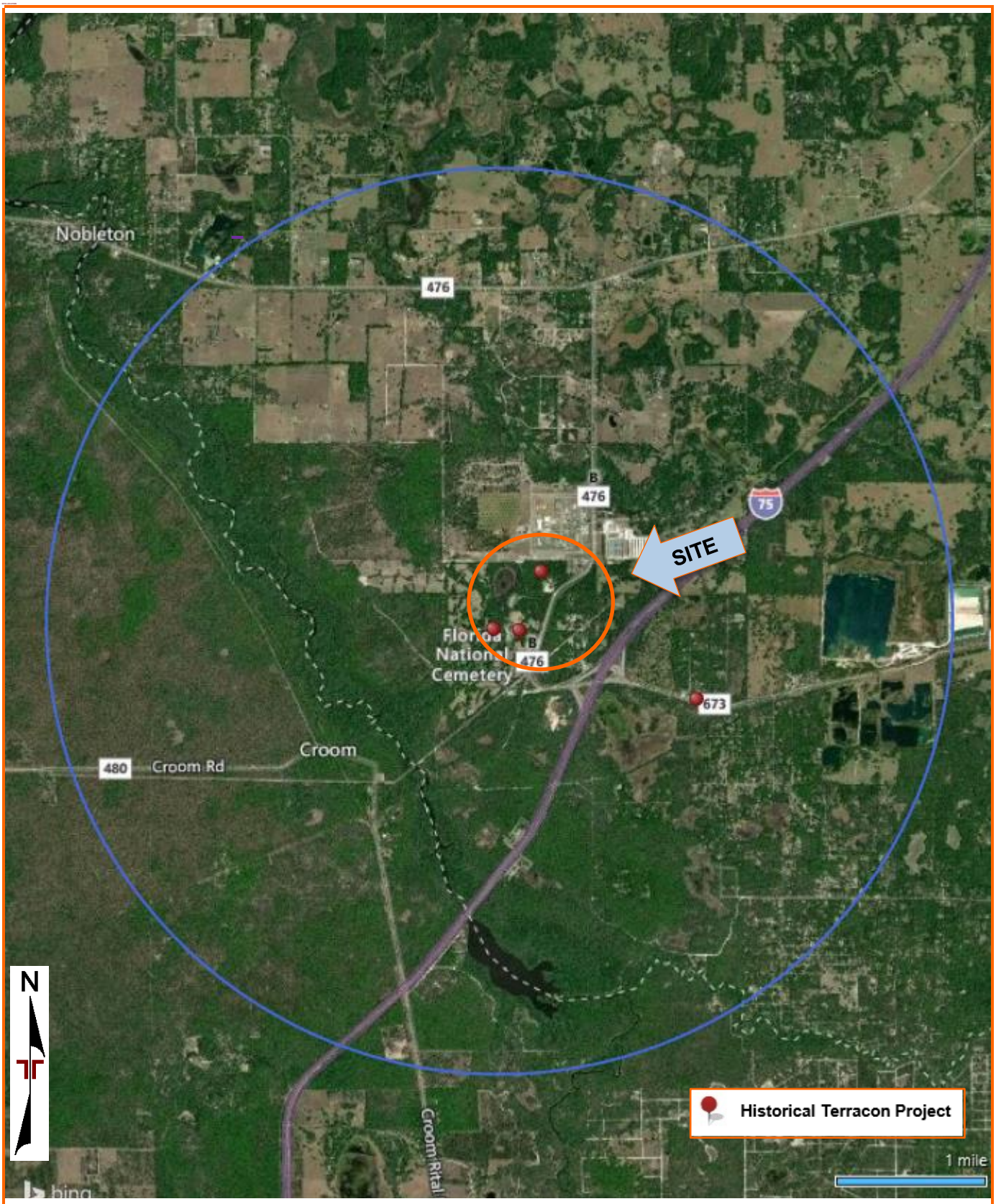
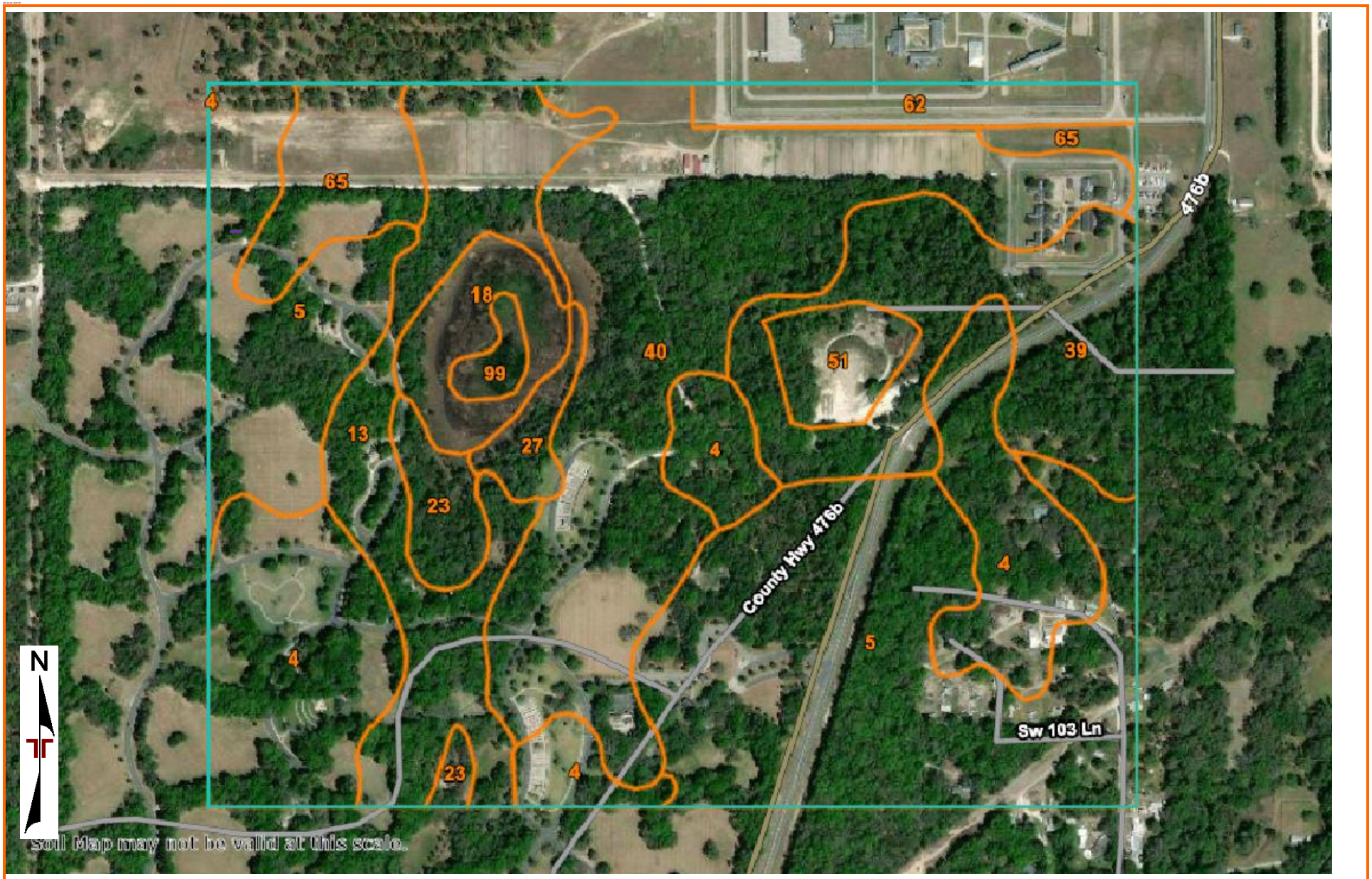


DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

USDA SOIL SURVEY

Florida National Cemetery Preliminary Geotechnical Exploration ■ Bushnell, Sumter County, Florida
December 17, 2019 ■ Terracon Project No. H4195095



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MAP PROVIDED BY MICROSOFT BING MAPS

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

EXPLORATION RESULTS

Contents:

Boring Logs (19 borings)
DRI Tests (DRI-1 to DRI-5)

BORING LOG NO. GV-1X

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6137° Longitude: -82.2148°

Approximate Surface Elev.: 68 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		**POORLY GRADED SAND (SP)**, fine grained, brown, very loose					18	2-1-1-2 N=2			
		orangish brown					18	1-1-1-1 N=2			
		light brown		5			18	1-1-1-2 N=2			
		loose					22	1-2-3-4 N=5			
		7.0	61+/-								
1		**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, light brown, medium dense					19	2-6-8-9 N=14			
				10							
		gray/brown, dense					18	11-12-13 N=25			
				15							
		17.0	51+/-								
2		**CLAYEY SAND (SC)**, fine grained, gray, dense					16	12-14-15 N=29			
		20.0	48+/-	20							
		Boring Terminated at 20 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 12-09-2019 | Boring Completed: 12-09-2019

Drill Rig: BR 2500 | Driller: J. Coolidge

Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-4

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6137° Longitude: -82.2118°

Approximate Surface Elev.: 57 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND (SP), fine grained, brown						HA			
		tan						HA	5		3
				5				HA			
		with rock fragments, medium dense					18	3-4-4-5 N=8			
		8.0	49+/-								
		CLAYEY SAND (SC), fine grained, gray with red streaks, medium dense					16	5-7-4-7 N=11			
		11.0	46+/-	10							
		HIGHLY PLASTIC CLAY (CH), with sand, light gray, medium stiff									
							18	1-2-2 N=4			
		17.0	40+/-	15							
4		**HIGHLY WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments									
		20.0	37+/-					10-8-10 N=18			
		Boring Terminated at 20 Feet		20							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Hand auger to 6 feet then mud-rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-05-2019 | Boring Completed: 11-05-2019
Drill Rig: BR 2500 | Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-5

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6139° Longitude: -82.209°

Approximate Surface Elev.: 63 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION
				POORLY GRADED SAND (SP), fine grained, light brown, loose
				light tan
		8.0	55+/-	
				CLAYEY SAND (SC), fine grained, brown with red streaks, medium dense
				light gray
		16.0	47+/-	
				HIGHLY PLASTIC CLAY (CH), with sand, light gray with red, stiff
				medium stiff
		28.0	35+/-	100% loss of circulation at 28 feet
4				**HIGHLY WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		X	18	1-1-2-2 N=3			
		X	18	1-1-3-3 N=4			
5		X	18	3-2-3-4 N=5			
		X	18	3-4-4-5 N=8			
		X	18	6-3-5-5 N=8			
10							
		X	18	6-5-5 N=10			
15							
		X	16	3-3-4 N=7	49	104-34-70	80
20							
		X	18	1-2-2 N=4			
25							
		X	16	3-2-5 N=7			
30							
		X	14	9-4-4 N=8			
35							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-06-2019
Boring Completed: 11-06-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-5

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6139° Longitude: -82.209°

Approximate Surface Elev.: 63 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4		**HIGHLY WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments *(continued)*									
		40.0	23+/-	40		X	14	4-5-5 N=10			
		Boring Terminated at 40 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-06-2019
Boring Completed: 11-06-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-6

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6135° Longitude: -82.2103°

Approximate Surface Elev.: 62 (Ft.) +/-

DEPTH	ELEVATION (Ft.)	Description	MODEL LAYER	DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		POORLY GRADED SAND (SP), fine grained, light gray/brown, very loose				18	1-1-1-1 N=2
		light brown, loose				18	1-2-1-2 N=3
				5		18	2-2-3-2 N=5
		medium dense				16	3-5-7-6 N=12
8.0	54+/-						
		CLAYEY SAND (SC), fine grained, gray, brown and red, medium dense				16	8-7-5-5 N=12
11.0	51+/-			10			
		HIGHLY PLASTIC CLAY (CH), with sand, light gray, medium stiff				16	2-3-3 N=6
				15			
19.5	42.5+/-					16	2-2-3 N=5
		WEATHERED LIMESTONE, cream colored, samples as calcareous clayey sand with limestone fragments	4	20			
				25		14	7-13-10 N=23
		100% loss of circulation at 29 feet		30		14	10-3-3 N=6
35.0	27+/-			35		14	6-7-9 N=16
		Boring Terminated at 35 Feet					

GRAPHIC LOG | WATER LEVEL OBSERVATIONS | WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-06-2019 | Boring Completed: 11-06-2019

Drill Rig: BR 2500 | Driller: J. Coolidge

Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-7

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6127° Longitude: -82.2095°

Approximate Surface Elev.: 72 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			POORLY GRADED SAND (SP), fine grained, light brown, very loose								
		2.0	70+/-				10	WOH/18"-1			
			CLAYEY SAND (SC), fine grained, gray with red and brown, loose								
		4.0	68+/-				16	2-4-4-5 N=8			
			HIGHLY PLASTIC CLAY (CH), with sand, light gray, stiff	5			16	5-5-7-9 N=12			
		6.0	66+/-								
4			**WEATHERED LIMESTONE**, gray, samples as calcareous clayey sand with limestone fragments				16	1-4-5-7 N=9			
			cream colored				16	3-2-3-7 N=5			
				10							
			100% loss of circulation at 12 feet								
							14	16-12-3 N=15			
				15							
							14	8-18-23 N=41			
		20.0	52+/-	20							
			Boring Terminated at 20 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 8 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-06-2019
Boring Completed: 11-06-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-8

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6127° Longitude: -82.2116°

Approximate Surface Elev.: 50 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1				**POORLY GRADED SAND (SP)**, fine grained, dark brown, loose
				light brown
				light gray, medium dense
		8.0	42+/-	
				POORLY GRADED SAND WITH CLAY (SP-SC), fine grained, light gray, loose
		11.0	39+/-	
3				**HIGH PLASTICITY CLAY (CH)**, with sand, light gray, medium stiff
		17.0	33+/-	
2				**CLAYEY SAND (SC)**, fine grained, light gray, very loose
		21.0	29+/-	
4				**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments
		25.0	25+/-	
				Boring Terminated at 25 Feet

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			18	1-1-2-2 N=3			
			18	1-3-3-6 N=6	17		3
5	▽		16	5-4-6-7 N=10			
			16	5-5-7-9 N=12			
			18	2-2-4-3 N=6			
10							
			18	3-2-4 N=6			
15							
			18	WOH/6"-2-2 N=4			
20							
			16	7-8-8 N=16			
25							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-06-2019
Boring Completed: 11-06-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-9

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6119° Longitude: -82.2098°

Approximate Surface Elev.: 72 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
3		**HIGH PLASTICITY CLAY (CH)**, with sand, gray with red and brown, medium stiff					18	1-2-4-5 N=6			
		stiff					14	4-4-8-7 N=12	40	128-39-89	89
		very stiff		5			14	6-7-8-9 N=15			
		with some limestone					14	2-4-4-3 N=8			
		8.0	64+/-								
2		**CLAYEY SAND (SC)**, fine grained, gray, medium dense					14	4-6-6-8 N=12			
		11.0	61+/-	10							
4		**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments					14	22-21-17 N=38			
				15							
		loss of circulation at 17 feet					16	15-6-5 N=11			
				20							
		25.0	47+/-				16	19-15-8 N=23			
		Boring Terminated at 25 Feet		25							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 6 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-07-2019
Boring Completed: 11-07-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-10

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6121° Longitude: -82.208°

Approximate Surface Elev.: 56 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND (SP), fine grained, dark and light brown, loose					16	2-4-4-4 N=8			
		2.0	54+/-								
		VERY CLAYEY SAND (SC), fine grained, dark brown, loose					16	2-2-3-2 N=5	18	33-18-15	30
		4.0	52+/-								
		HIGHLY PLASTIC CLAY (CH), with sand, brown and orange, stiff		5			16	3-3-5-5 N=8			
							18	3-5-6-7 N=11			
		brown, orange and gray, medium stiff					18	2-2-3-11 N=5			
		9.5	46.5+/-	10							
4		**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments									
							15	20-31-36 N=67			
				15							
		19.0	37+/-								
		19.5	36.5+/-				10	33-50/6"			
		LIMESTONE, cream colored, samples as calcareous clayey sand with limestone fragments									
		Boring Terminated at 19.5 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 8 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-07-2019
Boring Completed: 11-07-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-12

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.611° Longitude: -82.2098°

Approximate Surface Elev.: 69 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		**POORLY GRADED SAND (SP)**, fine grained, light brown, very loose					16	WOH/18"-1			
							16	1-1-1-1 N=2			
		tan, loose		5			16	2-2-2-2 N=4			
							16	3-3-3-3 N=6			
							18	3-3-4-4 N=7			
		11.0	58+/-	10							
1		**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, brown, loose					13	4-3-5 N=8	24		5
				15							
		brown gray and orange					14	4-3-5 N=8			
				20							
							14	4-4-4 N=8			
		27.0	42+/-	25							
3		**HIGHLY PLASTIC CLAY (CH)**, with sand, orangish brown, soft					12	WOH/12"-1			
		31.0	38+/-	30							
2		**CLAYEY SAND (SC)**, fine grained, orangish brown, very loose					14	WOH/18"			
				35							
		100% loss of circulation at 36 feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:
35 feet 3 inch casing

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-07-2019 | Boring Completed: 11-07-2019
Drill Rig: BR 2500 | Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-12

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.611° Longitude: -82.2098°

Approximate Surface Elev.: 69 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2			**CLAYEY SAND (SC)**, fine grained, orangish brown, very loose *(continued)*								
				40		X	16	WOR/6"-WOH/6"-1 N=1			
				45		X	13	WOR/6"-2-1 N=3			
		47.0	22+/-								
4			**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments, very soft to 53.5 feet								
				50		X	11	WOR/6"-2-2 N=4			
			Sampled from 50 to 53.5 with no sample recovery			X	0	WOR/42"			
				55		X	10	6-9-4 N=13			
		59.0	10+/-								
			LIMESTONE, cream colored, samples as calcareous clayey sand with limestone fragments	60		X	10	11-50/6"			
		61.0	8+/-								
			WEATHERED LIMESTONE, cream colored, samples as calcareous clayey sand with limestone fragments								
		65.0	4+/-	65		X		21-21-22 N=43			
			Boring Terminated at 65 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-07-2019 | Boring Completed: 11-07-2019

Drill Rig: BR 2500 | Driller: J. Coolidge

Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-13

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6103° Longitude: -82.2103°

Approximate Surface Elev.: 65 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1				**POORLY GRADED SAND (SP)**, fine grained, light gray/brown, loose
				light brown
				medium dense
				white
		11.0	54+/-	
				POORLY GRADED SAND WITH CLAY (SP-SC), fine grained, tan, medium dense
		17.0	48+/-	
				POORLY GRADED SAND WITH SILT (SP-SM), fine grained, light gray, medium dense
				white
		32.0	33+/-	
				POORLY GRADED SAND WITH CLAY (SP-SC), fine grained, light gray and brown, medium dense

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			18	2-3-3-4 N=6			
			18	2-2-3-3 N=5			
5			18	2-2-2-3 N=4			
			18	4-5-5-6 N=10			
10			18	5-5-5-6 N=10			
15			16	5-8-8 N=16			
20			18	7-8-9 N=17			
25			16	5-6-8 N=14			
30			14	4-4-5 N=9			
35			16	4-5-5 N=10			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:
50 feet 3 inch casing

WATER LEVEL OBSERVATIONS

While drilling

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-08-2019
Boring Completed: 11-08-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-13

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6103° Longitude: -82.2103°

Approximate Surface Elev.: 65 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1				**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, light gray and brown, medium dense *(continued)*
		47.0	18+/-	
1				**POORLY GRADED SAND (SP)**, fine grained, white, medium dense
		57.0	8+/-	
1				**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, gray/brown, loose
		61.0	4+/-	
2				**CLAYEY SAND (SC)**, with some limestone fragments, fine grained, brown, loose
		67.0	-2+/-	
2				**CLAYEY SAND (SC)**, fine grained, gray, very loose
				100 percent loss of circulation

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
40		X	16	6-7-7 N=14			
45		X	18	6-6-5 N=11			
50		X	13	11-6-6 N=12			
55		X	5	4-4-5 N=9			
60		X	16	1-2-3 N=5			
65		X	14	2-2-3 N=5			
70		X	18	WOH/18"			

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-08-2019
Boring Completed: 11-08-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-13

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6103° Longitude: -82.2103°

Approximate Surface Elev.: 65 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
2			**CLAYEY SAND (SC)**, fine grained, gray, very loose *(continued)*	75			18	WOH/18"			
		77.0	-12+/-								
			CLAYEY SAND (SC), with some limestone fragments, fine grained, gray, very loose								
				80				WOH/18"			
		82.0	-17+/-								
			CLAYEY SAND (SC), fine grained, gray, very loose								
				85				WOR/18"			
		86.0	-21+/-								
4			**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments								
				90			16	8-11-11 N=22			
				95			10	6-10-21 N=31			
				100			14	WOR/18"			
		104.5	-39.5+/-				3	22-37-50/5"			
		104.9	-40+/-	105							
			LIMESTONE, cream colored, samples as calcareous clayey sand with limestone fragments								
			Boring Terminated at 105 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-08-2019
Boring Completed: 11-08-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-14

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6106° Longitude: -82.2108°

Approximate Surface Elev.: 62 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	Description
1	2.0	60+/-	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, dark and light brown, loose
1	6.0	56+/-	**POORLY GRADED SAND (SP)**, fine grained, light brown, loose
2	8.0	54+/-	**CLAYEY SAND (SC)**, fine grained, brown and red and orange, loose
3	14.0	48+/-	**HIGHLY PLASTIC CLAY (CH)**, with sand, gray, red and brown, stiff
4			**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments
4			100% loss of circulation at 18 feet

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
	X	18	2-2-2-1 N=4
	X	17	3-3-3-2 N=6
5	X	17	2-3-2-5 N=5
	X	18	4-4-3-5 N=7
	X	17	1-2-6-6 N=8
10			
	X	16	3-3-4 N=7
15			
	X	14	1-1/12" N=1
20			
	X	16	1-2-2 N=4
25			
	X	15	WOH/6"-1-2 N=3
30			
	X	13	2-3-7 N=10
35			

WATER LEVEL OBSERVATIONS

WATER CONTENT (%)

ATTERBERG LIMITS LL-PL-PI

PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-07-2019
Boring Completed: 11-07-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-14

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6106° Longitude: -82.2108°

Approximate Surface Elev.: 62 (Ft.) +/-

DEPTH ELEVATION (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4		**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments *(continued)*									
				40		X	15	7-8-25 N=33			
		45.0	17+/-	45		X	15	12-11-14 N=25			
		Boring Terminated at 45 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-07-2019 | Boring Completed: 11-07-2019

Drill Rig: BR 2500 | Driller: J. Coolidge

Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-15

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6099° Longitude: -82.2096°

Approximate Surface Elev.: 65 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION
				POORLY GRADED SAND (SP), fine grained, light brown, very loose
		2.0	63+/-	
				CLAYEY SAND (SC), with limestone and chert lenses, fine grained, brown, loose
				tan, medium dense
		6.0	59+/-	
				HIGHLY PLASTIC CLAY (CH), with sand, gray, stiff
				with limestone fragments, medium stiff
				100% loss of circulation at 18 feet
				very soft
		24.0	41+/-	
4				**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		X	24	1-1-1-2 N=2			
		X	24	2-3-3-11 N=6			
5		X	24	28-10-7-8 N=17			
		X	12	7-6-6-8 N=12			
		X	12	4-4-4-3 N=8			
10							
		X	18	2-2-4 N=6			
15							
		X	18	WOH/18"			
20							
		X	6	WOR/6"-1/12" N=1			
25							
		X	18	4-3-2 N=5			
30							
		X	18	6-12-15 N=27			
35							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 6 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-13-2019
Boring Completed: 11-13-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-15

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6099° Longitude: -82.2096°

Approximate Surface Elev.: 65 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4		**WEATHERED LIMESTONE**, cream colored, samples as calcareous clayey sand with limestone fragments *(continued)*									
		40.0	25+/-	40			18	6-12-12 N=24			
		Boring Terminated at 40 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 6 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-13-2019
Boring Completed: 11-13-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

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BORING LOG NO. GV-16

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6101° Longitude: -82.2109°

Approximate Surface Elev.: 60 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1				**POORLY GRADED SAND (SP)**, fine grained, brown and gray, loose
				light brown
				white
		11.0	49+/-	
2				**CLAYEY SAND (SC)**, fine grained, gray/brown, medium dense
		16.0	44+/-	
1				**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, gray/brown, loose
				medium dense
		26.0	34+/-	
1				**POORLY GRADED SAND (SP)**, fine grained, white, medium dense

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		X	18	2-2-2-3 N=4			
		X	18	2-2-3-2 N=5			
5		X	18	2-2-3-3 N=5	4		2
		X	18	3-3-3-3 N=6			
		X	18	3-4-4-4 N=8			
10							
		X	16	5-6-7 N=13			
15							
		X	13	3-3-4 N=7			
20							
		X	13	4-5-6 N=11			
25							
		X	10	5-5-6 N=11			
30							
		X	10	6-8-10 N=18			
35							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-08-2019
Boring Completed: 11-08-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

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BORING LOG NO. GV-16

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6101° Longitude: -82.2109°

Approximate Surface Elev.: 60 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		**POORLY GRADED SAND (SP)**, fine grained, white, medium dense *(continued)*									
				40		X	6	6-8-10 N=18			
				45		X	10	6-9-15 N=24			
		46.0	14+/-								
		POORLY GRADED SAND WITH CLAY (SP-SC), fine grained, brown and gray, dense									
				50		X	12	14-19-20 N=39			
		52.0	8+/-								
		POORLY GRADED SAND (SP), fine grained, white, very dense									
				55		X	6	16-21-22 N=43			
		55.0	5+/-								
		Boring Terminated at 55 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-08-2019
Boring Completed: 11-08-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

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BORING LOG NO. GV-17

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6102° Longitude: -82.2136°

Approximate Surface Elev.: 48 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	Description
1	2.0	46+/-	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, dark brown, loose
1	11.0	37+/-	**POORLY GRADED SAND (SP)**, fine grained, gray/brown, loose light gray, loose medium dense loose
2	16.0	32+/-	**CLAYEY SAND (SC)**, fine grained, gray, medium dense
1	24.5	23.5+/-	**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, gray, medium dense
3			**HIGHLY PLASTIC CLAY (CH)**, with sand, light gray to light blue/gray, stiff

DEPTH (Ft.)	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
		16	WOH/6"-2-1-2 N=3
			2-2-3-4 N=5
5			3-4-4-5 N=8
			3-4-5-6 N=9
			2-3-3-4 N=6
10			
			8-11-11 N=22
15			
			8-12-12 N=24
20			
			8-7-4 N=11
25			
			3-4-4 N=8
30			
			2-3-3 N=6
35			

WATER LEVEL OBSERVATIONS: ▽ While sampling

WATER CONTENT (%)

ATTERBERG LIMITS: LL-PL-PI

PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

▽ *While sampling*

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-13-2019
Boring Completed: 11-13-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

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BORING LOG NO. GV-17

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6102° Longitude: -82.2136°

Approximate Surface Elev.: 48 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			HIGHLY PLASTIC CLAY (CH), with sand, light gray to light blue/gray, stiff *(continued)* soft								
				40		X		2-2-1 N=3			
		42.0	100% loss of circualtion at 42 feet	6+/-							
4			**WEATHERED LIMESTONE**, cream colored								
				45		X		1-1-6 N=7			
		50.0		-2+/-		X		15-16-19 N=35			
			Boring Terminated at 50 Feet	50							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

While sampling

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-13-2019 | Boring Completed: 11-13-2019

Drill Rig: BR 2500 | Driller: J. Coolidge

Project No.: H4195095

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BORING LOG NO. GV-18

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6099° Longitude: -82.2144°

Approximate Surface Elev.: 50 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	Description
1	2.0	48+/-	**POORLY GRADED SAND WITH SILT (SP-SM)**, fine grained, dark and light brown, very loose
1	8.0	42+/-	**POORLY GRADED SAND (SP)**, fine grained, light brown, loose white, medium dense
2	17.0	33+/-	**CLAYEY SAND (SC)**, fine grained, gray, medium dense dense
3	22.0	28+/-	**HIGHLY PLASTIC CLAY (CH)**, with sand, light gray, stiff
2	33.0	17+/-	**CLAYEY SAND (SC)**, fine grained, gray and dark gray, medium dense loose 50% loss of circulation at 33 feet
3	37.0	13+/-	**HIGHLY PLASTIC CLAY (CH)**, with sand, gray, soft

SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS
	18	1-1-1-1 N=2
	18	2-1-3-4 N=4
	14	4-4-5-7 N=9
	14	6-5-5-6 N=10
	14	4-7-11-12 N=18
	14	10-13-15 N=28
	16	7-5-7 N=12
	14	3-5-6 N=11
	18	3-3-3 N=6
	10	WOH/12"-2 N=2

DEPTH (Ft.): 5, 10, 15, 20, 25, 30, 35

WATER LEVEL OBSERVATIONS: While drilling

WATER CONTENT (%) | ATTERBERG LIMITS LL-PL-PI | PERCENT FINES

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-14-2019 | Boring Completed: 11-14-2019
Drill Rig: BR 2500 | Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-18

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6099° Longitude: -82.2144°

Approximate Surface Elev.: 50 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
4		**WEATHERED LIMESTONE**, cream colored		40			12	4-4-3 N=7			
		100% loss of circulation at 42 feet									
		44.0	6+/-				10	8-50/5"			
		44.4 **LIMESTONE**, cream colored	5.5+/-								
		Boring Terminated at 44.4 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-14-2019 | Boring Completed: 11-14-2019

Drill Rig: BR 2500 | Driller: J. Coolidge

Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-19

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6092° Longitude: -82.2147°

Approximate Surface Elev.: 54 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DESCRIPTION
1				**POORLY GRADED SAND (SP)**, fine grained, light brown, loose
				white
				medium dense
		11.0	43+/-	
2				**CLAYEY SAND (SC)**, fine grained, gray, medium dense
		17.0	37+/-	
1				**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, gray/brown, dense
				medium dense
		27.0	27+/-	
2				**CLAYEY SAND (SC)**, fine grained, gray/brown, medium dense

DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			16	WOH/6"-1-2-1 N=3			
			18	1-2-2-3 N=4			
5			16	3-3-4-4 N=7			
	▽		16	4-4-5-4 N=9			
			14	3-3-5-5 N=8			
10							
			14	8-10-11 N=21			
15							
			14	16-18-22 N=40			
20							
			16	12-10-9 N=19			
25							
			16	4-5-6 N=11			
30							
			14	3-3-8 N=11			
35							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

▽ *While drilling*

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-14-2019 | Boring Completed: 11-14-2019

Drill Rig: BR 2500 | Driller: J. Coolidge

Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-19

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6092° Longitude: -82.2147°

Approximate Surface Elev.: 54 (Ft.) +/-

MODEL LAYER	DEPTH	ELEVATION (Ft.)	DESCRIPTION	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
			CLAYEY SAND (SC), fine grained, gray/brown, medium dense *(continued)*								
				40		X	10	6-3-3 N=6			
	42.0	12+/-									
			POORLY GRADED SAND WITH CLAY (SP-SC), fine grained, gray/brown, dense								
				45		X	16	12-11-15 N=26			
	46.0	8+/-									
			HIGHLY PLASTIC CLAY (CH), with sand, gray/brown, soft								
	49.5	4.5+/-	100% loss of circulation at 49 feet			X	12	2-1-6 N=7			
4			**WEATHERED LIMESTONE**, cream colored	50							
				55		X	14	5-5-6 N=11			
	59.0	-5+/-									
	59.4	-5.5+/-	**LIMESTONE**, cream colored			X	10	15-50/5"			
			Boring Terminated at 59.4 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

While drilling

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-14-2019
Boring Completed: 11-14-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-20

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6091° Longitude: -82.214°

Approximate Surface Elev.: 51 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND (SP), fine grained, light brown, very loose					18	WOH/6"-1-1-2 N=2			
		loose					16	2-2-4-4 N=6			
		4.0	47+/-								
		CLAYEY SAND (SC), fine grained, gray/brown, loose		5			18	3-3-3-3 N=6			
							14	3-3-5-7 N=8	19	38-20-18	28
							18	3-3-3-3 N=6			
				10							
							16	1-1-3 N=4			
				15							
		17.0	34+/-								
		POORLY GRADED SAND WITH CLAY (SP-SC), fine grained, light gray, medium dense					16	3-5-4 N=9			
				20							
		22.0	29+/-								
		HIGHLY PLASTIC CLAY (CH), with sand, light gray, stiff					16	3-4-3 N=7			
				25							
		27.0	24+/-								
4		**WEATHERED LIMESTONE**, cream colored					14	9-10-9 N=19			
				30							
		34.5	16.5+/-				12	8-8-50/3"			
		34.8 **LIMESTONE**, cream colored	16+/-								
		Boring Terminated at 34.8 Feet									

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-14-2019 | Boring Completed: 11-14-2019

Drill Rig: BR 2500 | Driller: J. Coolidge

Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-22

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.6093° Longitude: -82.2106°

Surface Elev.: 59 (Ft.)

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
		POORLY GRADED SAND (SP), fine grained, gray/brown, loose									
							18	2-3-4-3 N=7			
							16	2-3-2-3 N=5			
		white, medium dense		5			16	4-5-6-6 N=11			
		6.0	53								
		HIGHLY PLASTIC CLAY (CH), with sand, gray, stiff					16	3-5-7-7 N=12			
							16	2-3-3-3 N=6			
				10							
		14.5 100% los of circulation at 15 feet	44.5				16	1-2-3 N=5			
4		**WEATHERED LIMESTONE**, cream colored		15							
							14	9-11-8 N=19			
				20							
							14	3-3-3 N=6			
				25							
		30.0	29				14	12-19-13 N=32			
		Boring Terminated at 30 Feet		30							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 8 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-12-2019
Boring Completed: 11-12-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

BORING LOG NO. GV-23

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.609° Longitude: -82.2097°

Approximate Surface Elev.: 65 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1		**POORLY GRADED SAND (SP)**, fine grained, light brown, loose					18	2-2-1-2 N=3	5		2
							18	2-1-2-1 N=3			
				5			18	2-3-2-2 N=5			
							18	2-2-2-4 N=4			
							16	3-3-4-5 N=7			
				10							
		medium dense									
							14	6-7-9 N=16			
				15							
		light gray									
							14	6-7-9 N=16			
				20							
		22.0	43+/-								
2		**CLAYEY SAND (SC)**, fine grained, light gray, medium dense									
							12	4-4-5 N=9			
				25							
		27.0	38+/-								
1		**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, dark brown, loose									
							10	2-2-3 N=5			
				30							
		medium dense									
							14	5-3-6 N=9			
				35							

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
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Boring Started: 11-12-2019
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Drill Rig: BR 2500
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Project No.: H4195095

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BORING LOG NO. GV-23

PROJECT: Florida National Cemetery

CLIENT: Mabbett & Associates, Inc.
Providence, RI

SITE: 6502 SW 102nd Ave
Bushnell, Florida

LOCATION See Exploration Plan

Latitude: 28.609° Longitude: -82.2097°

Approximate Surface Elev.: 65 (Ft.) +/-

MODEL LAYER	GRAPHIC LOG	DEPTH	ELEVATION (Ft.)	DEPTH (Ft.)	WATER LEVEL OBSERVATIONS	SAMPLE TYPE	RECOVERY (In.)	FIELD TEST RESULTS	WATER CONTENT (%)	ATTERBERG LIMITS LL-PL-PI	PERCENT FINES
1			**POORLY GRADED SAND WITH CLAY (SP-SC)**, fine grained, dark brown, loose *(continued)*								
		39.0	26+/-								
			light gray			X	14	1-9-10 N=19			
2			**CLAYEY SAND (SC)**, fine grained, light gray, loose	40							
				45		X	14	3-3-2 N=5			
				50		X	12	4-3-2 N=5			
			very loose								
			100% loss of circulation at 54 feet	55		X	16	WOH/18"			
		57.0	8+/-								
4			**WEATHERED LIMESTONE**, cream colored	60		X	14	2-1-3 N=4			
		65.0	0+/-	65		X	14	13-25-25 N=50			
			Boring Terminated at 65 Feet								

Stratification lines are approximate. In-situ, the transition may be gradual.

Hammer Type: Automatic

Advancement Method:
Mud rotary

Abandonment Method:
Boring backfilled with bentonite chips upon completion.

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevations were interpolated from provided LIDAR site elevation map

Notes:

WATER LEVEL OBSERVATIONS

Not encountered to 10 feet

Terracon
5463 W Waters Ave, Ste 830
Tampa, FL

Boring Started: 11-12-2019
Boring Completed: 11-12-2019
Drill Rig: BR 2500
Driller: J. Coolidge
Project No.: H4195095

THIS BORING LOG IS NOT VALID IF SEPARATED FROM ORIGINAL REPORT. GEO SMART LOG-NO WELL H4195095 FLORIDA NATIONAL .GPJ TERRACON_DATATEMPLATE.GDT 12/16/19

Terracon Project No.: H4195095

Double Ring Infiltration Test Results

PROJECT:	Florida National Cemetery	PROJECT LOCATION:	6502 SE 102nd Ave, Bushnell, Florida
DATE OF TEST:	11/20/2019	TEST LOCATION:	DRI-1/GV-6 Location
DEPTH OF TEST:	2 feet	DEPTH TO WATER TABLE:	Below 5 feet

TEST RESULTS:

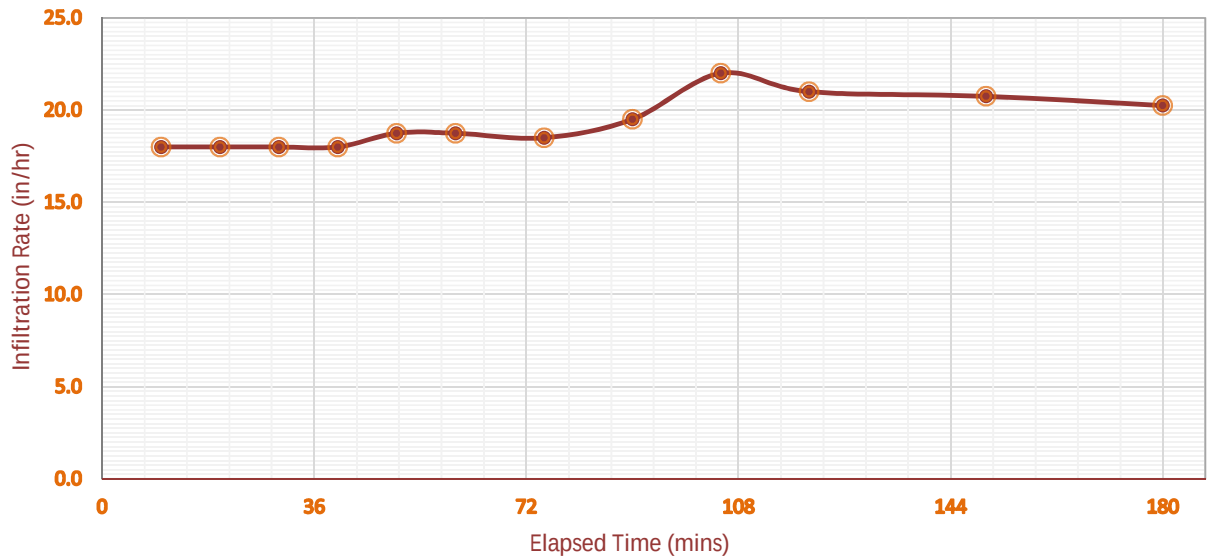
TEST TIME		INFLITRATION RATE (Inches/Hour)
0:10	min	18
0:10	min	18
0:10	min	18
0:10	min	18
0:10	min	18.75
0:10	min	18.75
Average 1st Hour		18.3
0:15	min	18.5
0:15	min	19.5
0:15	min	22
0:15	min	21
Average 2nd Hour		20.3
0:30	min	20.75
0:30	min	20.25
Average 3rd Hour		20.5

Soil Profile

Depth	*Description*
0 to 0.5	Lt gray F Sand
0.5 to 3.5	Lt Br F Sand
3.5 to 5	Very Lt Br F Sand

INFILTRATION RATE: 20.5 Inches Per Hour

Elapsed Time vs. Infiltration Rate Graph



Terracon Project No.: H4195095

Double Ring Infiltration Test Results

PROJECT:	Florida National Cemetery	PROJECT LOCATION:	6502 SE 102nd Ave, Bushnell, Florida
DATE OF TEST:	11/20/2019	TEST LOCATION:	DRI-2/GV-13 Location
DEPTH OF TEST:	2 feet	DEPTH TO WATER TABLE:	Below 5 feet

TEST RESULTS:

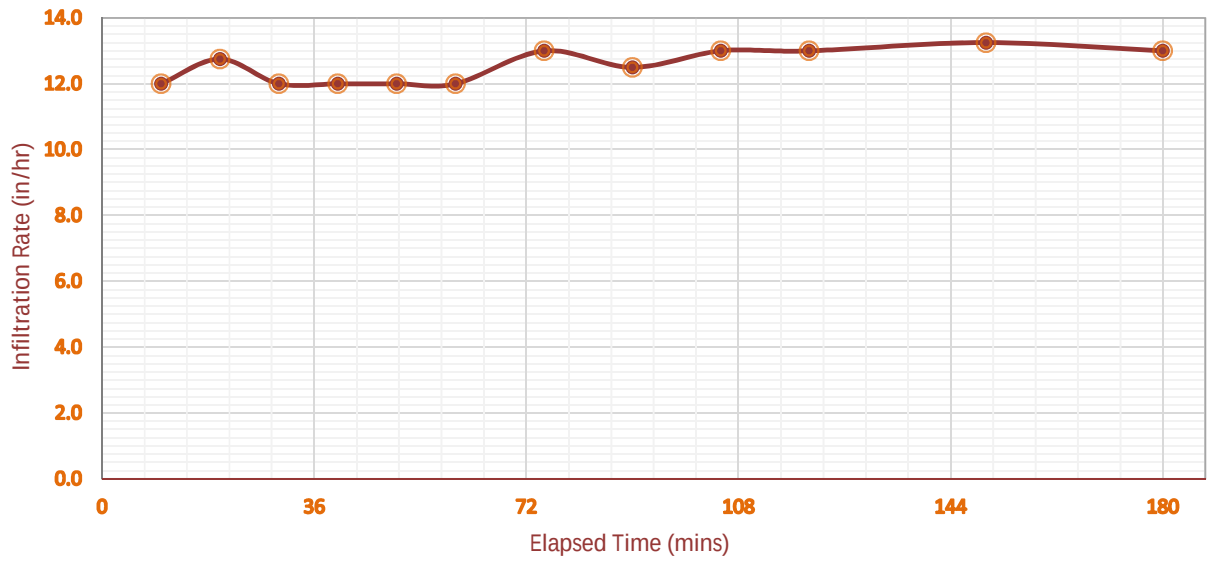
TEST TIME		INFLITRATION RATE (Inches/Hour)
0:10	min	12
0:10	min	12.75
0:10	min	12
0:10	min	12
0:10	min	12
0:10	min	12
Average 1st Hour		12.1
0:15	min	13
0:15	min	12.5
0:15	min	13
0:15	min	13
Average 2nd Hour		12.9
0:30	min	13.25
0:30	min	13
Average 3rd Hour		13.1

Soil Profile

Depth	*Description*
0 to 0.5	Gray F Sand
0.5 to 3	Lt Br F Sand
3 to 5	Very Lt Br F Sand

INFILTRATION RATE: 13.1 Inches Per Hour

Elapsed Time vs. Infiltration Rate Graph



Terracon Project No.: H4195095

Double Ring Infiltration Test Results

PROJECT:	Florida National Cemetery	PROJECT LOCATION:	6502 SE 102nd Ave, Bushnell, Florida
DATE OF TEST:	11/22/2019	TEST LOCATION:	DRI-3/GV-12 Location
DEPTH OF TEST:	2 feet	DEPTH TO WATER TABLE:	Below 5 feet

TEST RESULTS:

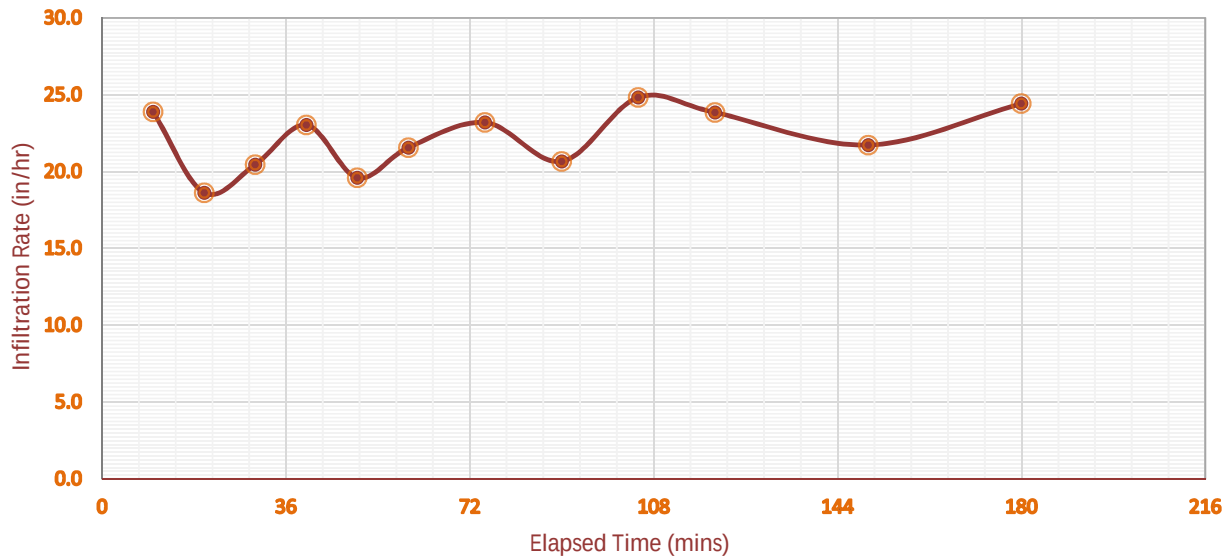
TEST TIME		INFLITRATION RATE (Inches/Hour)
0:10	min	23.9
0:10	min	18.6
0:10	min	20.5
0:10	min	23.0
0:10	min	19.6
0:10	min	21.6
Average 1st Hour		21.2
0:15	min	23.2
0:15	min	20.7
0:15	min	24.8
0:15	min	23.9
Average 2nd Hour		23.1
0:30	min	21.7
0:30	min	24.4
Average 3rd Hour		23.1

Soil Profile

Depth	*Description*
O to 1	Gray F Sand w/rts
1 to 5	Yellow F Sand

INFILTRATION RATE: 23.1 Inches Per Hour

Elapsed Time vs. Infiltration Rate Graph



Terracon Project No.: H4195095

Double Ring Infiltration Test Results

PROJECT:	Florida National Cemetery	PROJECT LOCATION:	6502 SE 102nd Ave, Bushnell, Florida
DATE OF TEST:	11/22/2019	TEST LOCATION:	DRI-4/GV-20 Location
DEPTH OF TEST:	2 feet	DEPTH TO WATER TABLE:	Below 5 feet

TEST RESULTS:

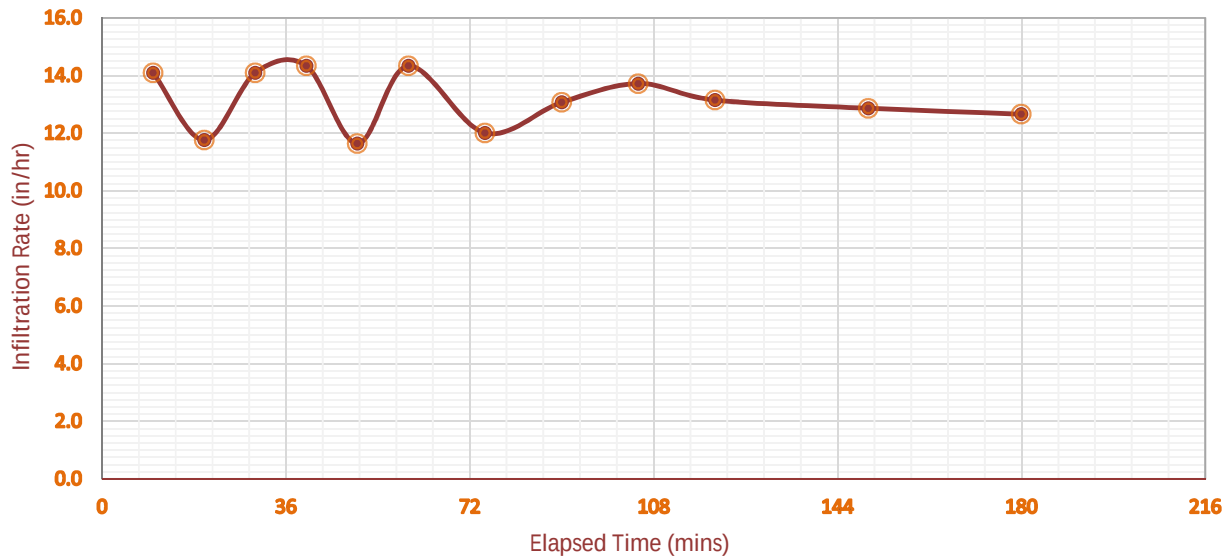
TEST TIME		INFLITRATION RATE (Inches/Hour)
0:10	min	14.1
0:10	min	11.8
0:10	min	14.1
0:10	min	14.3
0:10	min	11.6
0:10	min	14.3
Average 1st Hour		13.4
0:15	min	12.0
0:15	min	13.1
0:15	min	13.7
0:15	min	13.2
Average 2nd Hour		13.0
0:30	min	12.9
0:30	min	12.7
Average 3rd Hour		12.8

Soil Profile

Depth	*Description*
0 to 0 .5	Gray f Sand w/rts
0.5 to 2	Lt Gr/Lt Brn F Sand
2 to 5	Lt Brn/Yllw F Sand

INFILTRATION RATE: 12.8 Inches Per Hour

Elapsed Time vs. Infiltration Rate Graph



Terracon Project No.: H4195095

Double Ring Infiltration Test Results

PROJECT:	Florida National Cemetery	PROJECT LOCATION:	6502 SE 102nd Ave, Bushnell, Florida
DATE OF TEST:	11/23/2019	TEST LOCATION:	DRI-5/GV-23 Location
DEPTH OF TEST:	2 feet	DEPTH TO WATER TABLE:	Below 5 feet

TEST RESULTS:

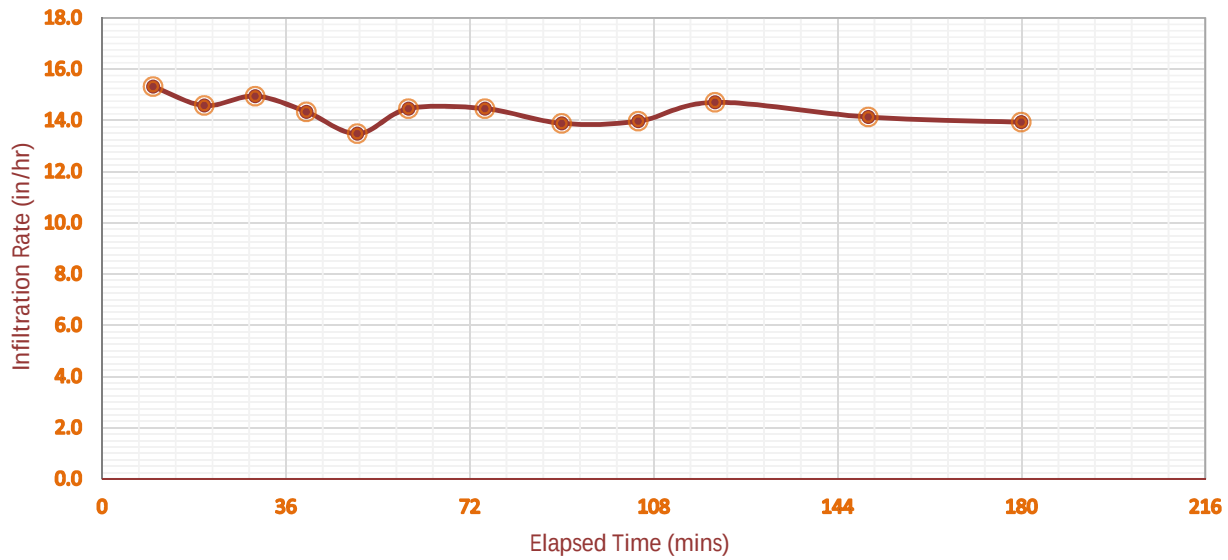
TEST TIME		INFLITRATION RATE (Inches/Hour)
0:10	min	15.3
0:10	min	14.6
0:10	min	14.9
0:10	min	14.3
0:10	min	13.5
0:10	min	14.5
Average 1st Hour		14.5
0:15	min	14.5
0:15	min	13.9
0:15	min	14.0
0:15	min	14.7
Average 2nd Hour		14.3
0:30	min	14.1
0:30	min	13.9
Average 3rd Hour		14.0

Soil Profile

Depth	*Description*
O to 0.5	Gray f Sand w/rts
0.5 to 1.5	Lt Gr F Sand

INFILTRATION RATE: 14.0 Inches Per Hour

Elapsed Time vs. Infiltration Rate Graph



SUPPORTING INFORMATION

Contents:

Unified Soil Classification System

UNIFIED SOIL CLASSIFICATION SYSTEM

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]					Soil Classification	
					Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	$Cu \geq 4$ and $1 \leq Cc \leq 3$ [E]		GW	Well-graded gravel [F]
			$Cu < 4$ and/or [$Cc<1$ or $Cc>3.0$] [E]		GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH		GM	Silty gravel [F, G, H]
			Fines classify as CL or CH		GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	$Cu \geq 6$ and $1 \leq Cc \leq 3$ [E]		SW	Well-graded sand [I]
			$Cu < 6$ and/or [$Cc<1$ or $Cc>3.0$] [E]		SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH		SM	Silty sand [G, H, I]
			Fines classify as CL or CH		SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots on or above "A"		CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]		ML	Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OL	Organic clay [K, L, M, N]
						Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line		CH	Fat clay [K, L, M]
			PI plots below "A" line		MH	Elastic Silt [K, L, M]
		Organic:	Liquid limit - oven dried / Liquid limit - not dried	< 0.75	OH	Organic clay [K, L, M, P]
						Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor				PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.

[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.

[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.

[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.

[E] $Cu = D_{60}/D_{10}$ $\quad Cc = \dfrac{(D_{30})^2}{D_{10} \times D_{60}}$

[F] If soil contains ≥ 15% sand, add "with sand" to group name.

[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.

[H] If fines are organic, add "with organic fines" to group name.

[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.

[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.

[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.

[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.

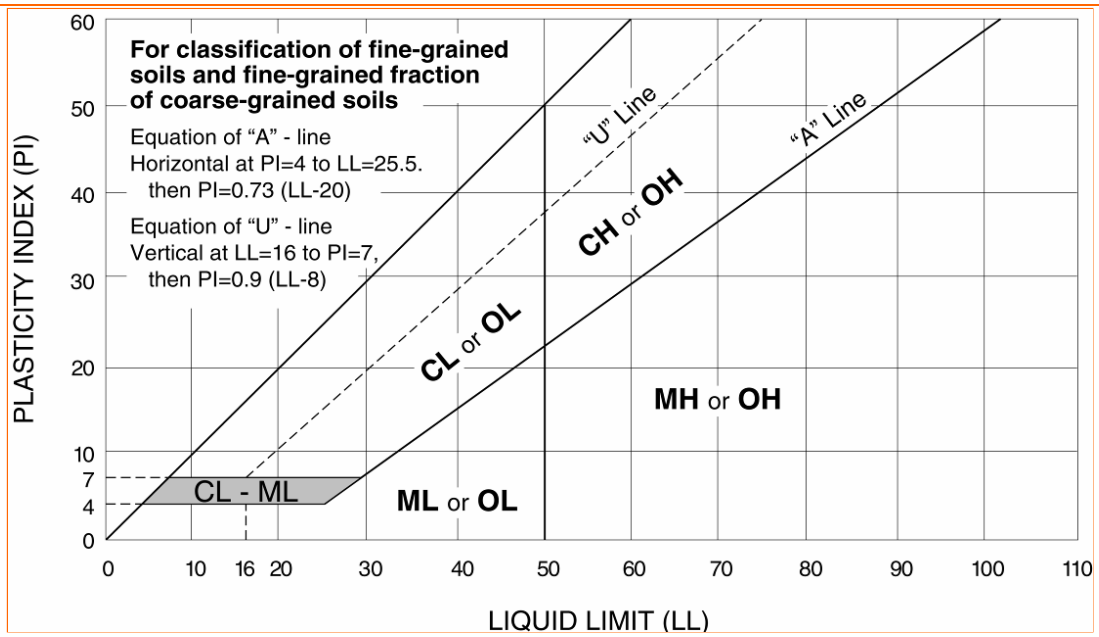
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.

[N] PI ≥ 4 and plots on or above "A" line.

[O] PI < 4 or plots below "A" line.

[P] PI plots on or above "A" line.

[Q] PI plots below "A" line.


For classification of fine-grained soils and fine-grained fraction of coarse-grained soils
Equation of "A" - line
Horizontal at PI=4 to LL=25.5.
then PI=0.73 (LL-20)
Equation of "U" - line
Vertical at LL=16 to PI=7,
then PI=0.9 (LL-8)
"U" Line
"A" Line
CH or OH
CL or OL
MH or OH
ML or OL
CL - ML
PLASTICITY INDEX (PI)
LIQUID LIMIT (LL)
0
4
7
10
20
30
40
50
60
0
10
16
20
30
40
50
60
70
80
90
100
110

Wetlands and Endangered Species Biological Assessment for the Site-Specific Environmental Assessment for the Florida National Cemetery, Bushnell, Florida

VA OFCM Prime Contract Number: VA101F-12-D-0056
VA Project Number: 911CM2025

Prepared for:
US Department of Veterans Affairs
Office of Construction and Facilities Management (003C4B)
425 I Street, NW
Washington, DC 20001

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Orlando, FL 32801

Mabbett & Associates, Inc.
5 Alfred Circle
Bedford, MA 01730

October 23, 2019

Table of Contents

1.0 Introduction 1
1.1 Florida National Cemetery Regulatory Planning History 1
2.0 Background Information Review 2
2.1 Physiography 2
2.2 Land Use and Vegetative Cover 2
2.3 Hydrology 3
2.4 Wetland Ecosystems 3
3.0 Environmental Setting 3
3.1 Soils 3
3.2 Land Use/Vegetative Cover 3
4.0 Wetlands and Other Surface Waters 4
4.1 Applicable Wetland Regulations 4
5.0 Listed Species Potentially in the Project Study Area 5
5.1 State-Listed Plant Species 6
5.2 Federally-Listed Animal Species 6
5.3 State-Listed Animal Species 7
5.4 Other Species of Concern 8
5.5 Gopher Tortoise Permitting, Mitigation, and Relocation 8
5.6 Critical Habitat 10
5.7 Commitments 10
6.0 Summary 11
7.0 References 12

Tables

Table 1: USDA-NRCS Soils within the Project Study Area
Table 2: Land Use/Vegetative Cover within the Project Study Area
Table 3: Listed Species Potentially Occurring within Project Study Area
Table 4: Gopher Tortoise Permitting Cost Summary

Figures

Figure 1: Location Map
Figure 2: Aerial Photograph
Figure 3: USDA-NRCS Soils
Figure 4: Vegetative Communities
Figure 5: Gopher Tortoise Burrows

Appendices

Appendix A: USACE Determination Data Forms
Appendix B: Standard Protection Measures for the Eastern Indigo Snake

1.0 Introduction

This Wetlands and Endangered Species Biological Assessment has been prepared for the U.S. Department of Veterans Affairs (VA) proposed 107.65-acre expansion project at the northeast portion (Project Study Area) of the Florida National Cemetery, which is located in Bushnell, Sumter County, Florida (**Figure 1**). An aerial photograph is provided as **Figure 2**. The purpose of the proposed project is to expand the current burial capacity to extend the longevity of the Florida National Cemetery for Veterans and their eligible family members in central Florida.

The purpose of this report is to describe the methodology and results of the field investigation to identify and delineate aquatic resources that may be subject to regulation under federal and/or state jurisdiction at the Project Study Area and to identify the potential effects of the proposed cemetery expansion on listed species and their associated habitats. This process included a field survey by qualified biologists of habitats within and adjacent to the Project Study Area, as well as literature and database reviews. Details on the study methodologies and results are provided below.

The Florida National Cemetery is located at 6502 Southwest 102nd Avenue, Bushnell, Florida. The Project study Area is located within Section 33 of Township 21 South, Range 21 East and Section 4 of Township 22 South, Range 21 East. The Project Study Area is located in a rural area and is bounded on the north by the Sumter Correctional Institute, on the east by County Road 476B, and on the west and south by developed portions of the Florida National Cemetery.

1.1 Florida National Cemetery Regulatory Planning History

In 1983, a Final Environmental Impact Statement (EIS) was completed by the VA National Cemetery Administration to evaluate the effects of developing a new National Cemetery in Florida. Two alternative sites were evaluated: a portion of the Cross-Florida Barge Canal right-of-way and a portion of the Croom tract of the Withlacoochee State Forest. The VA planned to provide either 295,444 grave sites at the Barge Canal alternative site or 256,727 grave sites at the Withlacoochee alternative site through the year 2040. The proposed Florida National Cemetery included administrative and service facilities at either site. During this study, the potential to adversely affect physical, biological, and cultural resources was assessed. Following completion of the Final EIS, the VA selected the Croom tract (Withlacoochee site) and permits have been issued by the Southwest Florida Water Management District (SWFWMD) and the United States Army Corps of Engineers (USACE) for several phases of construction of the Florida National Cemetery. The original phases of the Florida National Cemetery were constructed in accordance with a master plan developed for the initial cemetery design, while subsequent expansion phases (2006 and later) in the western portion of the property were constructed according to the 2005 Expansion Site Master Plan (VA, 2005).

Management and Storage of Surface Water (MSSW) permit No. 401576 issued on March 3, 1987, authorized construction of the first phase of the Florida National Cemetery on approximately 110 acres of land. An administration building, maintenance building, employee parking, two committal shelters, and 2.0 miles of paved roadways were included in the first phase (Phase I) located in the central, east, and southeast areas of the property. A well and pumping system were also installed for irrigation purposes in conjunction with Phase I. Existing wetlands on-site are utilized for water quality treatment. In addition, the run-off from a 25-year storm event is retained within the on-site wetland areas. Construction of Phase I was completed in 1993.

Subsequent permit modifications were made to the original permit to account for construction and operation of the phased cemetery expansion project. The most recent modification was the Environmental Resource Permit (ERP) modification No. 43001576.011 issued on April 15, 2019, which authorized the construction of two cemetery burial sections, one columbarium, and associated infrastructure as the Phase 5 Early Turnover project. The project area encompassed 7.57 acres of land in the northwest portion of the property.

2.0 Background Information Review

In September 2019, a review of background information was conducted for the Project Study Area and vicinity using readily available existing information from state and federal agency databases and published literature. The analysis was conducted to determine the presence and extent of biological and natural resources potentially occurring in the vicinity of the Project Study Area. The findings are presented in the following sections.

2.1 Physiography

The Project Study Area is located within the central Florida physiographic zone on the east edge of the Brooksville Ridge region and consists mostly of medium, fine sand and silt soils. The Brooksville Ridge is about 110 miles long and divided into two subequal parts by the valley of the Withlacoochee River at Dunnellon, Florida. The largest portion of the southern zone is approximately 60 miles long and varies between 10 and 15 miles wide. The northern portion is approximately 50 miles long and is between four and six miles wide. This region is typically above the piezometric surface. The elevations on the Brooksville Ridge vary in short distances from 70 to 200 feet. Little surface drainage occurs in this region, and the ground surface is comprised of sand a few feet thick and underlain with red clastic sediments of the Bone Valley and Alachua formations (FDNR 1970).

As stated in the 1983 Final EIS (VA 1983), the Florida National Cemetery is bordered on the west by the floodplain of the Withlacoochee River and on the east by an expansive system of lakes and prairies. The Ocala Limestone of Eocene Age is the uppermost rock unit found at the National Cemetery which is underlain by other limestone units to a depth of about 2,500 feet. Its surface is highly weathered, and the depth to the top of rock is quite variable. It is found at or just below land surface and is estimated to average about 12 feet below land surface over the entire property, including the Project Study Area. The karstic nature of the Ocala Limestone in the area is attested to by numerous sinkholes within this region. Residual clays lie atop the eroded surface of the Ocala Limestone, but may be breached by sinkholes, rock pinnacles, and erosional pinchouts. Soils and sandy overburden of variable thickness overlie the clay (VA 1983). The soils within the Project Study Area are characteristically well-drained sandy soils, (USDA-NRCS 2012).

2.2 Land Use and Vegetative Cover

Land use refers to the predominant use of a piece of land (e.g., agriculture, transportation, or residential). Land may be developed for use or remain undeveloped (e.g., a national park or conservation area) but still retain a land use classification. Vegetative cover refers to the predominant vegetative form of a developed or undeveloped piece of land (e.g., upland hardwood forest, bottomland swamp, or citrus grove). Together, land use and vegetative cover classifications describe landscapes within a particular area. In Florida, land use and vegetative cover types are commonly classified using the *Florida Land Use, Cover and Forms Classification System* (FLUCFCS) (FDOT, 1999). FLUCFCS is a uniform land classification system developed by the FDOT and is widely used by local, state, and federal agencies within Florida.

The Florida National Cemetery is located in a rural area and is bounded on the north by the Sumter Correctional Institute and on the northwest, west, and the south by the Withlacoochee State Forest. The southeast side is bordered by I-75 and by undeveloped lands. The land uses immediately adjacent to the National Cemetery are dominantly comprised of the Croom Wildlife Management Area tract of the Withlacoochee State Forest to the west, south, and north but also include low-density, rural residential and pastureland properties to the east. Other land uses in the surrounding area are predominantly mining, farming, ranching, and pine plantation, along with several publicly managed natural areas.

The presence and distribution of local vegetative communities is attributable to the socioeconomic development within the rural residential and agricultural landscape of Sumter County, Florida. Historically, vegetation in the Project Study Area was once pine flatwoods and xeric, longleaf pine communities that have changed over time due to historic logging practices.

2.3 Hydrology

The Project Study Area is located within the Withlacoochee River drainage basin (Hydrologic Unit Code (HUC) 03100208) as defined by the Florida Department of Environmental Protection (FDEP) (FDEP 2018).

2.4 Wetland Ecosystems

Wetlands within the region occur along the floodplains of the Withlacoochee River, its tributaries, and within depressions in the landscape that have formed over time due to the dissolution of the limestone subsurface; typical of the karstic geology of the region.

3.0 Environmental Setting

3.1 Soils

According to the United States Department of Agriculture Natural Resources Conservation Service (USDA-NRCS), 11 soil units are mapped as occurring within the project area (**Figure 3**). The areal distribution of the 11 soil map units is summarized below in **Table 1**:

Table 1: USDA-NRCS Soils Summary

Symbol	Soil Name, Description	Hydric / Not Hydric	Acreage
4	Candler Sand, 0 to 5 Percent Slopes	Not Hydric	7.28
5	Candler Sand, 5 to 8 Percent Slopes	Not Hydric	13.4
13	Tavares Fine Sand, 0 to 5 Percent Slopes	Not Hydric	8.59
18	Okeelanta Muck	Hydric	9.55
23	Ona-Ona, Wet, Fine Sand, 0 to 2 Percent Slopes	Not Hydric	4.82
27	Sumterville Fine Sand, Bouldery Subsurface, 0 to 5 Percent Slopes	Not Hydric	3.66
39	Mabel Fine Sand, Bouldery Subsurface, 0 to 5 Percent Slopes	Not Hydric	16.93
40	Millhopper Sand, Bouldery Subsurface, 0 to 5 Percent Slopes	Not Hydric	33.88
51	Pits-Dumps Complex	Unranked	6.41
65	Candler Sand, Bouldery Subsurface, 0 to 5 Percent Slopes	Not Hydric	0.97
99	Water	Unranked	2.16
		Total	**107.65**

The presence of hydric soils, along with hydrophytic vegetation and hydrologic indicators, are used to determine the presence and extent of wetlands in Florida. Hydric soils are present within the project area.

3.2 Land Use/Vegetative Cover

All vegetative habitats and land uses within the Project Study Area were classified using the FLUCFCS designations (FDOT 1999). A list of land use and vegetative cover types present within the Project Study Area is presented in **Table 2**. The land use and vegetative cover mapped within the Project Study Area are indicated in **Figure 4**.

Table 2: Land Cover Classifications

Classification Code	Land Cover Description	Acres
310	Herbaceous	0.33
434	Hardwood-Conifer Mixed	87.96
641	Freshwater Marsh	16.13
740	Disturbed Land	3.23
	Total	**107.65**

The Project Study Area is composed largely of hardwood-conifer mixed forest with a dense understory. The dominant vegetative species include laurel oak (*Quercus laurifolia*) and slash pine (*Pinus elliotttii*). Other vegetative species include cabbage palm (*Sabal palmetto*), water oak (*Quercus nigra*), red cedar (*Juniperus virginiana*), dogfennel (*Eupatorium* spp.), muscadine (*Vitis rotundifolia*), saw palmetto (*Serenoa repens*), tailed bracken (*Pteridium aquilinum*), partridge pea (*Chamaecrista fasciculata*), American pokeweed (*Phytolacca Americana*), common ragweed (*Ambrosia artemisiifolia*), and Johnsongrass (*Sorghum halepense*). Cogongrass (*Imperata cylindrica*), which is an invasive Category 1 plant species, as identified by the Florida Exotic Pest Plant Council (FLEPPC 2019), was observed throughout the Project Study Area along access roads, adjacent to the disturbed land depicted on Figure 4, and in a substantial patch northeast of the columbarium that is located just outside of the Project Study Area.

4.0 Wetlands and Other Surface Waters

Ecologists from AECOM performed a site review on September 18 and 19, 2019. During the site review, the landward extent of potentially jurisdictional wetlands and other surface waters were delineated based upon the presence of hydric soils, hydrologic indicators, and hydrophytic vegetation in accordance with the state and/or federal regulatory delineation criteria. The federal wetland delineation methodology is published in the United States Army Corps of Engineers' *Regional Supplement to the Army Corps of Engineers Wetlands Delineation Manual for the Atlantic and Gulf Coastal Plain* (USACE 2010). The State of Florida defines wetlands as those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soils (s. 373.019 Florida Statutes). Wetland delineation methodology is defined under Chapter 62-340.300(2) of the F.A.C.

<u>Wetland 1 (16.13 acres): Land Cover Code: 641</u>
One emergent freshwater marsh was identified within the Project Study Area. The edges of the freshwater marsh were dominated by maidencane (*Panicum hemitomon*) with bushy bluestem (*Andropogon glomeratus*), yelloweyed grass (*Xyris* sp.), umbrellasedge (*Fuirena* sp.), witchgrass (*Dichanthelium* sp.), spikerush (*Eleocharis* sp.), common persimmon (*Diospyros virginiana*), creeping primrosewillow (*Ludwigia repens*), bogbutton (*Lachnocaulon* sp.), and common buttonbush (*Cephalanthus occidentalis*). American white waterlily (*Nymphaea odorata*) and spatterdock (*Nuphar advena*) were observed in the deepest portions of the marsh. Carolina willow (*Salix caroliniana*) and broadleaf cattail (*Typha latifolia*) were observed near a stormwater conveyance ditch outfall. Soil saturation and hydric soil indicators were observed during the site review.

4.1 Applicable Wetland Regulations

The SWFWMD exercises regulatory jurisdiction over activities in wetlands in accordance with Chapter 62-330 of the Florida Administrative Code (F.A.C.) (F.A.C. 1994).

The USACE has regulatory jurisdiction over waters of the United States including wetlands pursuant to Section 404 of the Clean Water Act and Navigable Waters of the United States pursuant to Section 10 of the 1899 Rivers and Harbors Act. The wetland located within the Project Study Area may also fall under USACE jurisdiction due to connectivity to navigable waters via the stormwater conveyance ditch that drains into the wetland.

If expansion of the Florida National Cemetery includes development of the wetland within the Project Study Area, then an ERP modification will need to be obtained from SWFWMD and a permit may also be required from the USACE. Efficiently coordinate site inspections and permitting by conducting the following steps:

1. Prepare application materials for a formal request for a Preliminary Jurisdictional Determination with the USACE and an ERP modification with the SWFWMD.
2. Conduct a second site inspection with agency staff to verify the extent of wetlands. During the site inspection, the significant nexus rationale that enables the USACE to exert jurisdiction will be discussed.
3. Update the application materials to address revisions requested as a result of the inspection. The revised package will be submitted to the USACE and SWFWMD.

5.0 Listed Species Potentially in the Project Study Area

The ESA requires that all federal agencies undertake programs for the conservation of endangered and threatened species and prohibits federal agencies from authorizing, funding, or carrying out any action that would jeopardize a listed species or destroy or modify its critical habitat as designated in 50 CFR 17 and 226. Projects that would otherwise jeopardize a federally-listed species or impact its critical habitat must contain conservation measures or habitat mitigation that removes the jeopardy. State-listed species are those animal and plant species protected by the State of Florida pursuant to Chapter 68A-27 F.A.C. and Chapter 5B-40, F.A.C., respectively.

Plant species are listed by the Florida Department of Agriculture and Consumer Services (FDACS) as endangered, threatened, and commercially exploited. As defined by Chapter 581.185(2), Florida Statutes, “endangered plants" refers to species of plants native to the state that are in imminent danger of extinction within the state, and the survival of which is unlikely if the causes of a decline in the number of plants continue. “Threatened plants" refers to species native to the state that are in rapid decline in the number of plants within the state, but which have not so decreased in such number as to cause them to be endangered. "Commercially exploited plants" refers to species native to the state which are subject to being removed in significant numbers from native habitats in the state and sold or transported for sale (FDACS 2010).

Animal species may be classified as “endangered” when it is in danger of extinction within the foreseeable future throughout all or a significant portion of its range. A “threatened” classification is provided to those species likely to become endangered within the foreseeable future throughout all or a significant part of their ranges. The State of Florida also maintains a state list of endangered and threatened species and “species of special concern.” A species of special concern is a species that, although possibly relatively abundant and widespread in the state, is especially vulnerable to certain types of exploitation or environmental changes and have experienced long-term population declines.

Based on a review of available literature, online data sources, and field review, a total of two state-listed plant species and six state and/or federally-listed animal species have the potential to occur within the Project Study Area. Other species of concern that are not state- or federally-listed but are protected by state and/or federal law include the bald eagle and Florida black bear. Both the bald eagle and Florida black bear have the potential to occur within the Project Study Area. **Table 3** provides a summary of the listed and protected species with potential to occur within the Project Study Area. Each of these species is discussed in the following sections.

Table 3: Listed Species Potentially Occurring within Project Study Area

Scientific Name	Common Name	Federal Status	State Status
Plants			
Centrosema arenicola	sand butterfly pea	NL	E
Pteroglossaspis ecristata	giant orchid	NL	T

Scientific Name	Common Name	Federal Status	State Status
Reptiles			
Drymarchon couperi	eastern indigo snake	FT	FT
Gopherus polyphemus	gopher tortoise	C	T
Lampropeltis extenuata	short-tailed snake	NL	T
Pituophis melanoleucus	Florida pine Snake	NL	T
Birds			
Grus canadensis pratensis	Florida sandhill crane	NL	T
Mycteria americana	wood stork	FT	FT
Other Species of Concern			
Haliaeetus leucocephalus	bald eagle	NL	NL
Ursus americanus floridanus	Florida black bear	NL	NL

Note: F = Federal; T = Threatened; SSC = Species of Special Concern; E = Endangered; NL = Not Listed; C = Candidate

5.1 State-Listed Plant Species

The two state-listed plant species that have the potential to occur within the Project Study Area are the sand butterfly pea (*Centrosema arenicola*) and giant orchid (*Pteroglossaspis ecristata*). However, neither of these plant species have been reported by FNAI databases as occurring within one mile of the Project Study Area and none were observed within the Project Study Area during the field survey. If any of these species are found within the development portions within the Project Study Area in the future, coordination with the FDACS and/or the U.S. Fish and Wildlife Service (USFWS) would occur in advance of development. No federally-listed plant species have the potential to occur in the Project Study Area. Therefore, it is not anticipated that the proposed expansion project would adversely affect any listed plant species.

5.2 Federally-Listed Animal Species

Eastern Indigo Snake

The eastern indigo snake is listed as threatened by the USFWS. The indigo snake can be found in a variety of habitats including mesic flatwoods, swamps, wet prairies, xeric pinelands, and scrub areas. Based on review of FNAI data, the eastern indigo snake has been documented within Sumter County, but not within one mile of the Project Study Area. No eastern indigo snakes were observed during the field survey. While no eastern indigo snakes were observed during field surveys, suitable habitat for this species does exist within the Project Study Area. In an effort to reduce correspondence in effect determinations and responses, the USFWS has provided an *Eastern Indigo Snake Effect Determination Key* (updated in 2010). Using this key, the following steps were followed to determine the effect of the proposed expansion project on the indigo snake:

A. The project is not solely located in open water or salt marsh.
B. The permit authorizing the proposed expansion will be conditioned for use of the USFWS *Standard Protection Measures for the Eastern Indigo Snake* (**Appendix B**) during site preparation and project construction.
C. There are gopher tortoise burrows, holes, cavities, or other refugia where a snake could be buried or trapped and injured during project activities.
D. The project will impact less than 25 acres of eastern indigo snake habitat.

Based on this assessment, it has been determined that the proposed project "may affect, but not likely to adversely affect" the eastern indigo snake. In order to reduce the effect the project may have on the eastern indigo snake, it is recommended that VA incorporate the *Standard Protection Measures for the Eastern Indigo Snake* (Appendix B) during all construction phases of the project. In addition to this, excavation of possible underground refugia (i.e., gopher tortoise burrows) prior to construction is also an option.

Wood Stork

The wood stork typically nests in woody vegetation found within a variety of inundated forested wetlands, including cypress stands and domes, mixed hardwood swamps, sloughs, and mangroves. The species is also increasingly found in artificial habitats such as impoundments and dredged areas with native or exotic vegetation. Wood stork generally forages in shallow water in habitats such as freshwater marshes, lagoons, swamps, ponds, tidal creeks, and flooded pastures and ditches. Wood stork tends to seek out areas with reduced water levels where their prey is concentrated.

While no wood storks were observed during field surveys, suitable habitat for this species does exist within the Project Study Area. In an effort to reduce correspondence in effect determinations and responses, the USFWS has provided a *Wood Stork Effect Determination Key* (2010). The Project Study Area is located wood stork core foraging area. Therefore, if the project will impact less than 0.20 hectare (0.5 acre) of suitable foraging habitat, then the proposed project "may affect, but not likely to adversely affect" the wood stork. However, if the project will impact greater than 0.20 hectare (0.5 acre) of suitable foraging habitat, then the USFWS and the USACE require that any impacts to wetlands, which would eliminate a portion of the wood stork foraging habitat, be either mitigated through the purchase of mitigation credits or recreated elsewhere on-site so that there would be no net loss of wood stork foraging habitat.

Gopher Tortoise

The gopher tortoise is listed as threatened by the FWC and is a candidate for listing by the USFWS. The gopher tortoise requires well-drained, loose sandy soils for burrowing, and low-growing herbs and grasses for food. These conditions can be found in a number of habitats including dry prairies, pine flatwoods and disturbed or maintained sites such as roadsides.

A 100% survey of suitable gopher tortoise habitat was conducted on September 18 and 19, 2019 in accordance with the required methods listed in Appendix 4 of the Florida Fish and Wildlife Conservation Commission, *Gopher Tortoise Permitting Guidelines* (Revised January 2017). Six potentially occupied gopher tortoise burrows were observed within or adjacent to the Project Study Area during the field survey (**Figure 5**).

Suitable habitat within the proposed development area with the Project Study Area will need to be resurveyed prior to construction. Any gopher tortoises or burrows found in or within 25 feet of the proposed development area will require coordination with the FWC to secure permits needed to relocate the gopher tortoises and associated listed species prior to construction. See Section 4.3 for a detailed discussion of permitting, mitigation, and relocation parameters.

5.3 State-Listed Animal Species

Short-Tailed Snake and Florida Pine Snake

Both the short-tailed snake and Florida pine snake are listed by the FWC as threatened. These snakes typically inhabit dry upland habitats, typically sandhill, xeric hammock, and sand pine scrub. The pine snake often coexists with gopher tortoises and pocket gophers within suitable habitat. During the field survey, no snakes were observed within the Project Study Area. If a short-tailed snake or Florida pine snake is observed within the proposed project area prior to or during construction, coordination with FWC would occur to implement the proper conservation measures.

Florida Sandhill Crane

The Florida sandhill crane is listed by the FWC as threatened. The sandhill crane is associated with shallow freshwater areas, pasture and open woods habitats. Habitats such as wet and dry prairies, marshes, and marshy lake margins are optimum for the sandhill crane. During the field survey, no sandhill cranes or sandhill crane nests were observed within the Project Study Area. However, suitable habitat for the sandhill crane is available within the Project Study Area and the species is highly mobile and can utilize adjacent habitats. If there is evidence of nesting within the Project Study Area, then FWC recommends establishing a 400-foot buffer around the nest during the nesting season (late winter and spring) to limit impacts from construction activities.

5.4 Other Species of Concern

Bald Eagle

Though the bald eagle is no longer state or federally listed, it is still federally protected by the Bald and Golden Eagle Protection Act in accordance with 16 United States Code 668. The bald eagle typically uses riparian habitat associated with coastal areas, lake shorelines, and river banks. The nests are generally located near bodies of water that provide a dependable food source. As stated in the 1983 EIS, the bald eagle may occasionally forage within the vicinity and is commonly observed along the Withlacoochee River. According to the FWC's online bald eagle nest locater, no nests are located within one mile of the Project Study Area and none were observed during the field survey. For these reasons, it is not anticipated that the proposed expansion project would adversely affect the bald eagle. Pursuant to FWC bald eagle guidelines, any disturbance within 660 feet of a bald eagle nest requires additional coordination and potential permitting with the FWC.

Florida Black Bear

Although the Florida black bear has been removed from the state list, it is still protected and managed by the FWC pursuant to the Florida Black Bear Conservation Rule 68A-4.009, F.A.C. The Florida black bear can be found statewide in a number of habitats including mixed hardwood pine communities, cabbage palm hammock and forested wetland systems. This species tends to den alone within tree cavities, river banks, logs or caves. They will also seek shelter on the ground in palmetto thickets, gallberry (*Ilex glabra*), fetterbush (*Lyonia lucida*), and sweet pepperbush (*Clethra alnifolia)*. Suitable habitat for the black bear is available within the Project Study Area. However, according to FWC, the Project Study Area is not located within the FWC-designated Primary or Secondary Florida black bear range. No black bears were observed within the Project Study Area during the field survey. For these reasons, it is not anticipated that the proposed expansion project would adversely affect the Florida black bear.

5.5 Gopher Tortoise Permitting, Mitigation, and Relocation

The primary threat to the gopher tortoise is habitat fragmentation, destruction, and modification (either deliberately or from inattention), including conversion of longleaf pine forests to other silvicultural or agricultural habitats, urbanization, shrub/hardwood encroachment (mainly from fire exclusion or insufficient fire management), and establishment and spread of invasive species. Other threats include disease, predation (mainly on nests and young tortoises), and inadequate regulatory mechanisms, specifically those needed to protect and enhance relocated tortoise populations in perpetuity. The magnitude of threats to the eastern range of the gopher tortoise is moderate to low, as populations extend over a broad geographic area and conservation measures are in place in some areas (Department of the Interior, 2012).

Six potentially occupied gopher tortoise burrows were observed within and adjacent to the Project Study Area (Figure 5), therefore in order to develop in these areas, gopher tortoise burrows will either need to be avoided with a minimum 25-foot radius buffer, or the tortoises will require relocation. The FWC, through Chapter 68 of the F.A.C., regulates activities that may affect the state-listed gopher tortoise. An FWC permit is required for land development activities (including site preparation for such activities) that result in potential impacts to gopher tortoises or their burrows.

Conservation Permit and 10 or Fewer Burrows Permit

A Conservation Permit is available for development projects that require the relocation of gopher tortoises when 10 or more burrows occur on the development site. The 10 or Fewer Burrows Permit may be used for projects that contain 10 or fewer gopher tortoise burrows on the development site. Both of these permits allow for relocation on-site or off-site to a FWC-approved Recipient Site. Both permits, with a mitigation contribution commensurate with the level and duration of habitat protection and management provided by the recipient site to sustain gopher tortoises, will be required to develop the Project Study Area.

Conservation permits issued for tortoises relocated to a long-term protected recipient site require a $217 contribution for the first group of ten burrows (up to five tortoises) and a $326 contribution per tortoise

thereafter (in addition to the costs of accepting the tortoises at the permitted recipient site). Gopher tortoise mitigation contributions must be submitted to FWC before the final permit will be issued. If the actual number of gopher tortoises relocated is less than the number estimated, a refund of any excess funds paid will be made to the permittee. Recipient sites may be situated any distance east or west of the donor site, but no more than 100 miles north or south of the donor site unless no such recipient site is available. A reservation letter from a permitted recipient site is required as part of the gopher tortoise relocation permit application. Recipient site prices are market driven and typically range between $700 and $1,000 per tortoise. Payment to the recipient site typically occurs after the relocation is complete.

Table 4: Gopher Tortoise Permitting Cost Summary

Permit Type	Mitigation Contribution
10 or Fewer Burrows	$217
Conservation Permit	$217 for the first group of 10 burrows (up to 5 tortoises), $326 each additional tortoise
Relocation Type	**Additional Fee Per tortoise**
Conservation Permit with Off-Site Relocation	Average $700-$1,000 per tortoise

Permitting and Relocation Process

Surveys prior to construction

Gopher tortoises are somewhat mobile and may excavate new burrows or re-excavate abandoned burrows throughout the year. Therefore, a survey of at least 15% of the suitable (potentially occupied) gopher tortoise habitat must be conducted within 90 days of initiation of construction of any portion of the project area (including staging areas for heavy equipment). This survey should be conducted with sufficient time to permit gopher tortoise relocations. Surveys are valid for up to 90 days for use in a permit application. Once the surveys are complete, it typically takes 90-120 days to apply for, and receive a Conservation/10 or Fewer Burrows Permit authorizing the excavation and translocation of gopher tortoises off-site to a permitted recipient site. Once issued, Conservation/10 or Fewer Burrows Permit are valid for six months.

Timing of tortoise excavation

The excavation and relocation of gopher tortoises should be scheduled to occur after an erosion control (silt fence) is installed around the construction site to identify the exact limits of staging and construction activities and to prevent tortoises from reoccupying the site prior to site preparation activities. Gopher tortoises can be excavated and relocated at any time while the permit is valid. However, gopher tortoises may only be excavated and/or relocated when the low temperature at the recipient site is forecasted by the National Weather Service (www.nws.noaa.gov) to be above 50˚ Fahrenheit (F) for three consecutive days after release (including the day of relocation). Temperatures below 50˚ F are not frequent in central Florida, but occur regularly enough (December through March) to warrant extra scheduling considerations since relocations must be performed before site preparation activities can commence.

Conducting the final, 100% site survey

After the Conservation Permit is received, a comprehensive, 100% survey of all suitable habitat proposed for development must be conducted no more than 90 days prior to, and no fewer than 72 hours before (excluding weekends and holidays) before commencing gopher tortoise capture and relocation activities. To effectively locate all potentially occupied gopher tortoise burrows and provide FWC staff the opportunity to check the surveys, the burrow location map from the 100% surveys must be received by FWC at least 72 hours (excluding weekends and holidays) before gopher tortoise capture and relocation activities begin. The FWC has the opportunity to request an

on-site survey inspection within 48 hours (excluding weekends and holidays) of receipt of the burrow location map from the 100% survey. Once the inspection is complete or the 48 hours have elapsed, the relocation can commence.

Relocation protocol

Gopher tortoises excavated from the donor site must be released at the recipient site by either releasing them near existing abandoned burrows or hand digging starter burrows for each tortoise. An "After Action" report is required to be submitted to the FWC documenting the number of burrows excavated and the size, sex, and number of gopher tortoises relocated.

Suggested timeline for surveying and permitting tortoises

Efficiently coordinate surveys, permitting, and relocation of listed species prior to site clearing activities by conducting the following steps:

1. Approximately four months prior to construction (site preparation), conduct a minimum of a 15% survey of the phase of the project that is proposed for construction to calculate the estimated tortoise population to be permitted for relocation.
2. Using the estimated tortoise population, compile and submit a relocation permit application to the FWC, obtain a reservation letter for a recipient site and pay the conservation fee for the number of tortoises anticipated for relocation.
3. After the erosion control measures are sufficiently in place to properly secure the site, perform a survey of 100% of the suitable habitat on-site to identify the exact number of burrows to be excavated.
4. Submit the results of the 100% survey to the FWC at least 72 business hours before starting the relocation to allow them the opportunity to review the site and verify the accuracy of the surveys prior to the excavations.
5. Mobilize a relocation team which consists of an FWC Authorized Agent and an experienced backhoe operator to excavate all of the burrows from the phase of development prior to site clearing.
6. Transport the recovered tortoises to the permitted recipient site.
7. Submit an "After Action" report to the FWC that documents the number and sizes of gopher tortoises actually excavated and relocated to the permitted recipient site. The final Conservation Fee and recipient site fees will be based on the number of tortoises (greater than 130 cm) that were actually relocated. The FWC and the recipient site will adjust the required fees commensurate with the captured population on the donor site.

5.6 Critical Habitat

The Project Study Area was assessed for the occurrence of Critical Habitat as defined by 17 CFR 35.1532. No federally-designated Critical Habitat occurs within the Project Study Area for any federally-listed species.

5.7 Commitments

Based on field and literature reviews, federally- and/or state-listed species have the potential to occur within the Project Study Area. In order to minimize adverse impacts to these species, the following commitments will be implemented:

1) Prior to construction, survey appropriate habitats for sand butterfly pea and giant orchid via pedestrian transects. If any are found within proposed project area, coordination with FDACS and/or USFWS will occur.
2) Implement the most recent version of USFWS' *Standard Protection Measures for the Eastern Indigo Snake* (Appendix A) during all construction phases of the project.
3) Prior to construction, survey appropriate habitats within the project area to determine the presence of gopher tortoises and gopher tortoise commensal species. If burrows are observed within 25 feet of the

proposed footprint of development, coordination with the FWC will occur to obtain the appropriate relocation/excavation authorization.

4) Prior to construction, survey appropriate habitats within the project area for bald eagle and sandhill crane nests. If present, coordination with the FWC and/or USFWS will occur.

6.0 Summary

A field survey of the Project Study Area was conducted on September 18 and 19, 2019 to evaluate the presence of wetlands and other surface waters and state- and federally-listed species habitat. One freshwater marsh was delineated in accordance with the state and/or federal regulatory delineation criteria. In addition, six gopher tortoise burrows were identified within and adjacent to the Project Study Area. Other state- and federally-listed species were identified as having the potential to occur within the Project Study Area. However, based on the findings and commitments, a preliminary determination has been made that the proposed project is not likely to adversely affect any state- or federally-listed plant or animal species. Permitting and mitigation will be required if the proposed expansion includes impacts to wetlands and listed species.

7.0 References

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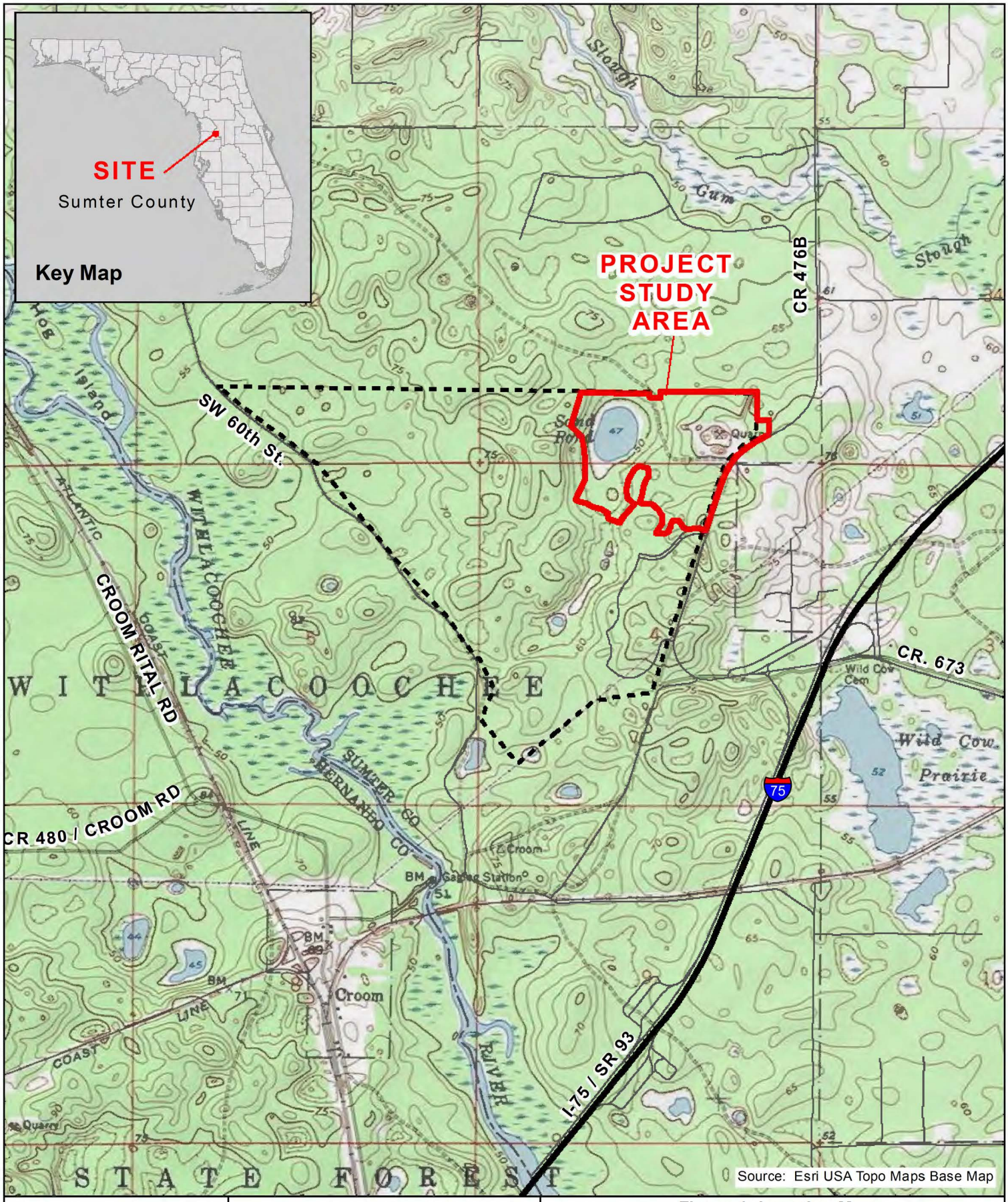
FIGURES



AECOM

0 2,000 Feet

1 inch = 2,000 feet

Legend

Project Study Area

Florida National Cemetery - Bushnell

Sections 33 - Township 21 South - Range 21 East
Sections 4 - Township 22 South - Range 21 East

Figure 1: Location Map

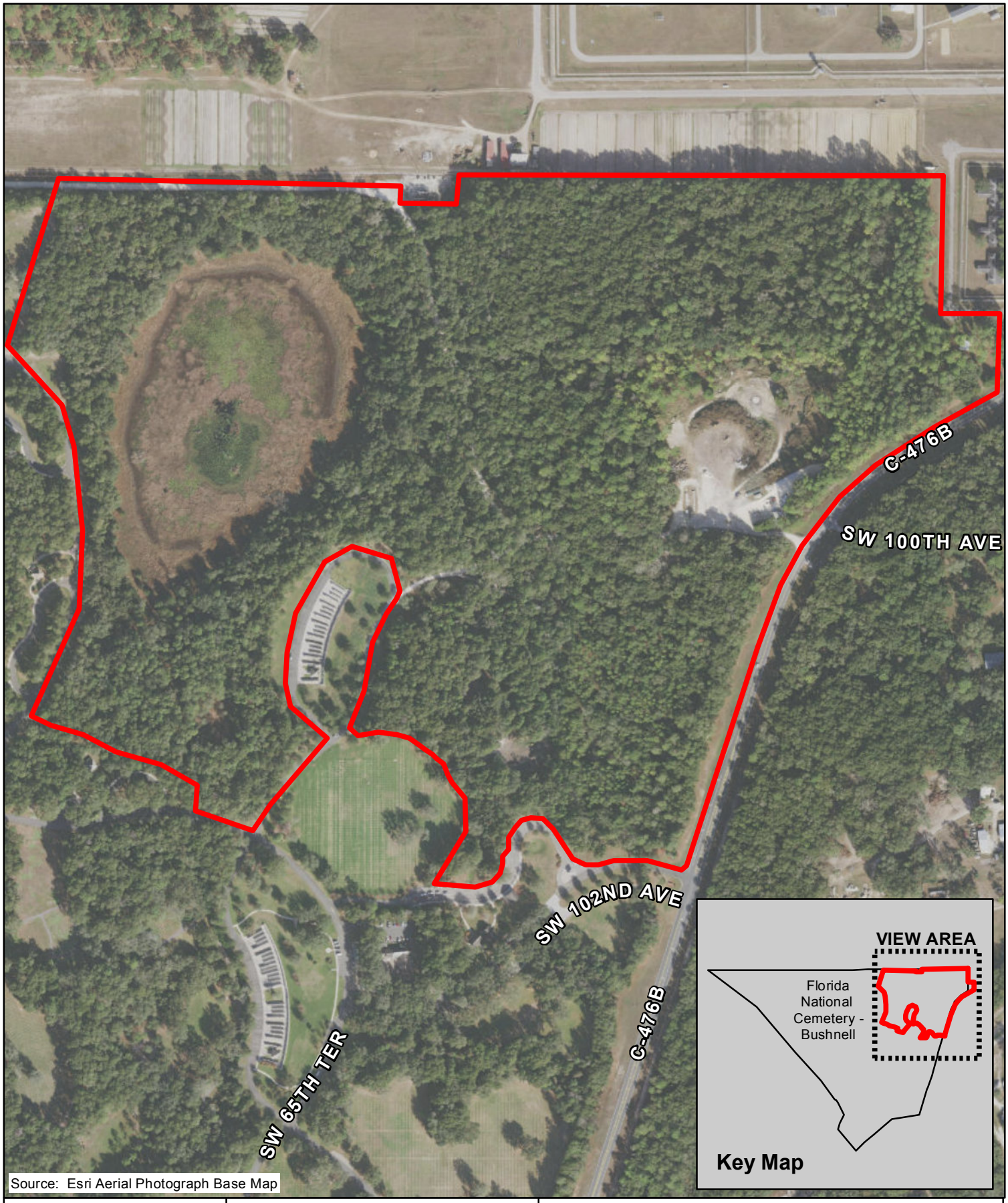
Wetlands and Endangered Species Biological Assessment

U.S. Department of Veterans Affairs

Florida National Cemetery: Bushnell

6502 SW 102nd Ave, Bushnell, FL 33513 (Sumter County)

Document Path: P:\DCS\Projects\ENV\60536161_VAFNC\900-CAD-GIS\920-GIS or Graphics\MXD\Expansion_100ac\WetlandsAndEndangeredSpeciesBiologicalAssessment_Figures_2019_10\FNCExp_WESBA_Fig1_LocationMap.mxd



Source: Esri Aerial Photograph Base Map

AECOM

N

0 400 Feet

1 inch = 400 feet

Legend

Project Study Area (107.65 acres)

Sections 33 - Township 21 South - Range 21 East
Sections 4 - Township 22 South - Range 21 East

Figure 2: Aerial Photograph
Wetlands and Endangered Species Biological Assessment
U.S. Department of Veterans Affairs
Florida National Cemetery: Bushnell
6502 SW 102nd Ave, Bushnell, FL 33513 (Sumter County)

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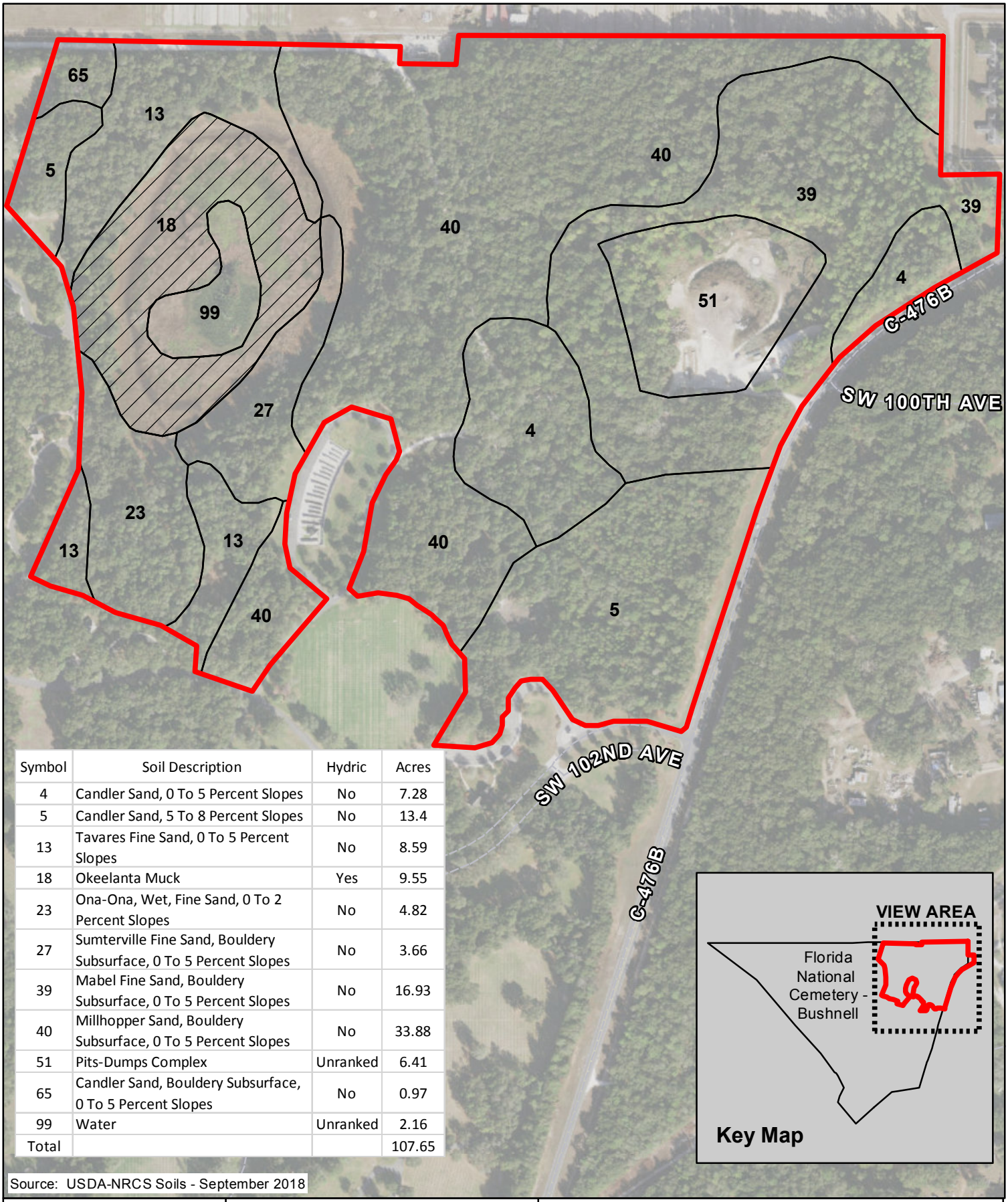

Symbol	Soil Description	Hydric	Acres
4	Candler Sand, 0 To 5 Percent Slopes	No	7.28
5	Candler Sand, 5 To 8 Percent Slopes	No	13.4
13	Tavares Fine Sand, 0 To 5 Percent Slopes	No	8.59
18	Okeelanta Muck	Yes	9.55
23	Ona-Ona, Wet, Fine Sand, 0 To 2 Percent Slopes	No	4.82
27	Sumterville Fine Sand, Bouldery Subsurface, 0 To 5 Percent Slopes	No	3.66
39	Mabel Fine Sand, Bouldery Subsurface, 0 To 5 Percent Slopes	No	16.93
40	Millhopper Sand, Bouldery Subsurface, 0 To 5 Percent Slopes	No	33.88
51	Pits-Dumps Complex	Unranked	6.41
65	Candler Sand, Bouldery Subsurface, 0 To 5 Percent Slopes	No	0.97
99	Water	Unranked	2.16
Total			107.65

Source: USDA-NRCS Soils - September 2018

AECOM

N

0 400 Feet

1 inch = 400 feet

Legend

Project Study Area (107.65 acres)

USDA-NRCS Soil

Hydric Soil

Sections 33 - Township 21 South - Range 21 East
Sections 4 - Township 22 South - Range 21 East

Figure 3: USDA-NRCS Soils

Wetlands and Endangered Species Biological Assessment

U.S. Department of Veterans Affairs

Florida National Cemetery: Bushnell

6502 SW 102nd Ave, Bushnell, FL 33513 (Sumter County)

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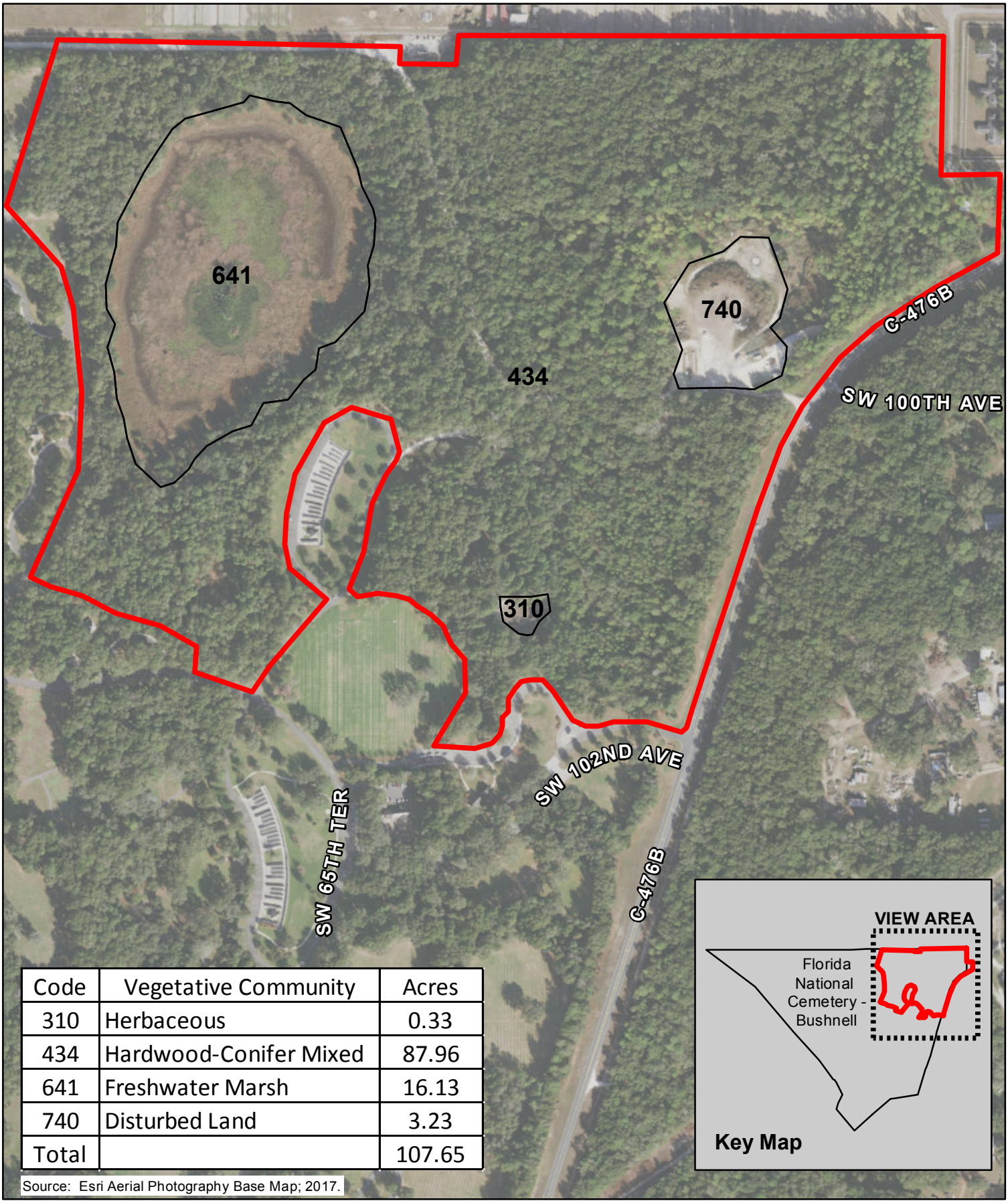


Code	Vegetative Community	Acres
310	Herbaceous	0.33
434	Hardwood-Conifer Mixed	87.96
641	Freshwater Marsh	16.13
740	Disturbed Land	3.23
Total		107.65

Source: Esri Aerial Photography Base Map; 2017.

AECOM

N

0 400 Feet

1 inch = 400 feet

Legend

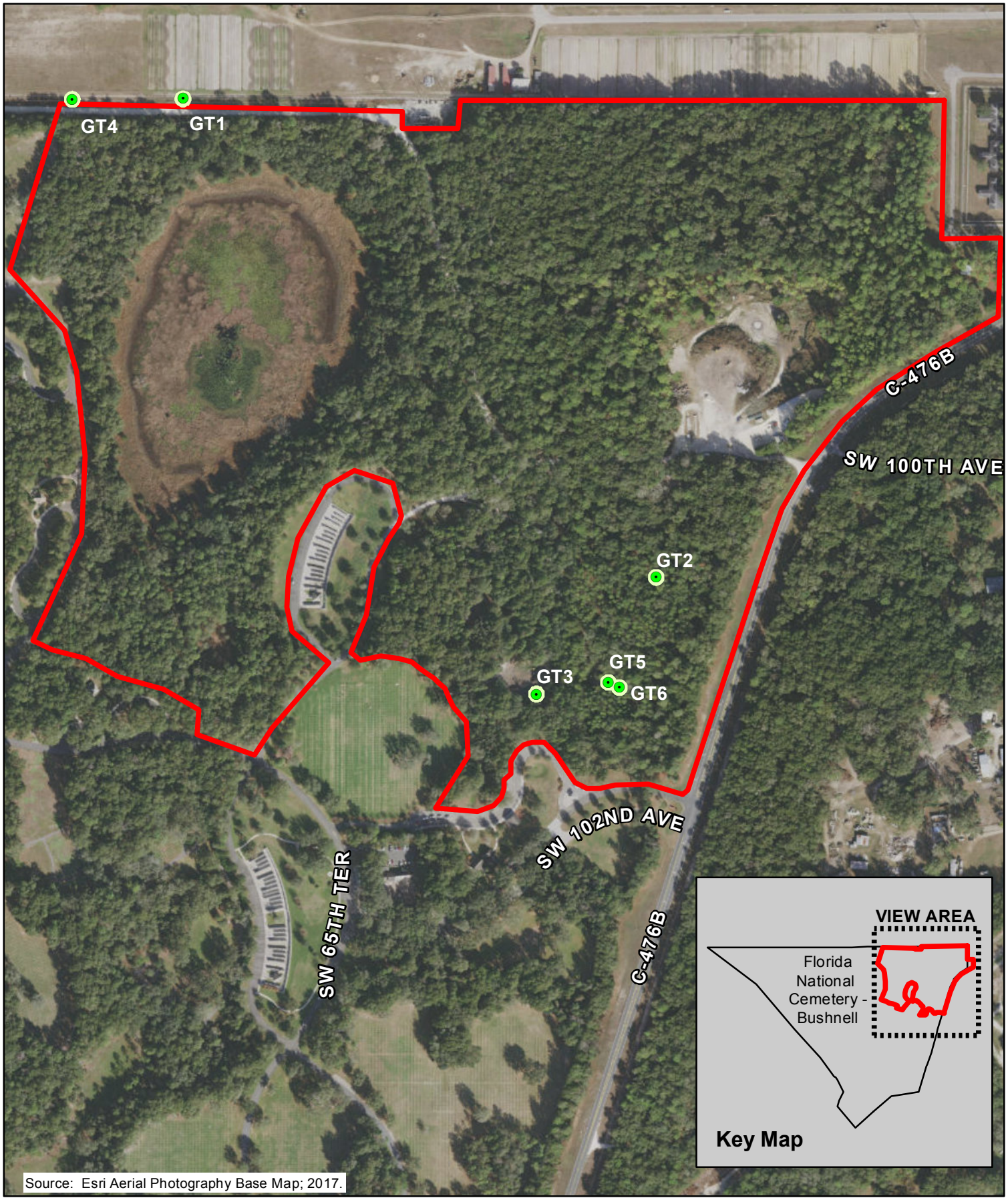
Project Study Area (107.65 acres)

Vegetative Communities

Sections 33 - Township 21 South - Range 21 East
Sections 4 - Township 22 South - Range 21 East

Figure 4: Vegetative Communities
Wetlands and Endangered Species Biological Assessment
U.S. Department of Veterans Affairs
Florida National Cemetery: Bushnell
6502 SW 102nd Ave, Bushnell, FL 33513 (Sumter County)

Document Path: P:\DCS\Projects\ENV\60536161_VAFNC\900-CAD-GIS\920-GIS or Graphics\MXD\Expansion_100ac\WetlandsAndEndangeredSpeciesBiologicalAssessment_Figures_2019_10\FNCExp_WESBA_Fig4_Vegetative_Communities.mxd



Source: Esri Aerial Photography Base Map; 2017.

AECOM

N

0 400 Feet

1 inch = 400 feet

Legend

Project Study Area (107.65 acres)

Potentially Occupied Gopher Tortoise Burrows and 25' Buffer (9/19/19)bb

Sections 33 - Township 21 South - Range 21 East
Sections 4 - Township 22 South - Range 21 East

Figure 5: Gopher Tortoise Burrows
Wetlands and Endangered Species Biological Assessment
U.S. Department of Veterans Affairs
Florida National Cemetery: Bushnell
6502 SW 102nd Ave, Bushnell, FL 33513 (Sumter County)

Document Path: P:\DCS\Projects\ENV\60536161_VAFNC\900-CAD-GIS\920-GIS or Graphics\MXD\Expansion_100ac\WetlandsAndEndangeredSpeciesBiologicalAssessment_Figures_2019_10\FNCExp_WESBA_Fig5_Gopher_Tortoise_Burrows.mxd

APPENDICES

APPENDIX A

USACE Wetland Determination Data Forms

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Florida National Cemetery City/County: Bushnell Sampling Date: 2019-09-18

Applicant/Owner: VA State: Florida Sampling Point: Wetland 1

Investigator(s): KJS, BB Section, Township, Range: 33, 22S, 21E

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): LRR U Lat: 28.612427 Long: -82.211941 Datum: WGS 84

Soil Map Unit Name: Millhopper Sand, Bouldery Substratum, 0-5% slope NWI classification: PEM

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	**Is the Sampled Area within a Wetland?** **Yes ✓ No _____**
Hydric Soil Present?	Yes ✓	No _____	
Wetland Hydrology Present?	Yes ✓	No _____	

Remarks:
Hog rooting near edge present but insignificant

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☑ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) **(LRR U)**
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) **(LRR T, U)**

Field Observations:

Surface Water Present?	Yes _____	No _____	Depth (inches): _____
Water Table Present?	Yes _____	No _____	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No _____	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No _____

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Wetland 1

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Quercus nigra	10	✓	FAC
2. Quercus laurifolia	25	✓	FACW
3. Pinus elliottii	10	✓	FACW
4.			
5.			
6.			
7.			
8.			
	45% = Total Cover		
50% of total cover: 23	20% of total cover: 9		

Sapling/Shrub Stratum (Plot size: 30' radius)			
1. Quercus laurifolia	5	✓	FACW
2. Serenoa repens	5	✓	FACU
3.			
4.			
5.			
6.			
7.			
8.			
	10% = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Herb Stratum (Plot size: 30' radius)			
1. Panicum hemitomon	25	✓	OBL
2. Dichanthelium Erectifolium	25	✓	OBL
3. Euthamia Gramifolia	10		FAC
4. Eupatorium capillifolium	10		FACU
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	70% = Total Cover		
50% of total cover: 35	20% of total cover: 14		

Woody Vine Stratum (Plot size: 30' radius)			
1. Vitis rotundifolia	10	✓	FAC
2.			
3.			
4.			
5.			
	10% = Total Cover		
50% of total cover: 5	20% of total cover: 2		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 7 (A)

Total Number of Dominant Species Across All Strata: 8 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 88 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	50	x 1 =	50
FACW species	40	x 2 =	80
FAC species	30	x 3 =	90
FACU species	15	x 4 =	60
UPL species	0	x 5 =	0
Column Totals:	135 (A)		280 (B)

Prevalence Index = B/A = 2.1

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: Wetland 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0 - 2	10YR2/1	100					Loamy sand	
2 - 10	10YR5/1	100					Sand	
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☑ Organic Bodies (A6) (LRR P, T, U)
- ☐ 5 cm Mucky Mineral (A7) (LRR P, T, U)
- ☐ Muck Presence (A8) (LRR U)
- ☐ 1 cm Muck (A9) (LRR P, T)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) (MLRA 150A)
- ☐ Sandy Mucky Mineral (S1) (LRR O, S)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (LRR P, S, T, U)
- ☐ Polyvalue Below Surface (S8) (LRR S, T, U)
- ☐ Thin Dark Surface (S9) (LRR S, T, U)
- ☐ Loamy Mucky Mineral (F1) (LRR O)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) (LRR U)
- ☐ Depleted Ochric (F11) (MLRA 151)
- ☐ Iron-Manganese Masses (F12) (LRR O, P, T)
- ☐ Umbric Surface (F13) (LRR P, T, U)
- ☐ Delta Ochric (F17) (MLRA 151)
- ☐ Reduced Vertic (F18) (MLRA 150A, 150B)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149A)
- ☐ Anomalous Bright Loamy Soils (F20) (MLRA 149A, 153C, 153D)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) (LRR O)
- ☐ 2 cm Muck (A10) (LRR S)
- ☐ Reduced Vertic (F18) (outside MLRA 150A,B)
- ☐ Piedmont Floodplain Soils (F19) (LRR P, S, T)
- ☐ Anomalous Bright Loamy Soils (F20) (MLRA 153B)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes ✓ No ____

Remarks:

Environmental Site Photos

Project Name:	Florida National Cemetery Expansion
Sampling Point:	W1-1W
Photo 1 of 4	**Date of Site Visit:** September 18, 2019 **County / State:** Sumter County, FL **Photo Direction:** ☒N ☐S ☐E ☐W
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View facing north inside of Wetland 1.	
Photo 2 of 4	**Date of Site Visit:** September 18, 2019 **County / State:** Sumter County, FL **Photo Direction:** ☐N ☐S ☒E ☐W
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View facing east inside of Wetland 1.	

Environmental Site Photos

Project Name:	Florida National Cemetery Expansion
Sampling Point:	W1-1W
Photo 3 of 4	**Date of Site Visit:** September 18, 2019 **County / State:** Sumter County, FL **Photo Direction:** ☐N ☒S ☐E ☐W
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View facing south inside of Wetland 1.	
Photo 4 of 4	**Date of Site Visit:** September 18, 2019 **County / State:** Sumter County, FL **Photo Direction:** ☐N ☐S ☐E ☒W
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View facing west inside of Wetland 1.	

Environmental Site Photos

Project Name:	Florida National Cemetery Expansion
Sampling Point:	W1-1W
Photo 1 of 4	**Date of Site Visit**: September 18, 2019
	County / State: Sumter County, FL
	Photo Direction: Downward
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View of soils inside of Wetland 1.	

WETLAND DETERMINATION DATA FORM – Atlantic and Gulf Coastal Plain Region

Project/Site: Florida National Cemetery City/County: Bushnell Sampling Date: 2019-09-18

Applicant/Owner: VA State: Florida Sampling Point: Upland 1

Investigator(s): KJS, BB Section, Township, Range: 33, 21S, 21E

Landform (hillslope, terrace, etc.): _____ Local relief (concave, convex, none): _____ Slope (%): _____

Subregion (LRR or MLRA): LRR U Lat: 28.585938 Long: -82.221564 Datum: WGS 84

Soil Map Unit Name: Millhopper Sand, Bouldery Substratum, 0-5% slope NWI classification: _____

Are climatic / hydrologic conditions on the site typical for this time of year? Yes ✓ No _____ (If no, explain in Remarks.)

Are Vegetation _____, Soil _____, or Hydrology _____ significantly disturbed? Are "Normal Circumstances" present? Yes ✓ No _____

Are Vegetation _____, Soil _____, or Hydrology _____ naturally problematic? (If needed, explain any answers in Remarks.)

SUMMARY OF FINDINGS – Attach site map showing sampling point locations, transects, important features, etc.

Hydrophytic Vegetation Present?	Yes ✓	No _____	Is the Sampled Area within a Wetland? Yes _____ No ✓
Hydric Soil Present?	Yes _____	No ✓	
Wetland Hydrology Present?	Yes _____	No ✓	

Remarks:

HYDROLOGY

Wetland Hydrology Indicators:

Primary Indicators (minimum of one is required; check all that apply)

- ☐ Surface Water (A1)
- ☐ High Water Table (A2)
- ☐ Saturation (A3)
- ☐ Water Marks (B1)
- ☐ Sediment Deposits (B2)
- ☐ Drift Deposits (B3)
- ☐ Algal Mat or Crust (B4)
- ☐ Iron Deposits (B5)
- ☐ Inundation Visible on Aerial Imagery (B7)
- ☐ Water-Stained Leaves (B9)
- ☐ Aquatic Fauna (B13)
- ☐ Marl Deposits (B15) (LRR U)
- ☐ Hydrogen Sulfide Odor (C1)
- ☐ Oxidized Rhizospheres along Living Roots (C3)
- ☐ Presence of Reduced Iron (C4)
- ☐ Recent Iron Reduction in Tilled Soils (C6)
- ☐ Thin Muck Surface (C7)
- ☐ Other (Explain in Remarks)

Secondary Indicators (minimum of two required)

- ☐ Surface Soil Cracks (B6)
- ☐ Sparsely Vegetated Concave Surface (B8)
- ☐ Drainage Patterns (B10)
- ☐ Moss Trim Lines (B16)
- ☐ Dry-Season Water Table (C2)
- ☐ Crayfish Burrows (C8)
- ☐ Saturation Visible on Aerial Imagery (C9)
- ☐ Geomorphic Position (D2)
- ☐ Shallow Aquitard (D3)
- ☑ FAC-Neutral Test (D5)
- ☐ Sphagnum moss (D8) (LRR T, U)

Field Observations:

Surface Water Present?	Yes _____	No ✓	Depth (inches): _____
Water Table Present?	Yes _____	No ✓	Depth (inches): _____
Saturation Present? (includes capillary fringe)	Yes _____	No ✓	Depth (inches): _____

Wetland Hydrology Present? Yes _____ No ✓

Describe Recorded Data (stream gauge, monitoring well, aerial photos, previous inspections), if available:

Remarks:

VEGETATION (Four Strata) – Use scientific names of plants.

Sampling Point: Upland 1

Tree Stratum (Plot size: 30' radius)	Absolute % Cover	Dominant Species?	Indicator Status
1. Pinus elliottii	20	✓	FACW
2. Quercus nigra	25	✓	FAC
3.			
4.			
5.			
6.			
7.			
8.			
	45% = Total Cover		
50% of total cover: 23	20% of total cover: 9		

Sapling/Shrub Stratum (Plot size: 30' radius)			
1. Serenoa repens	10	✓	FAC
2. Disopyros virginiana	25	✓	FAC
3. Quercus nigra	10	✓	FAC
4.			
5.			
6.			
7.			
8.			
	45% = Total Cover		
50% of total cover: 23	20% of total cover: 9		

Herb Stratum (Plot size: 30' radius)			
1. Vitis rotundifolia	50	✓	FAC
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
	50% = Total Cover		
50% of total cover: 25	20% of total cover: 10		

Woody Vine Stratum (Plot size: 30' radius)			
1.			
2.			
3.			
4.			
5.			
	= Total Cover		
50% of total cover:	20% of total cover:		

Dominance Test worksheet:

Number of Dominant Species That Are OBL, FACW, or FAC: 6 (A)

Total Number of Dominant Species Across All Strata: 6 (B)

Percent of Dominant Species That Are OBL, FACW, or FAC: 100 (A/B)

Prevalence Index worksheet:

Total % Cover of:		Multiply by:	
OBL species	0	x 1 =	0
FACW species	20	x 2 =	40
FAC species	120	x 3 =	360
FACU species	0	x 4 =	0
UPL species	0	x 5 =	0
Column Totals:	140 (A)		400 (B)

Prevalence Index = B/A = 2.9

Hydrophytic Vegetation Indicators:

- ☐ 1 - Rapid Test for Hydrophytic Vegetation
- ☑ 2 - Dominance Test is >50%
- ☑ 3 - Prevalence Index is ≤3.0[1]
- ☐ Problematic Hydrophytic Vegetation[1] (Explain)

[1]Indicators of hydric soil and wetland hydrology must be present, unless disturbed or problematic.

Definitions of Four Vegetation Strata:

Tree – Woody plants, excluding vines, 3 in. (7.6 cm) or more in diameter at breast height (DBH), regardless of height.

Sapling/Shrub – Woody plants, excluding vines, less than 3 in. DBH and greater than 3.28 ft (1 m) tall.

Herb – All herbaceous (non-woody) plants, regardless of size, and woody plants less than 3.28 ft tall.

Woody vine – All woody vines greater than 3.28 ft in height.

Hydrophytic Vegetation Present? Yes ✓ No ____

Remarks: (If observed, list morphological adaptations below).

SOIL

Sampling Point: Upland 1

Profile Description: (Describe to the depth needed to document the indicator or confirm the absence of indicators.)

Depth (inches)	Matrix Color (moist)	Matrix %	Redox Features Color (moist)	Redox %	Type[1]	Loc[2]	Texture	Remarks
0 - 10	10YR5/1	100					Sand	
-								
-								
-								
-								
-								
-								

[1]Type: C=Concentration, D=Depletion, RM=Reduced Matrix, MS=Masked Sand Grains. [2]Location: PL=Pore Lining, M=Matrix.

Hydric Soil Indicators: (Applicable to all LRRs, unless otherwise noted.)

- ☐ Histosol (A1)
- ☐ Histic Epipedon (A2)
- ☐ Black Histic (A3)
- ☐ Hydrogen Sulfide (A4)
- ☐ Stratified Layers (A5)
- ☐ Organic Bodies (A6) (LRR P, T, U)
- ☐ 5 cm Mucky Mineral (A7) (LRR P, T, U)
- ☐ Muck Presence (A8) (LRR U)
- ☐ 1 cm Muck (A9) (LRR P, T)
- ☐ Depleted Below Dark Surface (A11)
- ☐ Thick Dark Surface (A12)
- ☐ Coast Prairie Redox (A16) (MLRA 150A)
- ☐ Sandy Mucky Mineral (S1) (LRR O, S)
- ☐ Sandy Gleyed Matrix (S4)
- ☐ Sandy Redox (S5)
- ☐ Stripped Matrix (S6)
- ☐ Dark Surface (S7) (LRR P, S, T, U)
- ☐ Polyvalue Below Surface (S8) (LRR S, T, U)
- ☐ Thin Dark Surface (S9) (LRR S, T, U)
- ☐ Loamy Mucky Mineral (F1) (LRR O)
- ☐ Loamy Gleyed Matrix (F2)
- ☐ Depleted Matrix (F3)
- ☐ Redox Dark Surface (F6)
- ☐ Depleted Dark Surface (F7)
- ☐ Redox Depressions (F8)
- ☐ Marl (F10) (LRR U)
- ☐ Depleted Ochric (F11) (MLRA 151)
- ☐ Iron-Manganese Masses (F12) (LRR O, P, T)
- ☐ Umbric Surface (F13) (LRR P, T, U)
- ☐ Delta Ochric (F17) (MLRA 151)
- ☐ Reduced Vertic (F18) (MLRA 150A, 150B)
- ☐ Piedmont Floodplain Soils (F19) (MLRA 149A)
- ☐ Anomalous Bright Loamy Soils (F20) (MLRA 149A, 153C, 153D)

Indicators for Problematic Hydric Soils[3]:

- ☐ 1 cm Muck (A9) (LRR O)
- ☐ 2 cm Muck (A10) (LRR S)
- ☐ Reduced Vertic (F18) (outside MLRA 150A,B)
- ☐ Piedmont Floodplain Soils (F19) (LRR P, S, T)
- ☐ Anomalous Bright Loamy Soils (F20) (MLRA 153B)
- ☐ Red Parent Material (TF2)
- ☐ Very Shallow Dark Surface (TF12)
- ☐ Other (Explain in Remarks)

[3]Indicators of hydrophytic vegetation and wetland hydrology must be present, unless disturbed or problematic.

Restrictive Layer (if observed):

Type: _____

Depth (inches): _____

Hydric Soil Present? Yes _____ No ✓

Remarks:

Environmental Site Photos

Project Name:	Florida National Cemetery Expansion
Sampling Point:	W1-1U
Photo 1 of 4	**Date of Site Visit:** September 18, 2019 **County / State:** Sumter County, FL **Photo Direction:** ☒N ☐S ☐E ☐W
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View facing north outside of Wetland 1.	
Photo 2 of 4	**Date of Site Visit:** September 18, 2019 **County / State:** Sumter County, FL **Photo Direction:** ☐N ☐S ☒E ☐W
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View facing east outside of Wetland 1.	

Project Name:	Florida National Cemetery Expansion
Sampling Point:	W1-1U
Photo 3 of 4	**Date of Site Visit:** September 18, 2019 **County / State:** Sumter County, FL **Photo Direction:** ☐N ☒S ☐E ☐W
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View facing south outside of Wetland 1.	
Photo 4 of 4	**Date of Site Visit:** September 18, 2019 **County / State:** Sumter County, FL **Photo Direction:** ☐N ☐S ☐E ☒W
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View facing west outside of Wetland 1.	

Environmental Site Photos

Project Name:	Florida National Cemetery Expansion
Sampling Point:	W1-1U
Photo 1 of 4	**Date of Site Visit**: September 18, 2019
	County / State: Sumter County, FL
	Photo Direction: Downward
Photos Taken by (Name, Company):	Kelley Samuels and Brooke Bayer, AECOM
Description / Comments: View of soils outside of Wetland 1.	

APPENDIX B

STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE

STANDARD PROTECTION MEASURES FOR THE EASTERN INDIGO SNAKE
U.S. Fish and Wildlife Service
August 12, 2013

The eastern indigo snake protection/education plan (Plan) below has been developed by the U.S. Fish and Wildlife Service (USFWS) in Florida for use by applicants and their construction personnel. At least **30 days prior** to any clearing/land alteration activities, the applicant shall notify the appropriate USFWS Field Office via e-mail that the Plan will be implemented as described below (North Florida Field Office: jaxregs@fws.gov; South Florida Field Office: verobeach@fws.gov; Panama City Field Office: panamacity@fws.gov). As long as the signatory of the e-mail certifies compliance with the below Plan (including use of the attached poster and brochure), no further written confirmation or "approval" from the USFWS is needed and the applicant may move forward with the project.

If the applicant decides to use an eastern indigo snake protection/education plan other than the approved Plan below, written confirmation or "approval" from the USFWS that the plan is adequate must be obtained. At least 30 days prior to any clearing/land alteration activities, the applicant shall submit their unique plan for review and approval. The USFWS will respond via e-mail, typically within 30 days of receiving the plan, either concurring that the plan is adequate or requesting additional information. A concurrence e-mail from the appropriate USFWS Field Office will fulfill approval requirements.

The Plan materials should consist of: 1) a combination of posters and pamphlets (see **Poster Information** section below); and 2) verbal educational instructions to construction personnel by supervisory or management personnel before any clearing/land alteration activities are initiated (see **Pre-Construction Activities** and **During Construction Activities** sections below).

POSTER INFORMATION

Posters with the following information shall be placed at strategic locations on the construction site and along any proposed access roads (a final poster for Plan compliance, to be printed on 11" x 17" or larger paper and laminated, is attached):

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

SIMILAR SNAKES: The black racer is the only other solid black snake resembling the eastern indigo snake. However, black racers have a white or cream chin, thinner bodies, and WILL BITE if handled.

LIFE HISTORY: The eastern indigo snake occurs in a wide variety of terrestrial habitat types throughout Florida. Although they have a preference for uplands, they also utilize some wetlands

and agricultural areas. Eastern indigo snakes will often seek shelter inside gopher tortoise burrows and other below- and above-ground refugia, such as other animal burrows, stumps, roots, and debris piles. Females may lay from 4 - 12 white eggs as early as April through June, with young hatching in late July through October.

PROTECTION UNDER FEDERAL AND STATE LAW: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

Only individuals currently authorized through an issued Incidental Take Statement in association with a USFWS Biological Opinion, or by a Section 10(a)(1)(A) permit issued by the USFWS, to handle an eastern indigo snake are allowed to do so.

IF YOU SEE A <u>LIVE</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and allow the live eastern indigo snake sufficient time to move away from the site without interference;
- Personnel must NOT attempt to touch or handle snake due to protected status.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

IF YOU SEE A <u>DEAD</u> EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and immediately notify supervisor or the applicant's designated agent, **and** the appropriate USFWS office, with the location information and condition of the snake.
- Take photographs of the snake, if possible, for identification and documentation purposes.
- Thoroughly soak the dead snake in water and then freeze the specimen. The appropriate wildlife agency will retrieve the dead snake.

Telephone numbers of USFWS Florida Field Offices to be contacted if a live or dead eastern indigo snake is encountered:

North Florida Field Office – (904) 731-3336
Panama City Field Office – (850) 769-0552
South Florida Field Office – (772) 562-3909

PRE-CONSTRUCTION ACTIVITIES

1. The applicant or designated agent will post educational posters in the construction office and throughout the construction site, including any access roads. The posters must be clearly visible to all construction staff. A sample poster is attached.

2. Prior to the onset of construction activities, the applicant/designated agent will conduct a meeting with all construction staff (annually for multi-year projects) to discuss identification of the snake, its protected status, what to do if a snake is observed within the project area, and applicable penalties that may be imposed if state and/or federal regulations are violated. An educational brochure including color photographs of the snake will be given to each staff member in attendance and additional copies will be provided to the construction superintendent to make available in the onsite construction office (a final brochure for Plan compliance, to be printed double-sided on 8.5" x 11" paper and then properly folded, is attached). Photos of eastern indigo snakes may be accessed on USFWS and/or FWC websites.

3. Construction staff will be informed that in the event that an eastern indigo snake (live or dead) is observed on the project site during construction activities, all such activities are to cease until the established procedures are implemented according to the Plan, which includes notification of the appropriate USFWS Field Office. The contact information for the USFWS is provided on the referenced posters and brochures.

DURING CONSTRUCTION ACTIVITIES

1. During initial site clearing activities, an onsite observer may be utilized to determine whether habitat conditions suggest a reasonable probability of an eastern indigo snake sighting (example: discovery of snake sheds, tracks, lots of refugia and cavities present in the area of clearing activities, and presence of gopher tortoises and burrows).

2. If an eastern indigo snake is discovered during gopher tortoise relocation activities (i.e. burrow excavation), the USFWS shall be contacted within one business day to obtain further guidance which may result in further project consultation.

3. Periodically during construction activities, the applicant's designated agent should visit the project area to observe the condition of the posters and Plan materials, and replace them as needed. Construction personnel should be reminded of the instructions (above) as to what is expected if any eastern indigo snakes are seen.

POST CONSTRUCTION ACTIVITIES

Whether or not eastern indigo snakes are observed during construction activities, a monitoring report should be submitted to the appropriate USFWS Field Office within 60 days of project completion. The report can be sent electronically to the appropriate USFWS e-mail address listed on page one of this Plan.

IF YOU SEE A LIVE EASTERN INDIGO SNAKE ON THE SITE:

- Cease clearing activities and allow the eastern indigo snake sufficient time to move away from the site without interference.
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- Take photographs of the snake, if possible, for identification and documentation purposes.
- Immediately notify supervisor or the applicant's designated agent, **and** the appropriate U.S. Fish and Wildlife Service (USFWS) office, with the location information and condition of the snake.
- If the snake is located in a vicinity where continuation of the clearing or construction activities will cause harm to the snake, the activities must halt until such time that a representative of the USFWS returns the call (within one day) with further guidance as to when activities may resume.

IF YOU SEE A DEAD EASTERN INDIGO SNAKE ON THE SITE:

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Panama City ES Office – (850) 769-0552
South Florida ES Office – (772) 562-3909

DESCRIPTION: The eastern indigo snake is one of the largest non-venomous snakes in North America, with individuals often reaching up to 8 feet in length. They derive their name from the glossy, blue-black color of their scales above and uniformly slate blue below. Frequently, they have orange to coral reddish coloration in the throat area, yet some specimens have been reported to only have cream coloration on the throat. These snakes are not typically aggressive and will attempt to crawl away when disturbed. Though indigo snakes rarely bite, they should NOT be handled.

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LIFE HISTORY: The eastern indigo snake occurs in a wide variety of terrestrial habitat types throughout Florida. Although they have a preference for uplands, they also utilize some wetlands and agricultural areas. Eastern indigo snakes will often seek shelter inside gopher tortoise burrows and other below- and above-ground refugia, such as other animal burrows, stumps, roots, and debris piles. Females may lay from 4 - 12 white eggs as early as April through June, with young hatching in late July through October.

Killing, harming, or harassing indigo snakes is strictly prohibited and punishable under State and Federal Law.

Only individuals currently authorized through an issued Incidental Take Statement in association with a USFWS Biological Opinion, or by a Section 10(a)(1)(A) permit issued by the USFWS, to handle an eastern indigo snake are allowed to do so.

LEGAL STATUS: The eastern indigo snake is classified as a Threatened species by both the USFWS and the Florida Fish and Wildlife Conservation Commission. "Taking" of eastern indigo snakes is prohibited by the Endangered Species Act without a permit. "Take" is defined by the USFWS as an attempt to kill, harm, harass, pursue, hunt, shoot, wound, trap, capture, collect, or engage in any such conduct. Penalties include a maximum fine of $25,000 for civil violations and up to $50,000 and/or imprisonment for criminal offenses, if convicted.

August 12, 2013

ATTENTION:

THREATENED EASTERN INDIGO SNAKES MAY BE PRESENT ON THIS SITE!!!

Please read the following information provided by the U.S. Fish and Wildlife Service to become familiar with standard protection measures for the eastern indigo snake.

ATTENTION:

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August 12, 2013