Procurement Management Department
2115 Second Street, 1st Floor
Fort Myers, FL 33901
Main Line: (239) 533-8881
Fax Line: (239) 485-8383
www.leegov.com/procurement

Posted Date: September 13, 2023

Solicitation No.: B230169BAG

Solicitation Name: Corkscrew Road Widening - Phase II

Subject: Addendum Number 3

The following represents clarification, additions, deletions, and/or modifications to the above referenced bid. This addendum shall hereafter be regarded as part of the solicitation. Items not referenced herein remain unchanged, including the response date. Words, phrases or sentences with a strikethrough represent deletions to the original solicitation. Underlined words and bolded, phrases or sentences represent additions to the original solicitation.

1. ATTACHMENTS

a. CN180576ANB_Roadway Soil Survey Report 2023-09-12

2. QUESTIONS/ANSWERS

1.	Under minimum qualification requirements why is criteria 2 required when there is no industrial electrical work as part of the scope of this project? All work shown E29A and E30A for the wells, is stated to be done by others ahead of this project.
Answer	**This project includes reorienting the discharge piping of one well and reconnecting some electrical equipment due to the new location of the flow meter.**
2.	Criteria 3 and Criteria 4 Why is this required when there is no industrial electrical work as part of this scope of work to require this type of testing?
Answer	**Within the Utilities Plans is some electrical work required within the Well Sites 32 and 33**
3.	Why is Criteria 5 requiring Citect Silver level or better integrator when there is no SCADA work being a part of this project to require integration?
Answer	**Within the Utilities Plans is some electrical work required within the Well Sites 32 and 33**
4.	Sheet 16 □ What is the existing material of the existing 24” water main at the location of the 24” x 16” TSV □ What is the operating pressure of the existing 24” water main at the TSV location
Answer	**The existing water main is ductile iron pipe. Typical operating pressures around 20 PSI to 80 PSI**
5.	Sheet 17 □ What is the material of the existing 20” and 24” raw water mains at the locations of the 20”x20” TSV and 24”x24” TSV □ What is the operating pressures of the existing 20” and 24” raw water mains at the TSV locations

Answer	**The existing RAW water main is ductile iron pipe. Typical operating pressures around 20 PSI to 80 PSI**
6.	Sheet 18 □ What is the operating pressures of the existing 24" raw water mains at the TSV locations
Answer	**Typical operating pressures around 20 PSI to 80 PSI**
7.	What is the anticipated construction completion of Phase I?
Answer	**Phase I is anticipated to be completed by the end of January of 2024.**
8.	How will phase 1 construction affect the traffic control plan concepts provided in Phase II?
Answer	**Per response to no. 7 above. Phase I construction is anticipated to be completed or near completion at the beginning of this project. The successful contractor will need to coordinate with the Phase 1 contractor to minimize delays to the maximum extent possible if there is overlap.**
9.	Will the contractor be required to maintain pedestrian access to the existing sidewalks at each development?
Answer	**Requirements for maintenance of existing pedestrian and bicycle facilities are noted in the Traffic Control sheets.**
10.	What is the anticipated schedule for FPL to relocate their lines? This could drastically affect the overall project schedule of 660 calendar days.
Answer	**The specific duration of FPL's relocations is not known at this time as it is dependent upon the selected contractor's clearing and grubbing. Per the specifications and plan notes the contractor will be required to coordinate activities with all UAO's to minimize delays.**
11.	Are the plans provided in the specifications, the plans we are to use for bidding well 33 and well 32 or are we only bidding on the plan information provided in the Utility relocation plans?
Answer	**The "Corkscrew Utility Relocation (Phase 2)" plans are what is to be used for the work within well 32 and 33.**
12.	Please clarify what should be included in pay item 18a and 18b of section 0006 Utilities.
Answer	**Please review Measurement and Payment Section 01 22 13 Item 18 for items to be included.**
13.	As a follow up to Addendum 2, question 3 "Are there any actual core borings for Pond 4", was a geotechnical report prepared for the roadway area that provides the existing soil conditions and the ground water levels?
Answer	**The Roadway Soil Survey is attached herein.**
14.	Which specification will the contractor be required to follow for dewatering during drainage and utility installation?
Answer	**There is currently no dewatering permit for the project. Should the contractor choose to dewater they will need to obtain the necessary dewatering permit and abide by the conditions therein. Per note No. 16 the cost for construction-related permitting is the contractors responsibility and shall be considered inherent to other pay items.**

15.	Who is the CEI for this project?
Answer	**AIM Engineering is the CEI for this project.**

BIDDER/PROPOSER IS ADVISED, YOU ARE REQUIRED TO ACKNOWLEDGE RECEIPT OF THIS ADDENDUM WHEN SUBMITTING A BID/PROPOSAL. FAILURE TO COMPLY WITH THIS REQUIREMENT MAY RESULT IN THE BIDDER/PROPOSER BEING CONSIDERED NON-RESPONSIVE.

ALL OTHER TERMS AND CONDITIONS OF THE SOLICITATION DOCUMENTS ARE AND SHALL REMAIN THE SAME.

Brooke Green

Brooke Green, CPPB
Grants Procurement Analyst Direct Line: 239-533-8848
Lee County Procurement Management

September 12, 2023

Johnson Engineering, Inc.
2122 Johnson St.
Fort Myers, FL 33901

Attn: Mr. Ryan K. Bell, P.E., PTOE

RE: Roadway Soil Survey Report
Final Plans Submittal
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Mr. Bell:

Tierra, Inc. (Tierra) has completed a Roadway Soil Survey Report for the above referenced project. This report is being provided to assist in the preparation of the Final Plans Submittal. The results of our field exploration program and laboratory testing performed to date and subsequent geotechnical recommendations are presented herein.

Tierra appreciates the opportunity to be of service to Johnson Engineering, Inc. (Johnson) on this project. If you have any questions or comments regarding this report, please contact our office at your earliest convenience.

Sincerely,

TIERRA, INC.

Kaitlyn C. Waterman, P.E.
Geotechnical Engineer
Florida License No. 96615

Thomas E. Musgrave, P.E.
Geotechnical Engineer
Florida License No. 81669

TIERRA, Inc.
7351 Temple Terrace Highway • Tampa, Florida 33637
Phone (813) 989-1354 • Fax (813) 989-1355

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1.0 PROJECT INFORMATION

1.1 Project Authorization

Authorization to proceed with this project was issued by Johnson in accordance with the Subconsultant Agreement.

1.2 Project Description

The project consists of the widening of Corkscrew Road from Ben Hill Griffin (BHG) Parkway to Alico Road. The project is divided into two phases. Phase I of the project begins at BHG Parkway and terminates at Bella Terra Boulevard. Phase II of the project begins at Bella Terra Boulevard and terminates at Alico Road. Geotechnical design services in support of the proposed roadway improvements within the Phase I limits of the project were performed by others. Geotechnical design services in support of the proposed roadway improvements within the Phase II limits were performed by Tierra and are presented in this report.

The Phase II roadway improvements generally consist of widening the existing two-lane roadway to a four-lane roadway and milling and resurfacing portions of the existing roadway. Stormwater ponds, signalization improvements, box culverts and bridge structures to accommodate wildlife crossing are also proposed for the project.

The purpose of this report is to provide geotechnical (i.e. soils and groundwater) input to the design team to assist in the design of the proposed improvements. This report concentrates on the roadway portion of the project. Reports addressing the box culverts, bridge structures and signal structures will be submitted under separate cover.

1.3 General Site Conditions

The existing Corkscrew Road alignment is typically supported on an embankment utilized to separate the pavement section from the historical groundwater conditions. Land use adjacent to Corkscrew Road in the project area generally consists of residential areas and undeveloped land. Drainage culverts and linear ditches/swales are present along the majority of the project alignment.

2.0 PURPOSE AND SCOPE OF SERVICES

The geotechnical study was performed to obtain information on the existing subsurface conditions along the limits of the proposed roadway improvements to assist in the design of construction plans for the proposed widening. The following services were provided:

1. Reviewed published soil information obtained from the “Soil Survey of Lee County, Florida” published by the United States Department of Agriculture (USDA) National Resources Conservation Services (NRCS). Reviewed topographic information obtained from the “Corkscrew NW, Florida” Quadrangle map.

2. Submitted a boring location plan for the proposed roadway improvements to Johnson for approval prior to commencing work.

3. Conducted a visual reconnaissance of the project site and coordinated utility clearance via Sunshine State One Call.

4. Coordinated with Lee County to obtain Right-of-Way (ROW) use permits to perform the geotechnical exploration within the Corkscrew Road ROW.

5. Performed a geotechnical field study to evaluate the existing subsurface conditions along the project alignment consisting of borings, subsurface sampling and field-testing. We performed over 100 hand auger borings and 18 Standard Penetration Test (SPT) borings along the project alignment.

6. Visually examined soil samples recovered from the borings in the laboratory. Performed laboratory tests on selected representative samples to develop the soil legend for the project using the American Association of State Highway and Transportation Officials (AASHTO) Soil Classification System.

7. Measured groundwater levels at the boring locations, when encountered, and estimated Seasonal High Groundwater Table (SHGWT) levels along the roadway alignment.

8. Performed ten (10) pavement core borings within the travel lanes of Corkscrew Road and Alico Road. Conducted Maintenance of Traffic (MOT) operations in accordance with FDOT Standard Plans to obtain the asphalt cores.

9. Collected and tested six (6) bulk soil samples along the roadway alignment to determine a composite Limerock Bearing Ratio (LBR) value to be used in pavement design.

10. Coordinated with the project surveyor to obtain survey data (locations and elevations) of the borings performed along the roadway alignment to estimate the SHGWT.

11. Prepared this Roadway Soil Survey Report to support the project.

3.0 REVIEW OF PUBLISHED DATA

3.1 Regional Geology

The following paragraphs have been paraphrased from the Florida Geological Survey, Open-File Report 80, 2001 and other geologic references.

The near surface geologic deposits and formations from youngest to oldest in Lee County include: Holocene Sediment (Qh), Undifferentiated sediments (Qu), Shelly sediments (TQsu), the Tamiami Formation (Tt), the Peace River Formation (Thp), and the Arcadia Formation (Tha).

The Holocene sediments generally occur near the coastline and within river flood plains and include; quartz sands, carbonate sand and muds with organics. The Undifferentiated sediments

are siliciclastics that are light gray, tan, brown to black, unconsolidated to poorly consolidated, clean to clayey silty, unfossiliferous, variably organic-bearing sands to blue green to olive green, poorly to moderately consolidated, sandy, silty clays. The Shelly sediments are variably calcareous and fossiliferous quartz sands to well indurated, sandy, fossiliferous limestones with clayey sands and sandy clays present.

The Tamiami Formation is a poorly defined lithostratigraphic unit containing a wide range of mixed carbonate-siliciclastic lithologies. The lithologies include: 1) light gray to tan, unconsolidated, fine to coarse grained, fossiliferous sand; 2) light gray to green, poorly consolidated, fossiliferous sandy clay to clayey sand; 3) light gray, poorly consolidated, very fine to medium grained, calcareous, fossiliferous sand; 4) white to light gray, poorly consolidated, sandy, fossiliferous limestone; and 5) white to light gray, moderately to well indurated, sandy, fossiliferous limestone. The Tamiami Formation has from highly permeable to impermeable lithologies that form a complex aquifer and primarily outcrops in most of eastern Lee County and can reach thicknesses of greater than 100 feet.

The Peace River Formation is primarily found near sea level elevation and is approximately 50 to 150 feet thick under the county. The Peace River Formation is composed of interbedded sands, clays and carbonates. The sands are generally light gray to olive gray, poorly consolidated, clayey, variably dolomitic, very fine to medium grained and phosphatic. The clays are yellowish gray to olive gray, poorly to moderately consolidated sandy, silty, phosphatic and dolomitic. The carbonates are light gray to yellowish gray, poorly to well indurated, variably sandy and clayey, and phosphatic. The carbonates often include opaline chert.

The Arcadia Formation is predominantly a carbonate unit with variable siliciclastic component and is found about 150 to 200 feet below land surface (bls) in Lee County. Arcadia Formation is composed of yellowish gray to light olive gray to light brown, micro to finely crystalline, variably sandy, clayey and phosphatic, fossiliferous limestones and dolostones. Thin beds of sand and clay are common. The sands are yellowish gray, very fine to medium grained, poorly to moderately indurated, clayey, dolomitic and phosphatic. The clays are yellowish gray to light olive gray, poorly to moderately indurated, sandy, silty, phosphatic and dolomitic.

3.2 USGS Quadrangle Map

Based on a review of the “Corkscrew NW, Florida” Quadrangle map, it appears that the natural ground surface elevations in the project vicinity range from approximately +15 feet to +25 feet National Geodetic Vertical Datum of 1929 (NGVD 29). A reproduction of the **USGS Quadrangle Map** in illustrated in **Appendix A**.

3.3 USDA Soil Survey

Based on a review of the “Soil Survey of Lee County, Florida” published by the USDA (USDA Soil Survey), there are six (6) primary soil-mapping units noted within the project vicinity. A reproduction of the **USDA Vicinity Map** for the project and a summary of the Soil Survey information are provided in **Appendix A**. It should be noted that information contained in the USDA Soil Survey may not be reflective of actual soil and groundwater conditions, particularly if development in the project vicinity has modified soil conditions or surface/subsurface drainage.

3.4 Potentiometric Surface Information

Based on a review of the "Potentiometric Surface of the Upper Floridan Aquifer in Florida" maps published by the USGS, the potentiometric surface elevation of the upper Floridan Aquifer in the project vicinity is not available due to lack of water-level data in this area from wells open only to the Upper Floridan Aquifer. For the area generally south of Latitude 27°N, no interpretation was made because of a lack of control points and the complexity of the flow system, which includes several permeable zones. Artesian flow conditions were not encountered during our field exploration.

4.0 SUBSURFACE EXPLORATION

4.1 Boring Location Plan and Utility Clearance

Prior to commencing our subsurface explorations, a boring location plan for the proposed roadway improvements was developed based on the project design files provided by Johnson, general guidelines provided in the "Soils and Foundation Handbook" published by the FDOT and our engineering judgment. The boring locations were determined in the field by representatives of Tierra using hand-held, non-survey grade Garmin Etrex® Global Positioning System (GPS) equipment with a manufacturer's reported accuracy of ±10 feet.

Following completion of the borings, boring locations where the SHGWT depth was estimated for the project design were survey-located by the project surveyor. The project surveyor provided Tierra with the State Plane coordinates and elevations of the SHGWT boring locations.

The station and offset of each boring location were determined using the estimated/surveyed GPS coordinates in conjunction with project design files provided by Johnson. The approximate boring locations are presented on the **Boring Location Plan** sheets in **Appendix B**. The station and offset of each boring location are provided on the **Roadway Soil Profiles** sheets in **Appendix B**.

Utility clearances were coordinated by Tierra through Sunshine State One Call and updated as required prior to performing the soil borings in order to reduce the potential for damage to the underground utilities during the boring process.

4.2 Roadway Borings

To evaluate the subsurface conditions along the proposed roadway alignment, Tierra performed more than 100 auger borings and 18 SPT borings. Generally, the borings were performed at staggered intervals of approximately 100 feet within the limits of the proposed widening and at other select locations along the project alignment. The hand auger borings were performed to depths ranging from approximately 1¼ to 5¾ feet below existing grades. The SPT borings were performed to an approximate depth of 15 feet below existing grades. The hand auger borings advanced to depths of less than 5 feet were terminated due to a borehole collapse resulting from groundwater intrusion or hand auger refusal on limerock and/or cemented sands and/or caprock (near-surface limestone).

The hand auger borings were performed by manually twisting and advancing a bucket auger into the ground, typically in 6-inch increments. The SPT borings were performed using a drill rig with bentonite mud drilling procedures. The soil sampling was performed in general accordance with the American Society for Testing and Materials (ASTM) test designation D-1586. The initial 4 feet of the SPT borings were advanced by manual auger to verify utility clearances. SPT resistance N-values were then taken at intervals of 2 feet to a depth of 10 feet and on intervals of 5 feet thereafter. As each soil type was revealed, representative samples were placed in air-tight containers and returned to our office for confirmation of the field classification by a geotechnical engineer. The results of the borings performed for this project are further discussed are presented in the **Roadway Soil Profiles** sheets in **Appendix B**.

4.3 Asphalt Pavement Cores

Tierra performed ten (10) pavement cores at selected locations along the project alignment to determine the conditions of the existing pavement section, base materials and subgrade materials at the core locations. The pavement cores were performed with the use of a 4-inch outside diameter core bit. A hand auger boring was performed at each core location to approximate depths ranging from 3 to 5¾ feet below the existing pavement surface to identify the subgrade materials present. The space remaining from the coring operation was backfilled with soil to the depth of the base/stabilized subgrade and then with asphalt/grout patch to the existing pavement surface. The soil and patch were placed in approximately 2-inch lifts which were compacted through the use of a 10-pound hand-held rammer. The hand-held rammer device meets the specifications for the Modified Proctor Test (ASTM D-1557). The cores and base samples were transported to our laboratory for visual classification, measurements and analysis.

The asphalt pavement was visually classified using standard FDOT nomenclature. The actual mixture present within the core may be a Lee County mix design that may vary from standard FDOT mixtures. The results of the pavement cores are provided in the **Pavement Data Table** in **Appendix D**. Representative photographs of the pavement cores are also provided in **Appendix D**.

4.4 Bulk Soil Sampling and LBR Testing

Bulk soil samples were retrieved for LBR testing at six (6) locations along the proposed roadway improvements. In general, these samples were collected from the top 1 to 2 feet of the near-surface soils encountered. The samples were delivered to Tierra's laboratory for LBR testing. The LBR testing was performed in accordance with FSTM FM 5-515 "Florida Method of Test for Limerock Bearing Ratio (LBR)". The results of the LBR testing are provided in **Appendix E** of this report.

5.0 LABORATORY TESTING

5.1 General

Representative soil samples collected from the borings performed along the project alignment were classified and stratified in general accordance with the AASHTO Soil Classification System. Our classification was based on visual observations, using the results from the laboratory testing as confirmation. These tests included grain-size analyses, organic content testing, Atterberg Limits and natural moisture content determination. In addition, environmental corrosion tests were performed on selected soil samples to evaluate the corrosive nature of the subsurface soils encountered along the project alignment.

5.2 Test Designation

The following list summarizes the laboratory tests performed by Tierra and the respective test methods utilized.

- Grain-Size Analyses - The grain-size analyses were conducted in general accordance with the AASHTO test designation T-088 (ASTM test designation D-422).

- Atterberg Limits - The liquid limit and the plastic limit tests ("Atterberg Limits") were conducted in general accordance with the AASHTO test designations T-089 and T-090, respectively (ASTM test designation D-4318).

- Natural Moisture Content - The moisture content tests were conducted in general accordance with the AASHTO test designation T-265 (ASTM test designation D-2216).

- Organic Content - Tests were performed in general accordance with AASHTO T-267.

- Environmental Corrosion - Environmental corrosion tests were conducted in general accordance with the FDOT test designations FM 5-550, FM 5-551, FM 5-552 and FM 5-553.

A summary of the laboratory test results for each soil stratum encountered along the project alignment is presented on the **Roadway Soil Survey** sheet in **Appendix B**. This sheet includes ranges of laboratory test results for different stratum soil samples collected from borings performed along the project alignment. Detailed summaries of the laboratory test results performed for soil and environmental classification are presented in **Appendix E**.

6.0 RESULTS OF SUBSURFACE EXPLORATION

6.1 General Soil Conditions

In general, the soil borings consisted of sandy soils with varying amounts of cemented sands, shell, silts and/or rock fragments from the ground surface to the boring termination depths. Many of the auger borings encountered auger refusal conditions on limerock and/or cemented sands and/or near-surface limestone, colloquially known as "caprock" (Stratum 4). Weathered limestone/caprock (Stratum 4) was also encountered within several of the SPT borings

performed along the project alignment at depths ranging from 4 to 8 feet below existing grades. The presence of caprock is well known in the geographic area and is indicated as being within 12 to 40 inches of the ground surface along the alignment according to the USDA Soil Survey.

In addition, organic soils (Stratum 6, A-8) were encountered within two (2) borings performed along the project alignment from approximate station 829+50 to 830+50, Centerline Construction of Corkscrew Road.

The soil types encountered during this exploration have been assigned a stratum number. The stratum numbers and soil types associated with this project are listed in the table below.

Stratum Number	Typical Soil Description	AASHTO Classification Symbol
1	Gray to Brown SAND to SAND with Silt and Limerock Fragments – FILL	A-3
2	Gray to Pale Brown to Brown SAND to SAND with Silt, Occasionally with Shell and/or Limestone Fragments	A-3
3	Orange to Brown Silty SAND, Occasionally with Limerock and/or Shell Fragments	A-2-4
4	Weathered LIMESTONE/CAPROCK	---(1)
5	Light Brown to Brown Clayey SAND	A-2-6
6	Dark Brown Organic Silty SAND to MUCK	A-8
7	Orange to Gray to Brown Silty SAND to Silty-Clayey SAND to Clayey SAND	A-2-4
(1) AASHTO does not have a classification for Weathered LIMESTONE/CAPROCK		

A geotechnical engineer bases soil stratification on a visual review of the recovered samples, laboratory testing and interpretation of the field boring logs. The boring stratification lines represent the approximate boundaries between soil types of significantly different engineering properties; however, the actual transition may be gradual. In some cases, small variations in properties not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity. The soil profiles represent the conditions at the particular boring location and variations did occur and should be expected between the borings. The results of the borings performed for this project are presented in the **Roadway Soil Profiles** sheets in **Appendix B**.

6.2 Groundwater

When encountered, the groundwater table was measured at the boring locations during our field exploration. The depths to the encountered groundwater table were found to range from above the existing ground surface to a depth of approximately 10 feet below the existing ground

surface. The measured groundwater tables are presented on the **Roadway Soil Profiles** sheets in **Appendix B**. At some auger boring locations, the groundwater table was not encountered prior to the boring termination depth. GNE (Groundwater Not Encountered) is indicated on these soil profiles. The groundwater table was not apparent within some SPT borings prior to the introduction of drilling fluid (typically at a depth of 10 feet). GNA (Groundwater Not Apparent) is indicated on the soil profiles.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences (i.e. existing water management canals, swales, drainage ponds, underdrains and areas of covered soils, such as paved parking lots and sidewalks).

6.3 Seasonal High Groundwater Table Estimates

SHGWT levels were estimated at 17 boring locations along the roadway alignment. Generally, the borings were located at intervals ranging from approximately 200 to 500 feet on alternating sides of the roadway alignment. The SHGWT levels were estimated based on a review of the soil samples, measured groundwater levels in the borings, information provided in the USDA Soil Survey and surrounding topography. In addition, available well monitoring data from the Lee County Division of Natural Resources was reviewed as part of the SHGWT analysis. The estimated SHGWT depths at the boring locations performed along the roadway alignment ranged from ½ foot to 2½ feet below the existing ground surface. The estimated SHGWT levels are illustrated in the **Roadway Soil Profiles** in **Appendix B** and tabulated on the **Summary of Seasonal High Groundwater Table Estimates** in **Appendix C**.

The reported SHGWT levels are estimated historic levels. Man-made influences, such as existing water management ditches, swales and drainage ponds, all of which existing along the project corridor, will affect groundwater levels but are not considered when estimating the SHGWT. Where appropriate, biological indicators should be used in conjunction with the historic SHGWT levels when setting pavement grades.

6.4 Pavement Conditions

The pavement cores performed within the travel lanes of Corkscrew Road generally encountered approximately 1.5 to 5.2 inches of Type S-I asphalt pavement underlain by 6.1 to 13.0 inches of limerock with shell base materials.

The **Pavement Data Table** provided in **Appendix D** should be reviewed for specific information regarding the existing asphalt pavement, base and subgrade materials encountered at each core location. Photographs of the asphalt pavement cores and core locations are provided in the **Representative Photographs of Pavement Cores** in **Appendix D**. It is important to note that base material thicknesses reported in the **Pavement Data Table** may not be reflected in the sample photographs due to the sample break-up during recovery.

7.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS

7.1 General

In general, the existing subsurface soils encountered in the borings performed are suitable for supporting the proposed construction after proper subgrade preparation. If buried organic soils, debris or unsuitable fills are encountered during construction, they should be removed and replaced with clean, compacted, sandy (SELECT) soils in accordance with Lee County guidelines and the FDOT Standard Plans.

The removal and utilization of top-soils and other surficial organic soils should be accomplished in accordance with Lee County guidelines and the FDOT Standard Plans. Site preparation should consist of normal clearing and grubbing followed by compaction of subgrade soils. Backfill should consist of materials conforming to and compacted in accordance with Lee County guidelines and the FDOT Specifications.

7.2 Weathered Limestone/Caprock

Weathered limestone/caprock (Stratum 4) is known to occur at relatively shallow depths within this general geographic area and was encountered within the borings performed along the proposed roadway alignment. This material is rock. Excavation into and/or through this material may be difficult and will require non-conventional construction techniques and specialized equipment. In addition, limestone/caprock is porous and difficult to de-water. The depth and consistency of this material can vary. Tierra has included a note on the **Roadway Soil Survey** sheet presented in **Appendix B** warning the Contractor of the presence of this material.

7.3 Organic Soils

Organic soils (Stratum 6, A-8) were encountered along the proposed roadway alignment from approximate station 829+50 to 830+50, Centerline Construction of Corkscrew Road. This material was encountered at depths ranging from approximately 1 to 1½ feet below the existing ground surface. Based on the results of laboratory testing, the organic content of the encountered organic soils ranges from 5 to 9 percent.

Tierra recommends removal of the organic soils in accordance with FDOT Standard Plans Index 120-002. The removal limits for organic soils will be provided for future plan submittals.

7.4 Embankment Settlement

Roadway cross-sections were not available at the time of this report. As the project progresses, embankment settlement will be evaluated utilizing developed cross-sections in conjunction with the results of the soil borings performed. Based on the results of the borings, anticipated maximum embankment heights of less than 10 feet and assuming proper subgrade preparation and adequate fill materials are utilized to construct the proposed embankments, limitations due to settlement are not anticipated.

7.5 Slope Stability

Roadway cross-sections were not available at the time of this report. As the project progresses, embankment slope stability should be evaluated utilizing developed cross-sections in conjunction with the results of the soil borings performed. Based on the results of the borings performed and assuming that embankments are constructed in accordance with FDOT Specifications, is anticipated that embankment slopes above the water table with a geometry of two horizontal to one vertical (2H:1V) or flatter will not pose limitations to roadway performance.

7.6 Cut and Fill Slopes

Roadway and pond cross-sections were not available at the time of this report. Cuts or slopes into or below the groundwater table, or that may be proposed for pond berm slopes, should be constructed at 3H:1V or flatter. However, once roadway and pond cross-sections are available, the efficacy of 3H:1V side slopes will need to be verified in coordination with the drainage engineer. Fill slopes for the proposed embankments should be constructed at 2H:1V or flatter. If cuts extend within Strata 5 and 7, groundwater/surface water may “perch” above these semi-confining/confining strata. Water will flow along the top of these strata through the more permeable overburden sands (Strata 1, 2, and 3). It is imperative that the drains, swales, ditches, etc. have constant downward slope (positive draining) and positive outfall.

7.7 Temporary Side Slopes

Excavations and temporary side slopes should comply with the Occupational Safety and Health Administration’s (OSHA) trench safety standards, 29 C.F.R., s. 1926.650, Subpart P, all subsequent revisions or updates of OSHA’s referenced standard adopted by the Department of Labor and Employment Security and Florida’s Trench Safety Act, Section 553.62, Florida Statutes.

We are providing this information solely as a service to our client. Tierra does not assume responsibility for construction site safety or the Contractor’s or other party’s compliance with local, state, and federal safety or other regulations.

7.8 Groundwater Control

Depending upon groundwater levels at the time of construction, some form of dewatering may be required to achieve the required compaction. Due to groundwater levels during the wet season of the year, seepage may enter the bottom and sides of excavated areas. Such seepage will act to loosen soils and create difficult working conditions. Groundwater levels should be determined immediately prior to construction. Shallow groundwater should be kept below the lowest working area to facilitate proper material placement and compaction in accordance with Lee County guidelines and the FDOT Specifications.

7.9 Pavement Design Considerations

The pavement design engineer should review the current FDOT Flexible Pavement Design Manual and Lee County guidelines for roadway design to ensure an adequate Structural Number (SN) value is obtained based on the corresponding ESAL value over the design life of the roadway improvements. Based on the results of the LBR tests performed on bulk soil samples obtained from along the proposed roadway alignment and the FDOT ± 2% of Optimum Method and 90% Method, a design Modulus of Resilience (M_R) value of 12,000 psi is recommended for use in flexible pavement design. **Design LBR Calculation** tables are provided in **Appendix D**. It should be noted that the design M_R value obtained from the tests performed may not be representative of borrow materials which may support some of the proposed roadway.

In accordance with FDOT guidelines, grades for this type of roadway should be ideally set to provide a minimum separation required for the proposed roadways between the bottom of the base and the estimated seasonal high groundwater levels. Correspondingly, the base should remain equally above sustained water treatment levels in roadside ditches, making positive drainage of the drains, swales and ditches important. The choice of base material would depend upon the relationship of final roadway improvement grades and the bottom of the base to the estimated seasonal high groundwater table levels. The design of the pavement section should be in accordance with Lee County guidelines, the FDOT Flexible Pavement Manual and the FDOT Plans Preparation Manual.

7.10 On-Site Soil Suitability

The general suitability of the soils encountered during our geotechnical exploration is presented on the **Roadway Soil Survey** in **Appendix B**. FDOT Standard Plans Indices 120-001 and 120-002 should be consulted to determine the specific use/suitability of the soil types encountered during our geotechnical exploration performed to date.

7.11 General Roadway Construction

The overall site preparation and mechanical densification work for the construction of the proposed roadway should be in accordance with FDOT Specifications and Lee County requirements.

8.0 REPORT LIMITATIONS

Our services have been performed, our findings obtained, and our recommendations prepared in accordance with generally accepted geotechnical engineering principles and practices at the time of this report. Our geotechnical engineering evaluation of the site and subsurface conditions with respect to the planned roadway improvements, and our recommendations for site preparation and foundation construction are based upon the following: (1) site observations, (2) the field exploratory test data obtained during the geotechnical study, and (3) our understanding of the project information and anticipated grades as presented in this report. This company is not responsible for the conclusions, opinions or recommendations made by others based on these data.

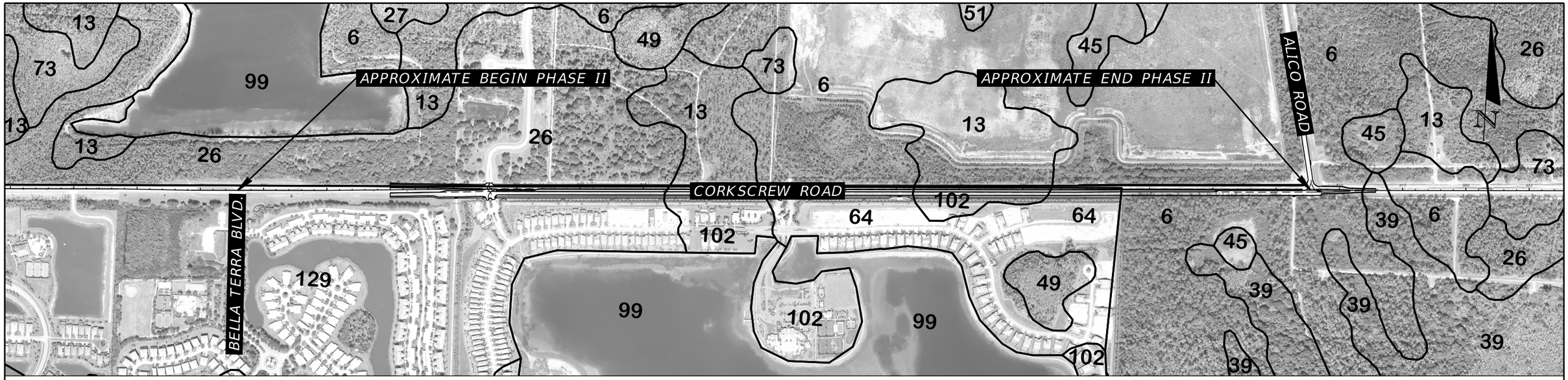
The scope of the exploration was intended to evaluate soil conditions within the influence of the proposed roadway improvements. The analyses and recommendations submitted in this report are based upon the anticipated location and type of construction and data obtained from the soil borings performed at the locations indicated and does not reflect any variations which may occur among these borings. If any variations become evident during the course of construction, a re-evaluation of the recommendations contained in this report will be necessary after we have had an opportunity to observe the characteristics of the conditions encountered.

The scope of services, included herein, did not include any environmental assessment for the presence or absence of hazardous or toxic materials in the soil, surface water, groundwater, air, on the site, below and around the site. Any statements in this report or on the boring logs regarding odors, colors, unusual or suspicious items and conditions are strictly for the information of Johnson Engineering, Inc. and their client.

APPENDIX A

USDA Soil Survey & USGS Quadrangle Maps

Summary of USDA Soil Survey



REFERENCE: USDA SOIL SURVEY OF LEE COUNTY, FLORIDA

REFERENCE: USGS QUADRANGLE MAP OF "CORKSCREW NW, FLORIDA"

TOWNSHIP: 46S
RANGE: 26E
SECTION: 20,21,22

0 200 800
Feet

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

THOMAS E. MUSGRAVE, JR., P.E.
P.E. LICENSE NUMBER 81669
TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637
CERTIFICATE OF AUTHORIZATION NO. 6486

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

USDA SOIL SURVEY & USGS QUADRANGLE MAPS

SHEET NO.

SUMMARY OF USDA SOIL SURVEY
LEE COUNTY, FLORIDA

USDA Map Symbol and Soil Name	Depth (in)	Soil Classification		Permeability (in/hr)	pH	Seasonal High Water Table	
		USCS	AASHTO			Depth (feet)	Months
(6) Hallandale	0-2	SP, SP-SM	A-3	6.0 - 20.0	5.1-6.5	0.3 - 1.5	June-Oct
	2-7	SP, SP-SM	A-3	6.0 - 20.0	5.6-8.4		
	7-12	SP, SP-SM	A-3	0.6 - 6.0	5.6-8.4		
	12-16	Limestone[1]		2.0 - 20.0	---		
(13) Boca fine sand	0-2	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-8.4	0.3 - 1.5	July-Oct
	2-25	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-8.4		
	25-30	SC	A-2-4, A-2-6, A-6	0.6 - 2.0	5.1-8.4		
	30-34	Limestone[1]		2.0 - 20.0	---		
(26) Pineda	0-1	SP, SP-SM	A-3	6.0 - 20.0	4.5-7.3	0.5 - 1.5	June-Nov
	1-5	SP, SP-SM	A-3	6.0 - 20.0	4.5-7.3		
	5-36	SP, SP-SM	A-3	6.0 - 20.0	4.5-7.3		
	36-54	SC, SC-SM,SM	A-2-4, A-2-6	0.1 - 0.2	5.1-8.4		
	54-80	SM, SP-SM	A-2-4, A-3	2.0 - 6.0	5.1-8.4		
(64) Hallandale-Urban land	0-2	SP, SP-SM	A-3	6.0 - 20.0	5.1-6.5	0.3 - 1.5	June-Oct
	2-11	SP, SP-SM	A-3	6.0 - 20.0	6.1-6.5		
	11-13	Limestone[1]		2.0 - 20.0	---		
	Information not provided for Urban Land						
(102) Boca fine sand-Urban land complex, 0 to 2 percent slopes	0-3	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	5.1-8.4	0.3 - 2.0	Jan-Dec
	3-14	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	5.6-8.5		
	14-25	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	6.0-8.4		
	25-30	SC, SM, SC-SM	A-2-4, A-6, A-4	0.6 - 2.0	7.0-8.6		
	30-40	Limestone[1]		2.0 - 20.0	---		
	Information not provided for Urban Land						
(129) Pineda fine sand-Urban land complex, 0 to 2 percent slopes	0-1	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	4.5-7.3	0.5 - 2.0	Jan-Dec
	1-5	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	4.5-7.3		
	5-36	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	4.5-7.3		
	36-54	CL, SC, SC-SM	A-2-4-, A-6, A-4	0.1 - 0.2	4.5-7.8		
	54-80	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	5.1-7.8		
	Information not provided for Urban Land						

[1] AASHTO and USCS do not provide classification for weathered/unweathered bedrock.

APPENDIX B

Roadway Soil Survey

Boring Location Plan

Roadway Soil Profiles

DATE OF SURVEY: SEPTEMBER 2019 - APRIL 2020
SURVEY MADE BY: TIERRA, INC.
SUBMITTED BY: THOMAS E. MUSGRAVE, JR., P.E.

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.: CR 850
COUNTY: LEE

LEE COUNTY PROJECT NO. : CN-180576ANB
PROJECT NAME: CORKSCREW ROAD WIDENING - BEN HILL GRIFFIN PARKWAY TO ALICO ROAD

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

	ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS PERCENT PASS (%)						ATTERBERG LIMITS (%)					CORROSION TEST RESULTS				
STRATUM NO.	NO. OF TESTS	% ORGANIC	NO. OF TESTS	MOISTURE CONTENT	NO. OF TESTS	10 MESH	40 MESH	60 MESH	100 MESH	200 MESH	NO. OF TESTS	LIQUID LIMIT	PLASTIC INDEX	AASHTO GROUP	DESCRIPTION	NO. OF TESTS	RESISTIVITY ohm-cm	CHLORIDE ppm	SULFATES ppm	pH
1	--	--	--	--	4	79-100	43-99	31-94	19-50	5-10	--	--	--	A-3	GRAY TO BROWN SAND TO SAND WITH SILT AND LIMEROCK FRAGMENTS - FILL	4	11,000-21,000	15-30	<5	8.2-8.9
2	--	--	--	--	6	92-94	89-92	81-86	38-46	1-7	--	--	--	A-3	GRAY TO PALE BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH SHELL AND/OR LIMESTONE FRAGMENTS	3	4,400-17,000	15-30	<5-9	7.4-8.1
3	--	--	--	--	8	100	87-99	80-95	34-54	11-14	--	--	--	A-2-4	ORANGE TO BROWN SILTY SAND, OCCASIONALLY WITH LIMEROCK AND/OR SHELL FRAGMENTS	1	6,400	15	<5	8.1
4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	WEATHERED LIMESTONE/CAPROCK	--	--	--	--	--
5	--	--	2	16-19	2	--	--	--	--	21-24	2	28-34	12-18	A-2-6	LIGHT BROWN TO BROWN CLAYEY SAND	--	--	--	--	--
6	2	5-9	2	39-50	2	--	--	--	--	16-38	--	--	--	A-8	DARK BROWN ORGANIC SILTY SAND TO MUCK	--	--	--	--	--
7	--	--	10	18-74	17	100	92-99	84-95	49-62	16-28	10	NP-27	NP-10	A-2-4	ORANGE TO GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND TO CLAYEY SAND	1	3,900	30	<5	7.7

NOTES:

1. THE MATERIAL FROM STRATA 1, 2 AND 3 (A-3/A-2-4) APPEARS SATISFACTORY FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH FDOT STANDARD PLANS, INDEX 120-001.
2. THE MATERIAL FROM STRATUM 7 (A-2-4) APPEARS SATISFACTORY FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH FDOT STANDARD PLANS, INDEX 120-001. HOWEVER, THIS MATERIAL IS LIKELY TO RETAIN EXCESS MOISTURE AND MAY BE DIFFICULT TO DRY AND COMPACT. IT SHOULD BE USED IN THE EMBANKMENT ABOVE THE WATER LEVEL EXISTING AT THE TIME OF CONSTRUCTION.
3. THE MATERIAL FROM STRATUM 5 (A-2-6) IS PLASTIC MATERIAL AND SHALL BE REMOVED IN ACCORDANCE WITH FDOT STANDARD PLANS, INDEX 120-002 AND UTILIZED IN ACCORDANCE WITH FDOT STANDARD PLANS, INDEX 120-001. THE REMOVAL LIMITS WILL BE DEPICTED ON THE ROADWAY CROSS-SECTIONS AS NECESSARY FOR FUTURE PLAN SUBMITTALS.
4. THE MATERIAL FROM STRATUM 6 (A-8) IS MUCK MATERIAL AND SHALL BE REMOVED IN ACCORDANCE WITH FDOT STANDARD PLANS, INDEX 120-002 AND UTILIZED IN ACCORDANCE WITH FDOT STANDARD PLANS, INDEX 120-001. THE REMOVAL LIMITS WILL BE DEPICTED ON THE ROADWAY CROSS-SECTIONS AND ON THE MUCK DELINEATION SHEETS FOR FUTURE SUBMITTALS.
5. THE MATERIAL FROM STRATUM 4 IS WEATHERED LIMESTONE/CAPROCK. THIS MATERIAL IS ROCK. EXCAVATIONS INTO AND/OR THROUGH LIMESTONE/CAPROCK WILL BE DIFFICULT AND WILL REQUIRE NON CONVENTIONAL CONSTRUCTION TECHNIQUES AND SPECIALIZED EQUIPMENT. LIMESTONE/CAPROCK IS POROUS AND WILL BE DIFFICULT TO DEWATER.

EMBANKMENT AND SUBGRADE MATERIAL

STRATA BOUNDARIES ARE APPROXIMATE. MAKE FINAL CHECK AFTER GRADING.

▼ - WATER TABLE ENCOUNTERED

▼+ - WATER TABLE ENCOUNTERED ABOVE EXISTING GRADE DURING FIELD EXPLORATIONS

▽ - ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

GNE - GROUNDWATER NOT ENCOUNTERED

GNA - GROUNDWATER NOT APPARENT DUE TO THE INTRODUCTION OF DRILLING FLUID

NP - NON-PLASTIC

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

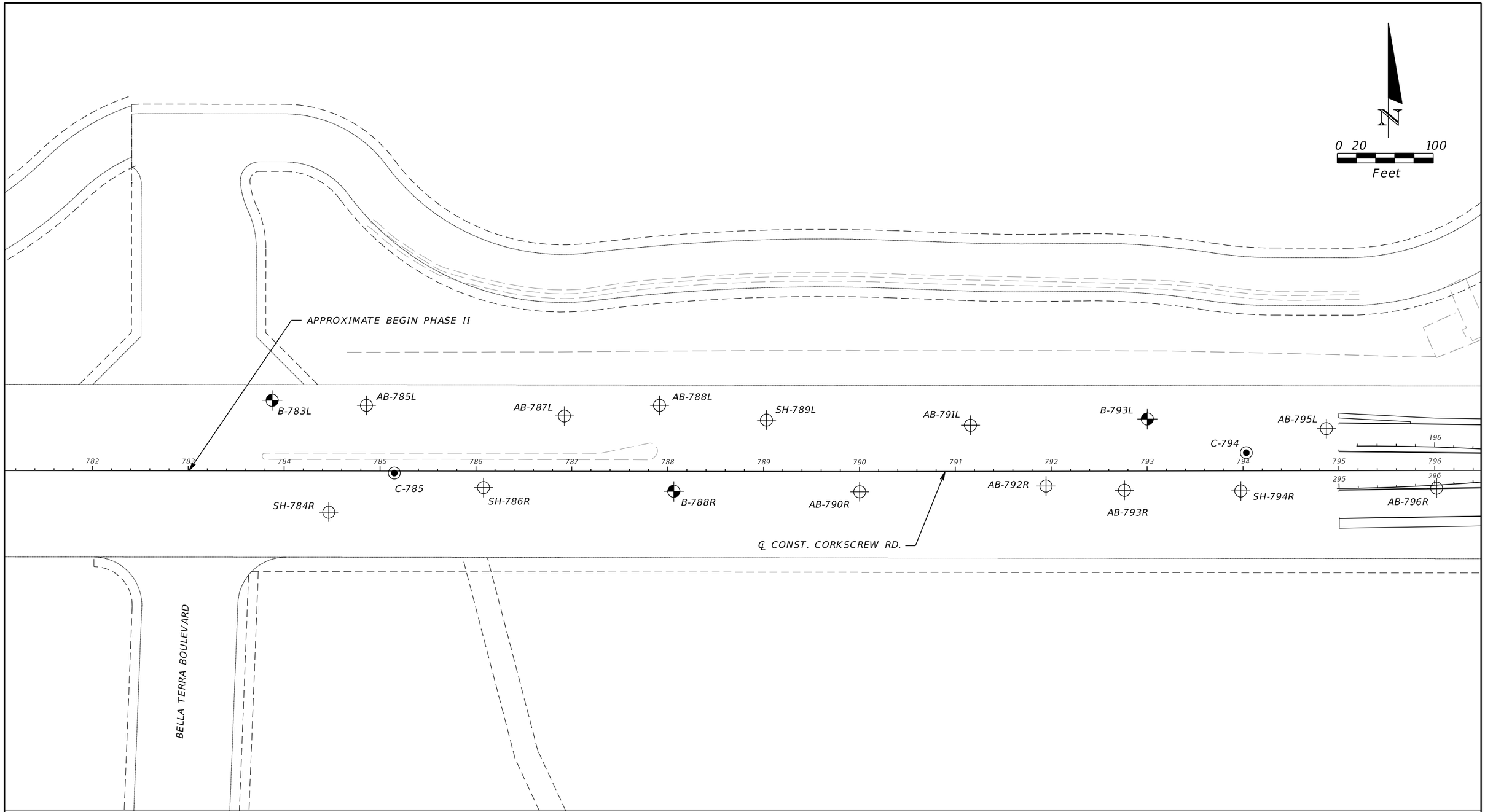
THOMAS E. MUSGRAVE, JR., P.E.
P.E. LICENSE NUMBER 81669
TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

ROADWAY SOIL SURVEY

SHEET NO.



LEGEND

- APPROXIMATE AUGER BORING LOCATION
- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE PAVEMENT CORE LOCATION

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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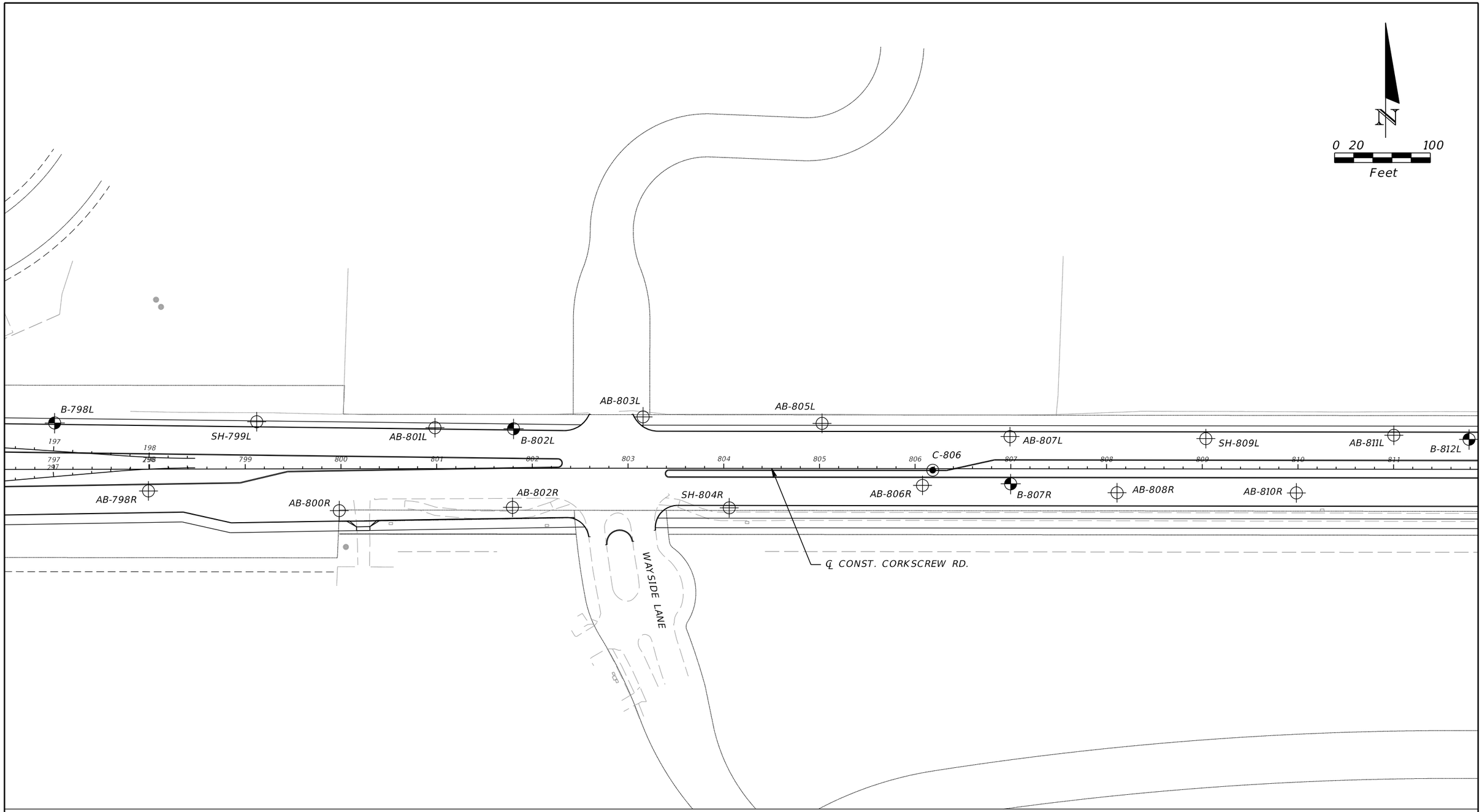
TAMPA, FLORIDA 33637

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

BORING LOCATION PLAN (1)

SHEET NO.



LEGEND

- APPROXIMATE AUGER BORING LOCATION
- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE PAVEMENT CORE LOCATION

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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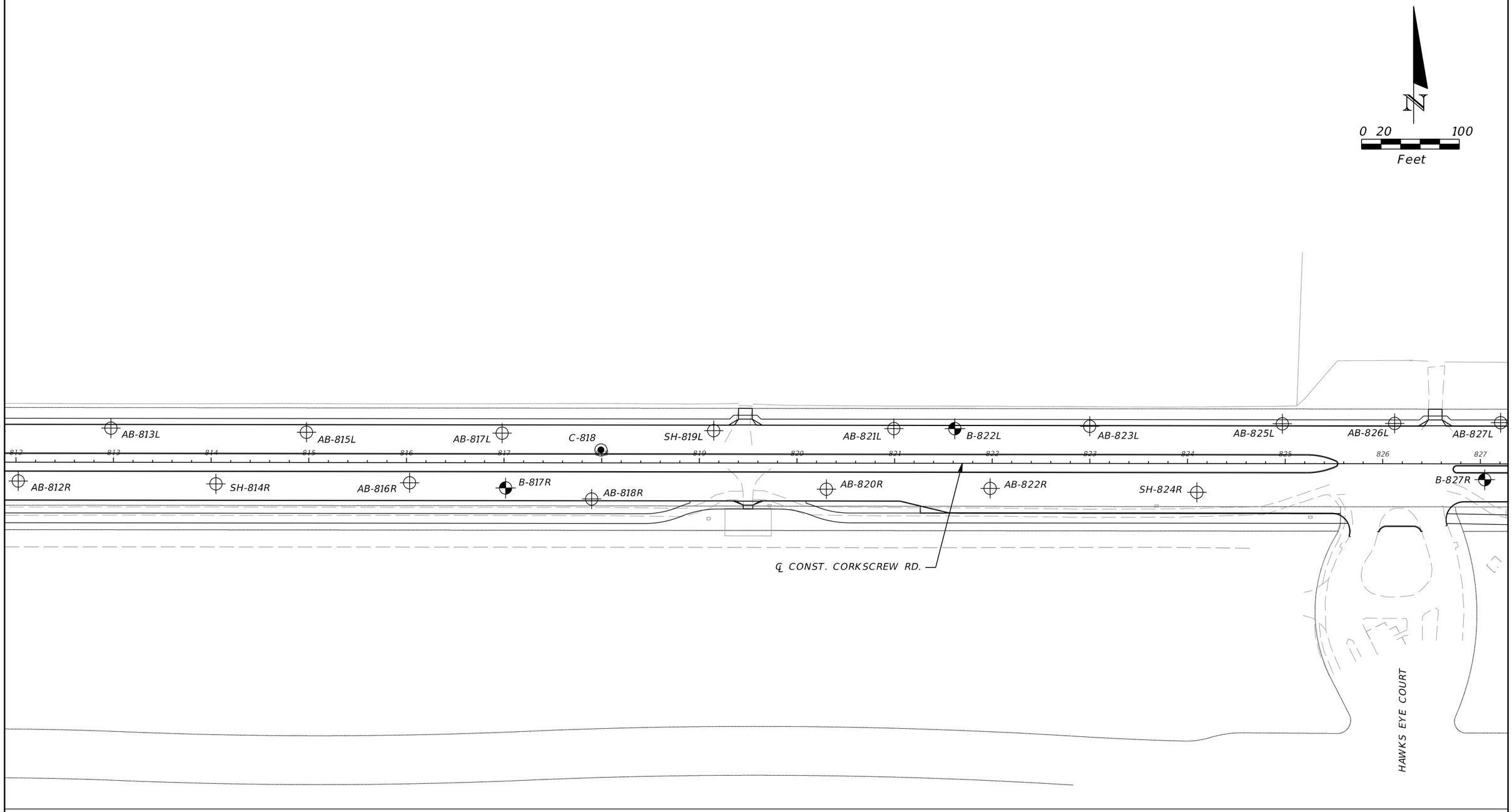
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

BORING LOCATION PLAN (2)

SHEET NO.



LEGEND

- APPROXIMATE AUGER BORING LOCATION
- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE PAVEMENT CORE LOCATION

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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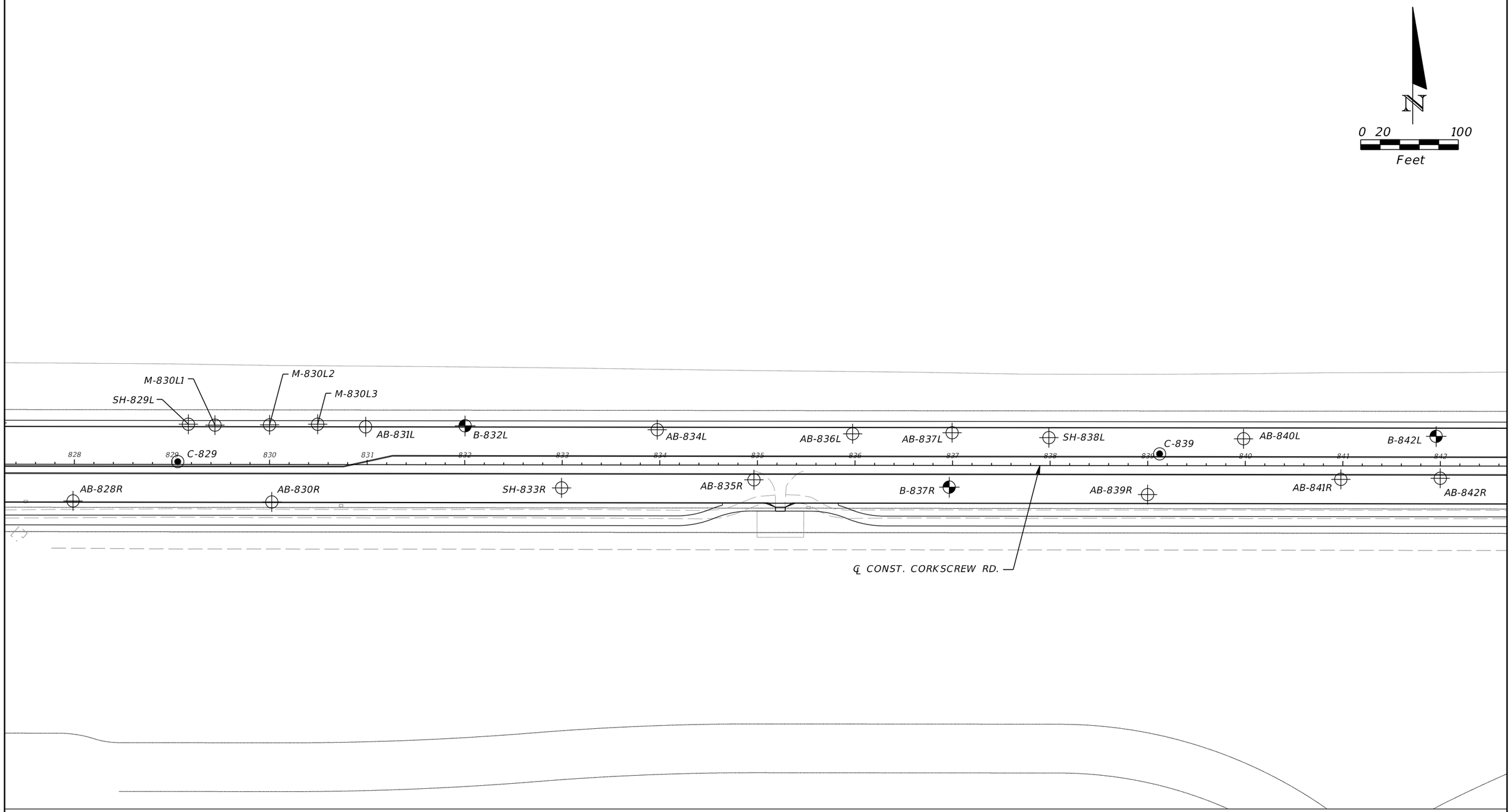
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

BORING LOCATION PLAN (3)

SHEET NO.



LEGEND

- APPROXIMATE AUGER BORING LOCATION
- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE PAVEMENT CORE LOCATION

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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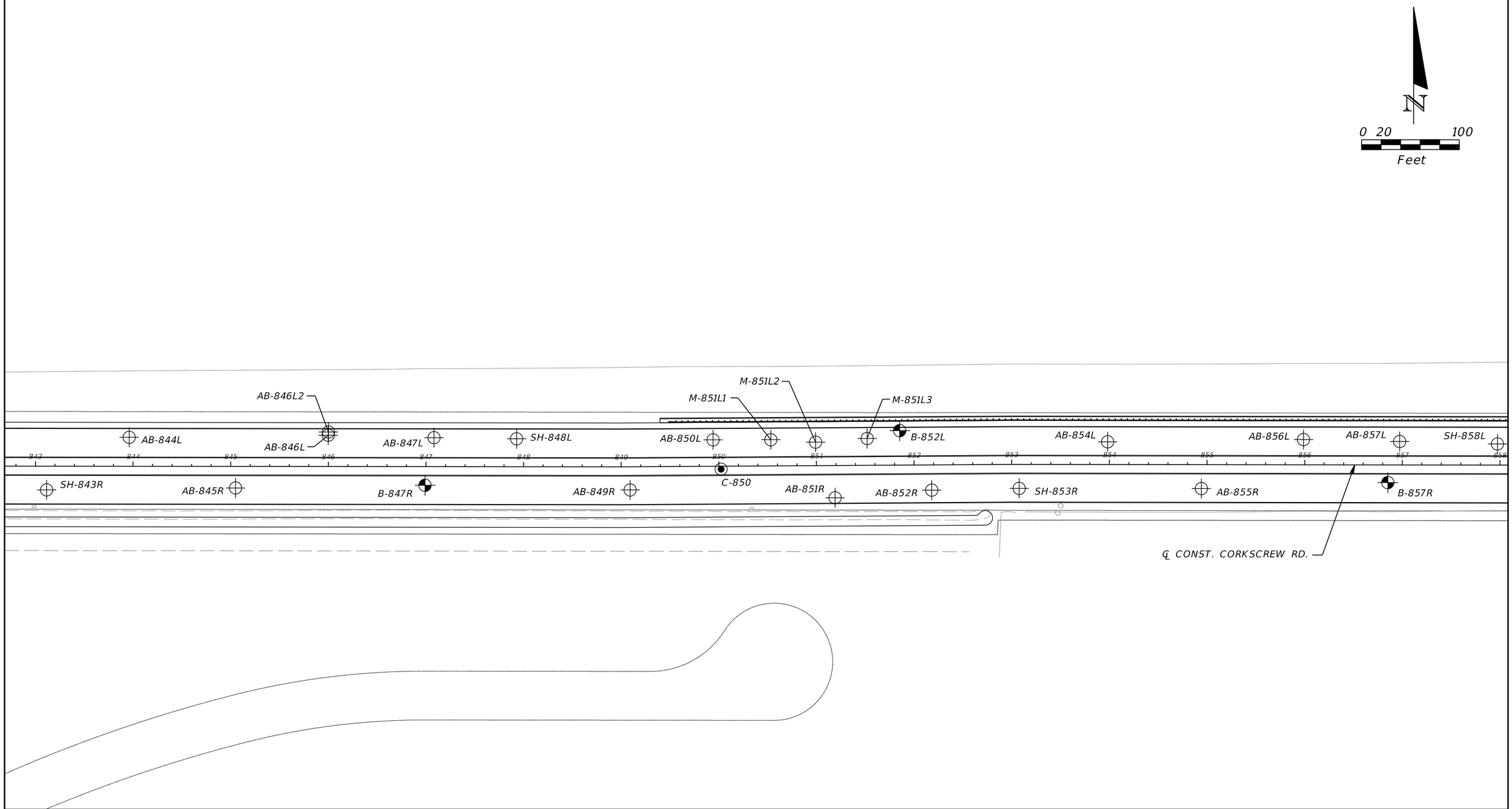
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

BORING LOCATION PLAN (4)

SHEET NO.



LEGEND

- APPROXIMATE AUGER BORING LOCATION
- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE PAVEMENT CORE LOCATION

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

THOMAS E. MUSGRAVE, JR., P.E.
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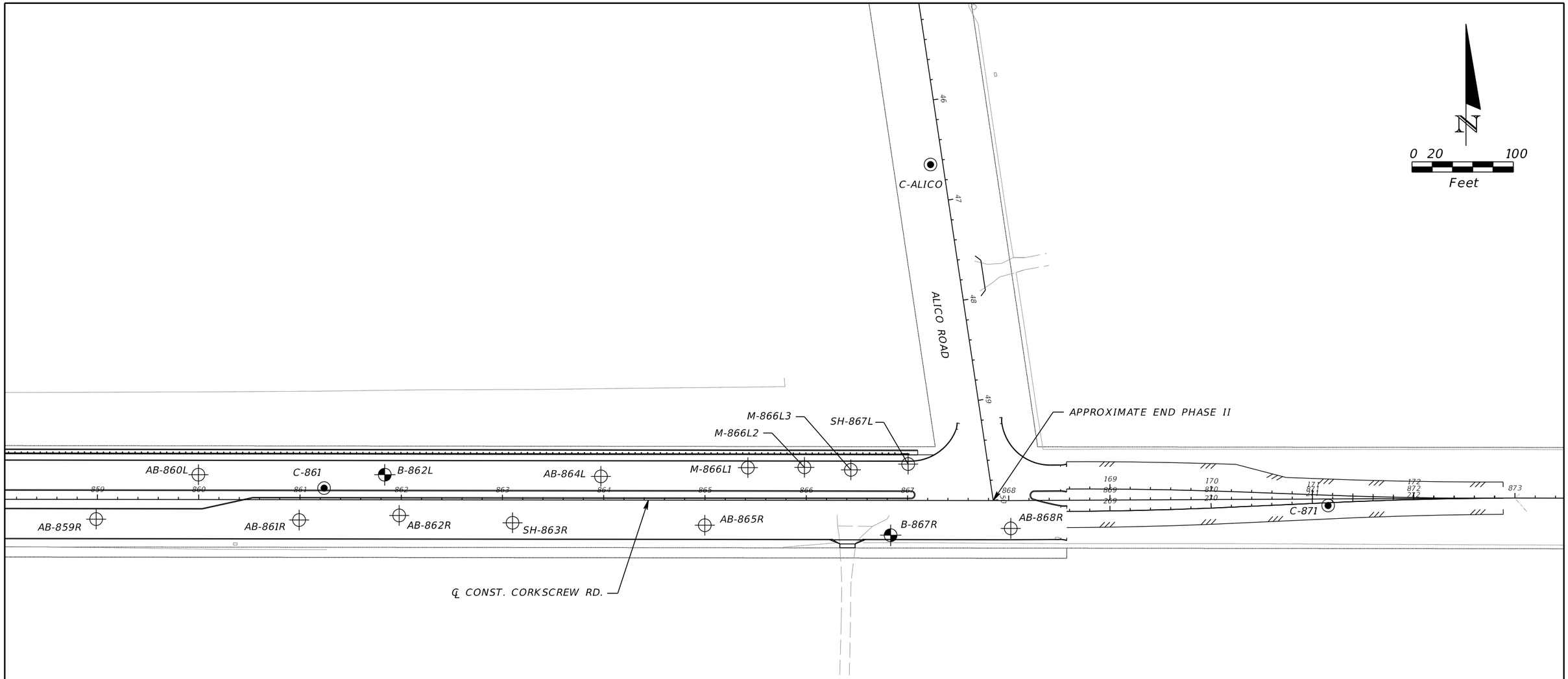
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

BORING LOCATION PLAN (5)

SHEET NO.



LEGEND

- APPROXIMATE AUGER BORING LOCATION
- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE PAVEMENT CORE LOCATION

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

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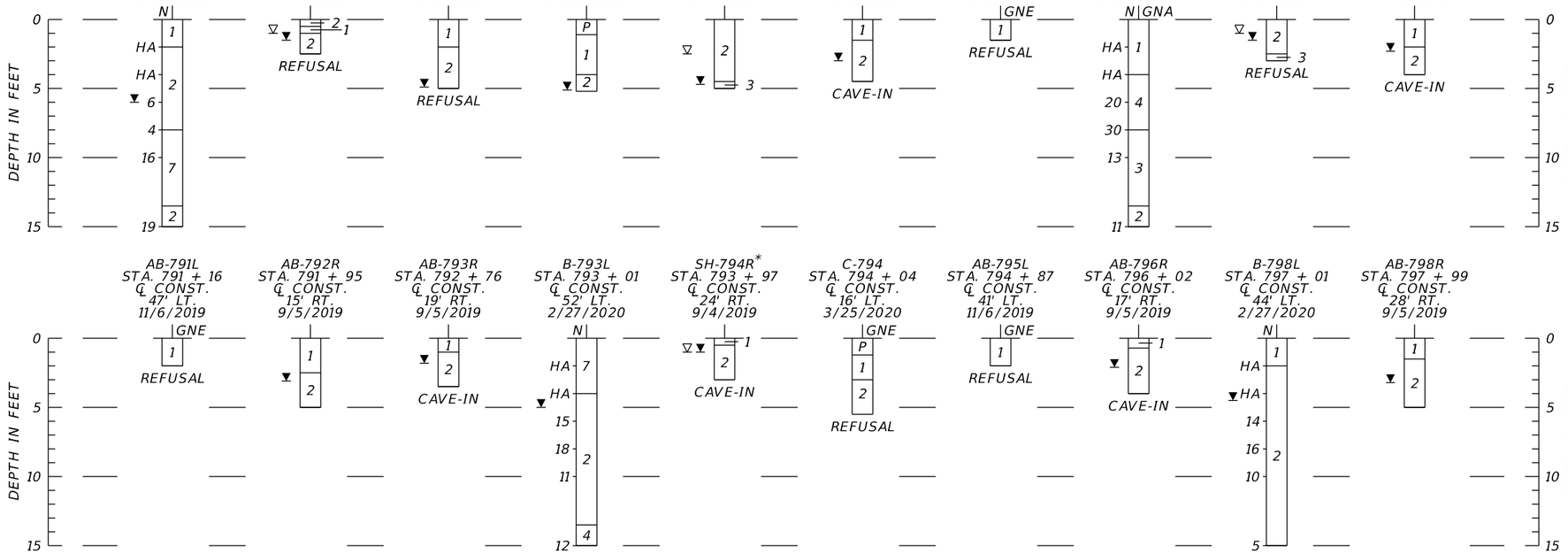
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

BORING LOCATION PLAN (6)

SHEET NO.



LEGEND

1.	GRAY TO BROWN SAND TO SAND WITH SILT AND LIMEROCK FRAGMENTS - FILL (A-3)
2.	GRAY TO PALE BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH SHELL AND/OR LIMESTONE FRAGMENTS (A-3)
3.	ORANGE TO BROWN SILTY SAND, OCCASIONALLY WITH LIMEROCK AND/OR SHELL FRAGMENTS (A-2-4)
4.	WEATHERED LIMESTONE/CAPROCK
5.	LIGHT BROWN TO BROWN CLAYEY SAND (A-2-6)
6.	DARK BROWN ORGANIC SILTY SAND TO MUCK (A-8)
7.	ORANGE TO GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND TO CLAYEY SAND (A-2-4)
P	ASPHALT PAVEMENT AND/OR BASE MATERIAL
A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
▽	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
▼	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼+	GROUNDWATER LEVEL ENCOUNTERED ABOVE EXISTING GRADE DURING FIELD EXPLORATIONS
GNE	GROUNDWATER NOT ENCOUNTERED
GNA	GROUNDWATER NOT APPARENT DUE TO THE INTRODUCTION OF DRILLING FLUID.
CAVE-IN	BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION
REFUSAL	BORING TERMINATED DUE TO REFUSAL CONDITIONS ON LIMEROCK AND/OR CAPROCK AND/OR CEMENTED SANDS
℄ CONST.	CENTERLINE CONSTRUCTION OF CORKSCREW ROAD

NOTES:

1. THE LOCATIONS OF THE BORINGS DENOTED WITH AN ASTERISK ("*") WERE PROVIDED BY THE PROJECT SURVEYOR. THE LOCATIONS OF THE REMAINING BORINGS WERE DETERMINED IN THE FIELD USING HAND-HELD, NON-SURVEY GRADE GLOBAL POSITIONING SYSTEM (GPS) EQUIPMENT WITH A MANUFACTURER'S REPORTED ACCURACY OF 10 FEET AND SHOULD BE CONSIDERED APPROXIMATE. STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED USING THE SURVEYED/ESTIMATED GPS COORDINATES IN CONJUNCTION WITH PROJECT DESIGN FILES PROVIDED BY JOHNSON ENGINEERING, INC.
2. THE SPT BORINGS WERE PERFORMED UTILIZING AN AUTOMATIC HAMMER.

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

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

THOMAS E. MUSGRAVE, JR., P.E.
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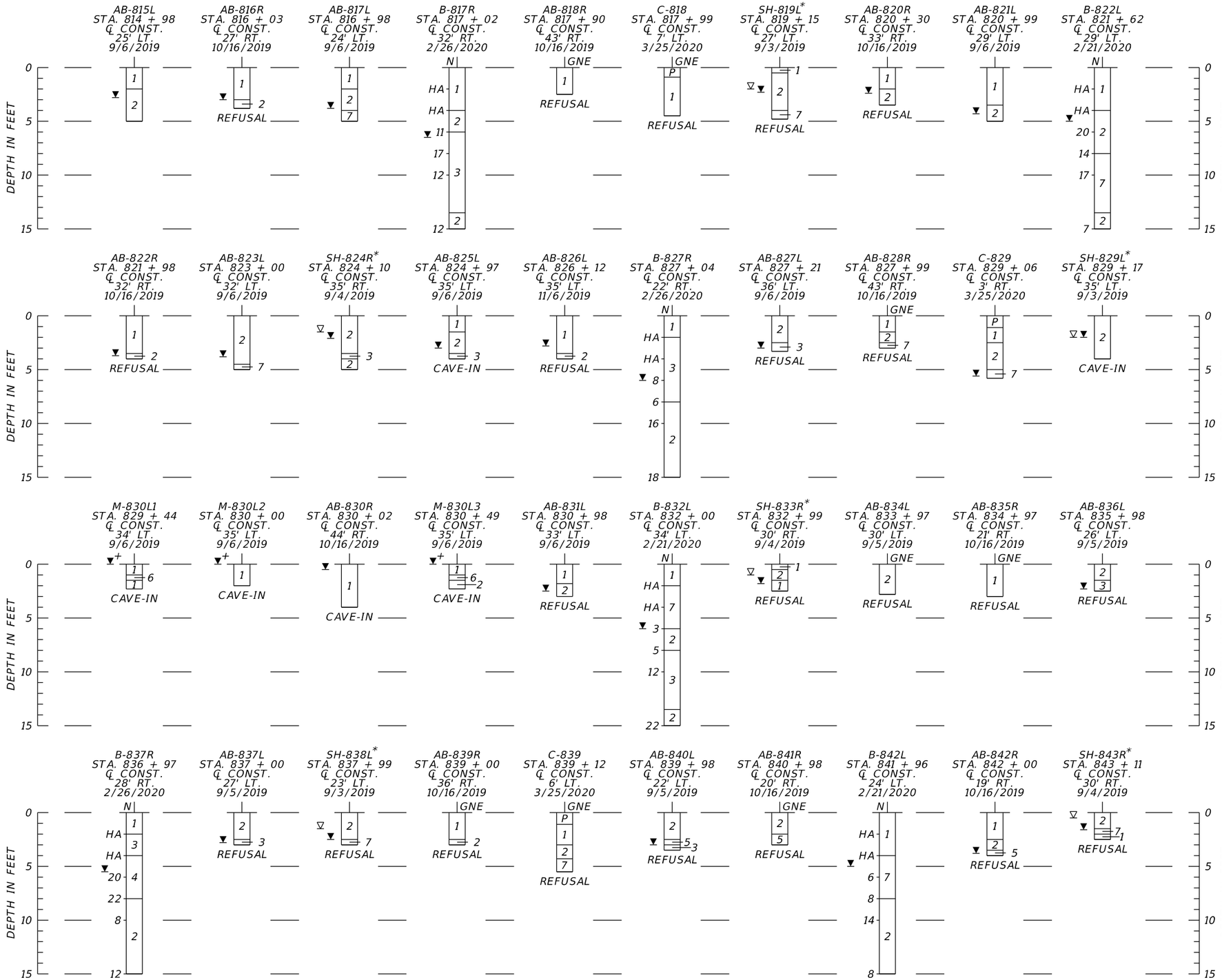
TAMPA, FLORIDA 33637

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

ROADWAY SOIL PROFILES (1)

SHEET NO.



LEGEND

1.	GRAY TO BROWN SAND TO SAND WITH SILT AND LIMEROCK FRAGMENTS - FILL (A-3)
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3.	ORANGE TO BROWN SILTY SAND, OCCASIONALLY WITH LIMEROCK AND/OR SHELL FRAGMENTS (A-2-4)
4.	WEATHERED LIMESTONE/CAPROCK
5.	LIGHT BROWN TO BROWN CLAYEY SAND (A-2-6)
6.	DARK BROWN ORGANIC SILTY SAND TO MUCK (A-8)
7.	ORANGE TO GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND TO CLAYEY SAND (A-2-4)
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▼	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼+	GROUNDWATER LEVEL ENCOUNTERED ABOVE EXISTING GRADE DURING FIELD EXPLORATIONS
GNE	GROUNDWATER NOT ENCOUNTERED
GNA	GROUNDWATER NOT APPARENT DUE TO THE INTRODUCTION OF DRILLING FLUID.
CAVE-IN	BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION
REFUSAL	BORING TERMINATED DUE TO REFUSAL CONDITIONS ON LIMEROCK AND/OR CAPROCK AND/OR CEMENTED SANDS
℄ CONST.	CENTERLINE CONSTRUCTION OF CORKSCREW ROAD

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REVISIONS

DATE	DESCRIPTION	DATE	DESCRIPTION

THOMAS E. MUSGRAVE, JR., P.E.
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7351 TEMPLE TERRACE HIGHWAY
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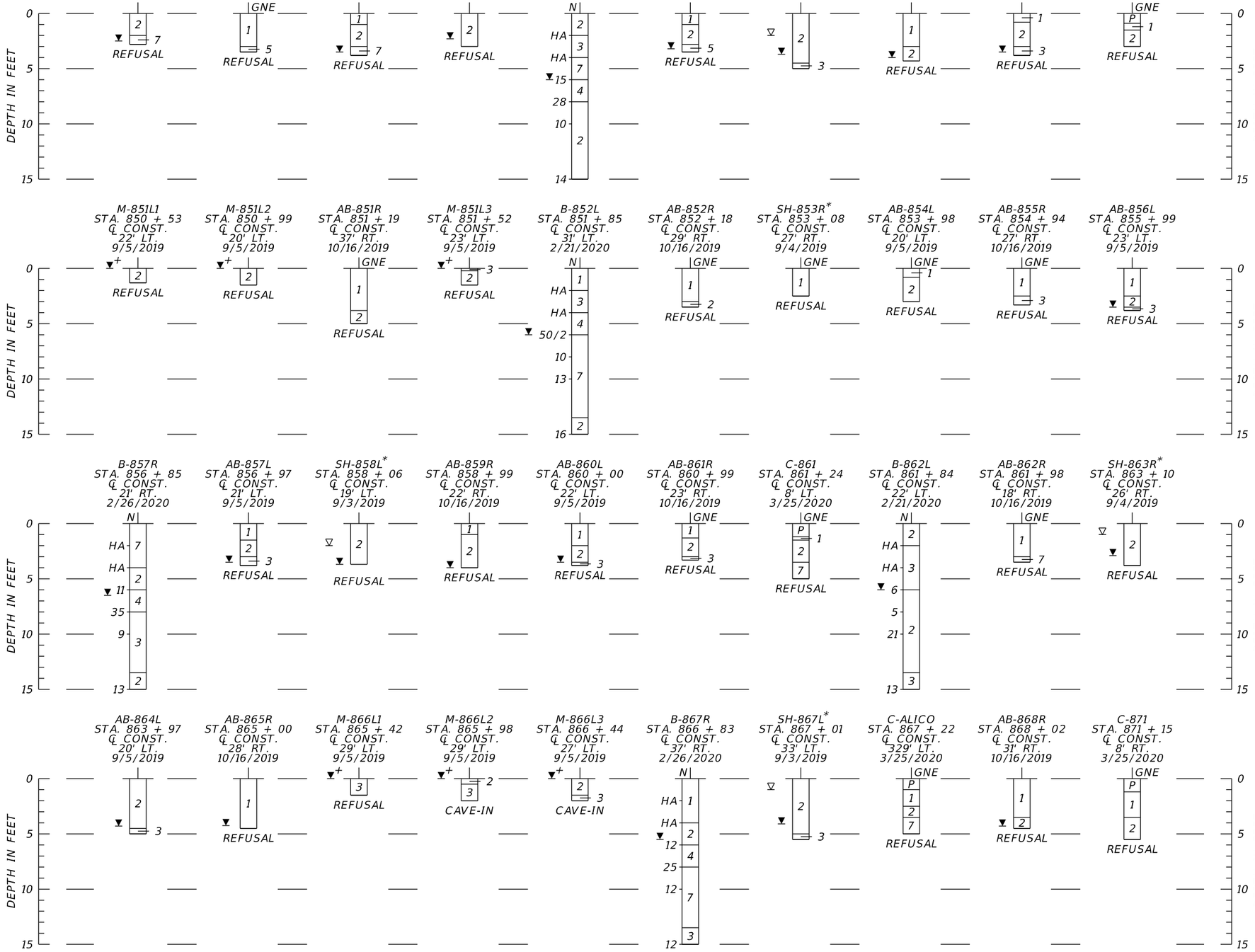
LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

ROADWAY SOIL PROFILES (2)

SHEET NO.



LEGEND

1.	GRAY TO BROWN SAND TO SAND WITH SILT AND LIMEROCK FRAGMENTS - FILL (A-3)
2.	GRAY TO PALE BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH SHELL AND/OR LIMESTONE FRAGMENTS (A-3)
3.	ORANGE TO BROWN SILTY SAND, OCCASIONALLY WITH LIMEROCK AND/OR SHELL FRAGMENTS (A-2-4)
4.	WEATHERED LIMESTONE/CAPROCK
5.	LIGHT BROWN TO BROWN CLAYEY SAND (A-2-6)
6.	DARK BROWN ORGANIC SILTY SAND TO MUCK (A-8)
7.	ORANGE TO GRAY TO BROWN SILTY SAND TO SILTY-CLAYEY SAND TO CLAYEY SAND (A-2-4)
P	ASPHALT PAVEMENT AND/OR BASE MATERIAL
A-3	AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
▽	ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
▼	GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
▼+	GROUNDWATER LEVEL ENCOUNTERED ABOVE EXISTING GRADE DURING FIELD EXPLORATIONS
GNE	GROUNDWATER NOT ENCOUNTERED
GNA	GROUNDWATER NOT APPARENT DUE TO THE INTRODUCTION OF DRILLING FLUID.
CAVE-IN	BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION
REFUSAL	BORING TERMINATED DUE TO REFUSAL CONDITIONS ON LIMEROCK AND/OR CAPROCK AND/OR CEMENTED SANDS
℄ CONST.	CENTERLINE CONSTRUCTION OF CORKSCREW ROAD

NOTES:

1. THE LOCATIONS OF THE BORINGS DENOTED WITH AN ASTERISK ("*") WERE PROVIDED BY THE PROJECT SURVEYOR. THE LOCATIONS OF THE REMAINING BORINGS WERE DETERMINED IN THE FIELD USING HAND-HELD, NON-SURVEY GRADE GLOBAL POSITIONING SYSTEM (GPS) EQUIPMENT WITH A MANUFACTURER'S REPORTED ACCURACY OF 10 FEET AND SHOULD BE CONSIDERED APPROXIMATE. STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED USING THE SURVEYED/ESTIMATED GPS COORDINATES IN CONJUNCTION WITH PROJECT DESIGN FILES PROVIDED BY JOHNSON ENGINEERING, INC.
2. THE SPT BORINGS WERE PERFORMED UTILIZING AN AUTOMATIC HAMMER.

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

REVISIONS			
DATE	DESCRIPTION	DATE	DESCRIPTION

THOMAS E. MUSGRAVE, JR., P.E.
P.E. LICENSE NUMBER 81669
TIERRA, INC.
7351 TEMPLE TERRACE HIGHWAY
TAMPA, FLORIDA 33637

LEE COUNTY PUBLIC WORKS
DEPARTMENT OF TRANSPORTATION

ROAD NO.	COUNTY	COUNTY PROJECT NO.
CR 850	LEE	CN180576ANB

ROADWAY SOIL PROFILES (3)

SHEET NO.

APPENDIX C

Summary of Seasonal High Groundwater Table Estimates

SUMMARY OF SEASONAL HIGH GROUNDWATER TABLE ESTIMATES
CORKSCREW ROAD WIDENING FROM BEN HILL GRIFFIN PARKWAY TO ALICO ROAD
LEE COUNTY, FLORIDA
LEE COUNTY PROJECT NO.: CN180576ANB
TIERRA PROJECT NO.: 6511-19-046

Boring Name	Boring Location[1] C/L Const.		Reference[7]	Boring Depth[2] (feet)	Ground Elevation[1] (feet, NAVD 88)	Measured Groundwater Table			USDA Soil Survey		Estimated SHGWT[5]	
	Station (feet)	Offset (feet)				Date Recorded	Depth[2] (feet)	Elevation (feet, NAVD88)	Map Symbol	Estimated SHGWT[4] Depth (feet)	Depth (feet)	Elevation (feet, NAVD88)
SH-784R	784+47	43' RT.	C/L CONST.	2.5	19.6	9/4/2019	1.5	18.1	129	0.3-1.5	1.0	18.6
SH-786R	786+08	17' RT.	C/L CONST.	5.0	20.9	9/5/2019	4.7	16.2	129	0.3-1.5	2.5	18.4
SH-789L	789+03	54' LT.	C/L CONST.	3.0	20.0	9/3/2019	1.5	18.5	26	0.0-1.0	1.0	19.0
SH-794R	793+97	24' RT.	C/L CONST.	3.0	20.3	9/4/2019	1.0	19.3	129	0.3-1.5	1.0	19.3
SH-799L	799+12	43' LT.	C/L CONST.	2.1	20.1	9/13/2019	GNE[3]	< 18.0	26	0.0-1.0	N.D.[6]	N.D.[6]
SH-804R	804+06	47' RT.	C/L CONST.	5.0	21.4	9/4/2019	4.4	17.0	129	0.3-1.5	2.5	18.9
SH-809L	809+04	26' LT.	C/L CONST.	3.0	21.0	9/3/2019	2.0	19.0	26	0.0-1.0	1.5	19.5
SH-814R	814+05	28' RT.	C/L CONST.	2.5	20.0	9/4/2019	0.8	19.2	129	0.3-1.5	0.5	19.5
SH-819L	819+15	27' LT.	C/L CONST.	4.8	21.2	9/3/2019	2.3	18.9	13	0.5-1.5	2.0	19.2
SH-824R	824+10	35' RT.	C/L CONST.	5.0	20.6	9/4/2019	2.1	18.5	102	0.3-1.5	1.5	19.1
SH-829L	829+17	35' LT.	C/L CONST.	4.0	20.8	9/3/2019	2.0	18.8	6	0.0-1.0	2.0	18.8
SH-833R	832+99	30' RT.	C/L CONST.	2.5	19.8	9/4/2019	1.8	18.0	64	0.5-1.5	1.0	18.8
SH-838L	837+99	23' LT.	C/L CONST.	3.0	20.7	9/3/2019	2.5	18.2	13	0.5-1.5	1.5	19.2
SH-843R	843+11	30' RT.	C/L CONST.	2.5	19.7	9/4/2019	1.6	18.1	102	0.3-1.5	0.5	19.2
SH-848L	847+93	23' LT.	C/L CONST.	5.0	21.3	9/3/2019	3.7	17.6	6	0.0-1.0	2.0	19.3
SH-853R	853+08	27' RT.	C/L CONST.	2.5	19.8	9/4/2019	GNE[3]	< 17.3	6	0.0-1.0	N.D.[6]	N.D.[6]
SH-858L	858+06	19' LT.	C/L CONST.	3.5	21.6	9/3/2019	3.7	17.9	6	0.0-1.0	2.0	19.6
SH-863R	863+10	26' RT.	C/L CONST.	3.8	20.6	9/4/2019	2.9	17.7	6	0.0-1.0	1.0	19.6
SH-867L	867+01	33' LT.	C/L CONST.	5.5	21.2	9/3/2019	4.1	17.1	6	0.0-1.0	1.0	20.2

[1] The boring locations and ground elevations were provided by the project surveyor.

[2] Depth below existing grades at time of augering.

[3] GNE: Groundwater not encountered within the depth of the boring performed.

[4] Seasonal high groundwater table depth based on the Lee County, Florida USDA Soil Survey information.

[5] Seasonal high groundwater table depth estimated based on soil stratigraphy, measured groundwater levels from the borings, the Lee County, Florida USDA Soil Survey information, Lee County well monitoring data and High Water Table Maps, and past experience with similar soil conditions in the project area.

[6] N.D.: Seasonal high groundwater table could not be determined due to lack of natural indicators.

[7] Boring locations are referenced to Centerline Construction of Corkscrew Road.

APPENDIX D

Pavement Data Table

Representative Photographs of Pavement Cores

Design LBR Calculation

Pavement Data Table
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Core No.	Core Location[1] (C/L Const. Corkscrew Road)		Roadway Alignment	Lane Designation	Asphalt Pavement Layers[2]				Total Asphalt Thickness (inches)	Base Material		Subgrade		Crack Depth (inches)	Pavement Condition[4]	Rut Depth (inches)	Cross Slope (%)	Depth to Groundwater Table[3] (feet)	Comments
					Type		Thickness (inches)												
	Station (feet)	Offset (feet)			Layer 1	Layer 2	Layer 1	Layer 2		Type	Thickness (inches)	Type	Depth[3] (feet)						
C-785	785+15	2' RT.	Corkscrew Rd.	R1	S-I	--	3.7	--	3.7	Limerock with Shell	9.8	A-3	1.1 to 5.2	N/A[5]	Good	N/A[6]	3.3	5.1	
C-794	794+04	16' LT.	Corkscrew Rd.	L1	S-I	--	1.5	--	1.5	Limerock with Shell	13.0	A-3	1.2 to 5.5	N/A[5]	Poor	0.5	3.7	GNE[7]	Auger refusal on hard material at a depth of 5.5 feet.
C-806	806+18	8' RT.	Corkscrew Rd.	R1	S-I	--	3.1	--	3.1	Limerock with Shell	8.9	A-3	1.0 to 5.0	3.1	Fair	N/A[6]	2.6	4.9	Full depth crack observed in core.
C-818	817+99	7' LT.	Corkscrew Rd.	L1	S-I	--	3.6	--	3.6	Limerock with Shell	7.3	A-3	0.9 to 4.5	3.6	Poor	0.1	2.6	GNE[7]	Full depth crack observed in core. Auger refusal on hard material at a depth of 4.5 feet.
C-829	829+06	3' RT.	Corkscrew Rd.	R1	S-I	--	2.5	--	2.5	Limerock with Shell	10.5	A-3	1.1 to 5.0	N/A[5]	Good	N/A[6]	1.9	5.6	
												A-2-4	5.0 to 5.8						
C-839	839+12	6' LT.	Corkscrew Rd.	L1	S-I	--	3.8	--	3.8	Limerock with Shell	9.5	A-3	1.1 to 4.3	3.8	Poor	N/A[6]	0.9	GNE[7]	Full depth crack observed in core. Auger refusal on caprock at a depth of 5.5 feet.
												A-2-4	4.3 to 5.5						
C-850	850+02	8' RT.	Corkscrew Rd.	R1	S-I	--	5.2	--	5.2	Limerock with Shell	6.1	A-3	0.9 to 3.0	N/A[5]	Good	N/A[6]	2.3	GNE[7]	Auger refusal on hard material at a depth of 3 feet.
C-861	861+24	8' LT.	Corkscrew Rd.	L1	S-I	--	3.3	--	3.3	Limerock with Shell	11.3	A-3	1.2 to 3.5	3.3	Poor	0.3	1.0	GNE[7]	Full depth crack observed in core. Auger refusal on caprock at a depth of 5 feet.
												A-2-4	3.5 to 5.0						
C-ALICO	867+22	329' LT.	Alico Rd.	L1	S-I	S-I	2.0	2.4	4.4	Limerock with Shell	7.3	A-3	1.0 to 3.5	4.4	Poor	0.6	0.7	GNE[7]	Full depth crack observed in core. Auger refusal on caprock at a depth of 5 feet.
												A-2-4	3.5 to 5.0						
C-871	871+15	8' RT.	Corkscrew Rd.	L1	S-I	--	3.1	--	3.1	Limerock with Shell	10.8	A-3	1.2 to 5.5	N/A[5]	Fair	0.1	0.7	GNE[7]	Auger refusal on caprock at a depth of 5.5 feet.

Notes:

[1] The pavement core locations were determined in the field using hand-held, non-survey grade Global Positioning System (GPS) equipment with a manufacturer's reported accuracy of ± 10 feet and should be considered approximate. Station and offset of the pavement core locations were determined using the estimated GPS coordinates in conjunction with project design files provided by Johnson Engineering, Inc.

[2] Pavement layer identification based on visual review using FDOT Mixture nomenclature. Actual pavement may be a local mix. Pavement layers are classified in descending order from the top of the core sample to the bottom.

[3] Depth measured from top of pavement.

[4] Pavement condition based on visual observation only: Good, Fair, or Poor.

[5] No cracks were observed within the pavement core.

[6] No measurable ruts observed.

[7] Groundwater not encountered within the depth of the boring.

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 1. Field View of Pavement Core C-785

Photograph 2. Side View of Pavement Core C-785

Photograph 3. Top View of Pavement Core C-785

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 4. Field View of Pavement Core C-794

Photograph 5. Side View of Pavement Core C-794

Photograph 6. Top View of Pavement Core C-794

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 7. Field View of Pavement Core C-806

Photograph 8. Side View of Pavement Core C-806

Photograph 9. Top View of Pavement Core C-806

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 10. Field View of Pavement Core C-818

Photograph 11. Side View of Pavement Core C-818

Photograph 12. Top View of Pavement Core C-818

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 13. Field View of Pavement Core C-829

Photograph 14. Side View of Pavement Core C-829

Photograph 15. Top View of Pavement Core C-829

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 16. Field View of Pavement Core C-839

Photograph 17. Side View of Pavement Core C-839

Photograph 18. Top View of Pavement Core C-839

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 19. Field View of Pavement Core C-850

Photograph 20. Side View of Pavement Core C-850

Photograph 21. Top View of Pavement Core C-850

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 22. Field View of Pavement Core C-861

Photograph 23. Side View of Pavement Core C-861

Photograph 24. Top View of Pavement Core C-861

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 25. Field View of Pavement Core C-871

Photograph 26. Side View of Pavement Core C-871

Photograph 27. Top View of Pavement Core C-871

Representative Photographs of Pavement Cores
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Photograph 28. Field View of Pavement Core C-ALICO

Photograph 29. Side View of Pavement Core C-ALICO

Photograph 30. Top View of Pavement Core C-ALICO

Design LBR Calculation
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046
2% of Optimum Method

Test No.	Bulk Sample Boring Location	Maximum LBR	LBR at Moisture Contents (of Optimum LBR):	
			- 2%	+ 2%
LBR # 1	AB-810R	45	39	44
LBR # 2	AB-813L	56	52	46
LBR # 3	AB-816R	62	48	62
LBR # 4	AB-826L	57	47	55
LBR # 5	SH-843R	60	58	44
LBR # 6	AB-868R	64	58	55
Mean LBR Value		57	50	51

Design LBR = 40

Design M_R (Resilent Modulus) [(1)] = 12,000 psi

[(1)] Based on 2020 FDOT Flexible Pavement Manual for conversion of LBR to M_R.

Design LBR Calculation
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046
90% Method

Test No.	Bulk Sample Boring Location	Maximum LBR	Rank	Percent of Samples with equal or greater value
LBR # 6	AB-868R	64	1	17
LBR # 3	AB-816R	62	2	33
LBR # 5	SH-843R	60	3	50
LBR # 4	AB-826L	57	4	67
LBR # 2	AB-813L	56	5	83
LBR # 1	AB-810R	45	6	100
Design LBR = 40				
Design M_R (Resilent Modulus) [(1)] = 12,000 psi				

[(1)] Based on 2020 FDOT Flexible Pavement Manual for conversion of LBR to M_R.

APPENDIX E

Summary of Laboratory Test Results for Soil Classification

Summary of Laboratory Test Results for Environmental Classification

Limerock Bearing Ratio Test Results

Summary of Laboratory Test Results for Soil Classification
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Boring Name	Depth (feet)	Stratum	AASHTO Symbol	Sieve Analysis (% Passing)					Atterberg Limits			Organic Content (%)	Natural Moisture Content (%)
				#10	#40	#60	#100	#200	LL	PL	PI		
B-783L	0.0 - 2.0	1	A-3	79	43	31	19	10	--	--	--	--	--
B-812L	0.0 - 2.0	1	A-3	100	99	94	50	8	--	--	--	--	--
B-822L	0.0 - 4.0	1	A-3	100	98	92	46	6	--	--	--	--	--
B-842L	0.0 - 4.0	1	A-3	100	97	87	37	5	--	--	--	--	--
AB-793R	2.0 - 2.5	2	A-3	--	--	--	--	1	--	--	--	--	--
B-802L	2.0 - 6.0	2	A-3	92	89	81	38	5	--	--	--	--	--
B-807R	0.0 - 4.0	2	A-3	94	92	86	46	7	--	--	--	--	--
SH-809L	2.0 - 2.5	2	A-3	--	--	--	--	4	--	--	--	--	--
SH-814R	1.5 - 2.5	2	A-3	--	--	--	--	1	--	--	--	--	--
SH-848L	1.5 - 2.0	2	A-3	--	--	--	--	4	--	--	--	--	--
AB-840L	3.0 - 3.5	3	A-2-4	--	--	--	--	12	--	--	--	--	--
B-802L	8.0 - 10.0	3	A-2-4	100	98	95	54	13	--	--	--	--	--
B-812L	6.0 - 8.0	3	A-2-4	100	99	94	53	14	--	--	--	--	--
B-817R	8.0 - 10.0	3	A-2-4	--	--	--	--	13	--	--	--	--	--
B-827R	2.0 - 4.0	3	A-2-4	--	--	--	--	13	--	--	--	--	--
B-837R	2.0 - 4.0	3	A-2-4	100	99	92	48	11	--	--	--	--	--
B-862L	2.0 - 6.0	3	A-2-4	100	99	92	50	11	--	--	--	--	--
B-867R	13.5 - 15.0	3	A-2-4	100	87	80	34	14	--	--	--	--	--
AB-840L	2.5 - 3.0	5	A-2-6	--	--	--	--	21	28	16	12	--	16
AB-847L	2.8 - 3.5	5	A-2-6	--	--	--	--	24	34	16	18	--	19
M-830L1	1.0 - 1.5	6	A-8	--	--	--	--	16	--	--	--	5	39
M-830L3	1.0 - 1.5	6	A-8	--	--	--	--	38	--	--	--	9	50
AB-817L	4.0 - 4.5	7	A-2-4	--	--	--	--	21	27	17	10	--	21
AB-844L	2.0 - 2.8	7	A-2-4	--	--	--	--	20	27	18	9	--	19
AB-846L	3.0 - 3.8	7	A-2-4	--	--	--	--	20	23	16	7	--	19
B-783L	8.0 - 10.0	7	A-2-4	100	99	95	57	16	--	--	--	--	--
B-793L	2.0 - 4.0	7	A-2-4	--	--	--	--	28	--	--	--	--	--
B-822L	8.0 - 10.0	7	A-2-4	--	--	--	--	23	22	16	6	--	20
B-832L	2.0 - 4.0	7	A-2-4	100	92	84	49	16	--	--	--	--	--
B-842L	4.0 - 6.0	7	A-2-4	100	98	94	62	21	--	--	--	--	--
B-847R	4.0 - 6.0	7	A-2-4	--	--	--	--	16	--	--	--	--	--
B-852L	8.0 - 10.0	7	A-2-4	--	--	--	--	21	23	15	8	--	74
B-857R	0.0 - 4.0	7	A-2-4	100	98	92	53	16	--	--	--	--	--
B-867R	8.0 - 10.0	7	A-2-4	--	--	--	--	18	--	--	--	--	--
C-829	5.0 - 5.3	7	A-2-4	--	--	--	--	20	NP	NP	NP	--	24
C-839	4.3 - 5.5	7	A-2-4	--	--	--	--	20	NP	NP	NP	--	19
SH-819L	4.0 - 4.8	7	A-2-4	--	--	--	--	16	23	17	6	--	21
SH-838L	2.5 - 3.0	7	A-2-4	--	--	--	--	19	23	17	6	--	20
SH-843R	1.5 - 2.0	7	A-2-4	--	--	--	--	16	22	17	5	--	18

Summary of Laboratory Test Results for Environmental Classification
Corkscrew Road Widening from Ben Hill Griffin Parkway to Alico Road
Lee County, Florida
Lee County Project No.: CN180576ANB
Tierra Project No.: 6511-19-046

Boring Name	Sample Depth (feet)			Stratum	pH (FM 5-550)	Resistivity (ohm-cm) (FM 5-551)	Chlorides (ppm) (FM 5-552)	Sulfates (ppm) (FM 5-553)	Environmental Classification* (Soil)	
									Steel	Concrete
AB-816R	1.0	-	2.0	1	8.7	13,000	30	<5	Slightly Aggressive	Slightly Aggressive
B-822L	0.0	-	4.0	1	8.2	21,000	15	< 5	Slightly Aggressive	Slightly Aggressive
B-842L	0.0	-	4.0	1	8.2	20,000	15	< 5	Slightly Aggressive	Slightly Aggressive
AB-868R	1.0	-	2.0	1	8.9	11,000	30	<5	Slightly Aggressive	Slightly Aggressive
B-802L	2.0	-	6.0	2	7.9	8,200	15	< 5	Slightly Aggressive	Slightly Aggressive
B-807R	0.0	-	4.0	2	7.4	4,400	30	< 5	Moderately Aggressive	Slightly Aggressive
SH-843R	1.0	-	2.0	2	8.1	17,000	30	9	Slightly Aggressive	Slightly Aggressive
B-862L	2.0	-	6.0	3	8.1	6,400	15	< 5	Slightly Aggressive	Slightly Aggressive
B-857R	0.0	-	4.0	7	7.7	3,900	30	< 5	Moderately Aggressive	Slightly Aggressive

* Based on the 2020 Structures Design Guidelines

TIERRA INC.

SUMMARY OF LIMEROCK BEARING RATIO TEST RESULTS

Tested For: Johnson Engineering, Inc.

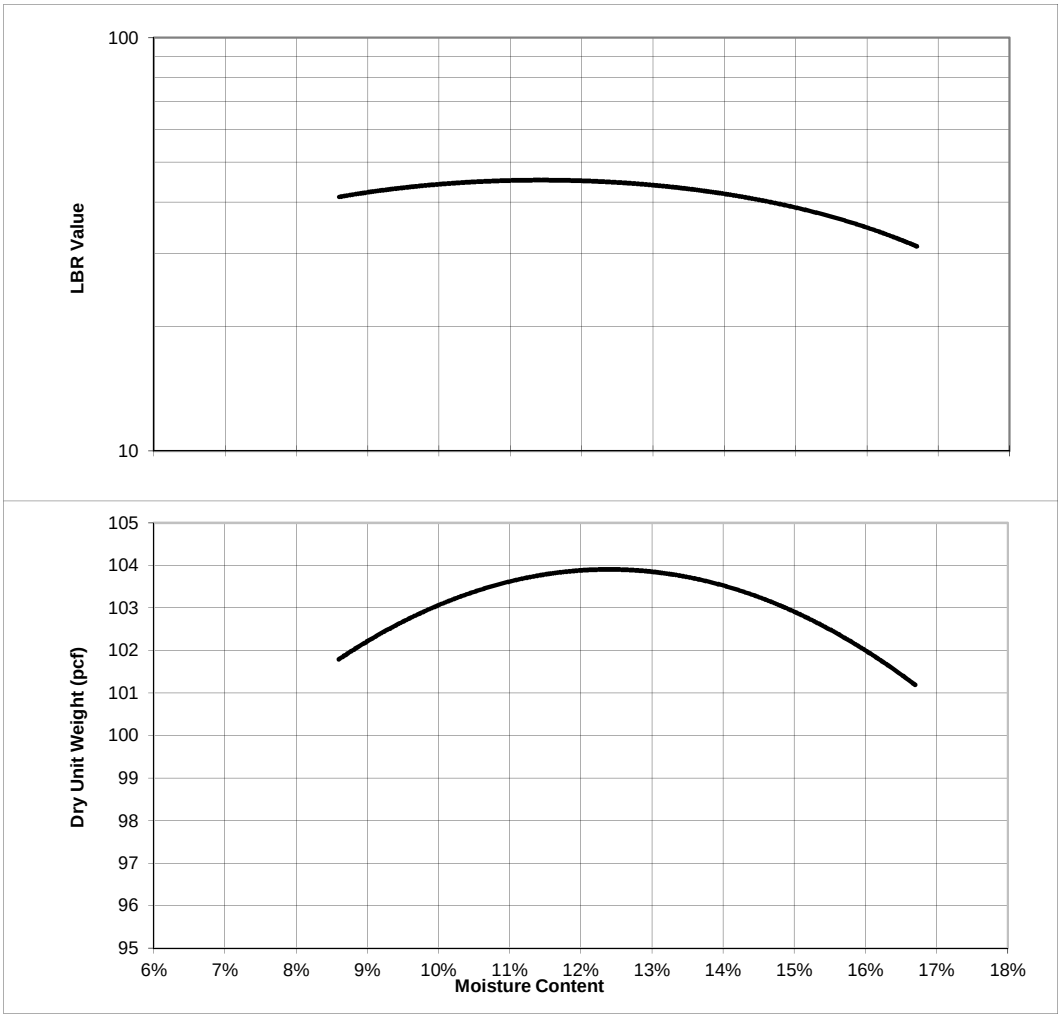
Project: Corkscrew Road Widening
BHG Parkway to Alico Road

Project No.: 6511-19-046

Date: 12/20/2019

Report No.: LBR # 1

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	45		
Maximum Density	103.9 pcf	Description:	Gray Fine Sand (A-3)
Optimum Moisture	12.5 %		
Test Method:	FSTM FM 5-515	Sample Location:	AB-810R
Tested By:	M. Mundy	Sample Depth:	1-2 feet

Respectfully Submitted,
TIERRA INC.

TIERRA INC.

SUMMARY OF LIMEROCK BEARING RATIO TEST RESULTS

Tested For: Johnson Engineering, Inc.

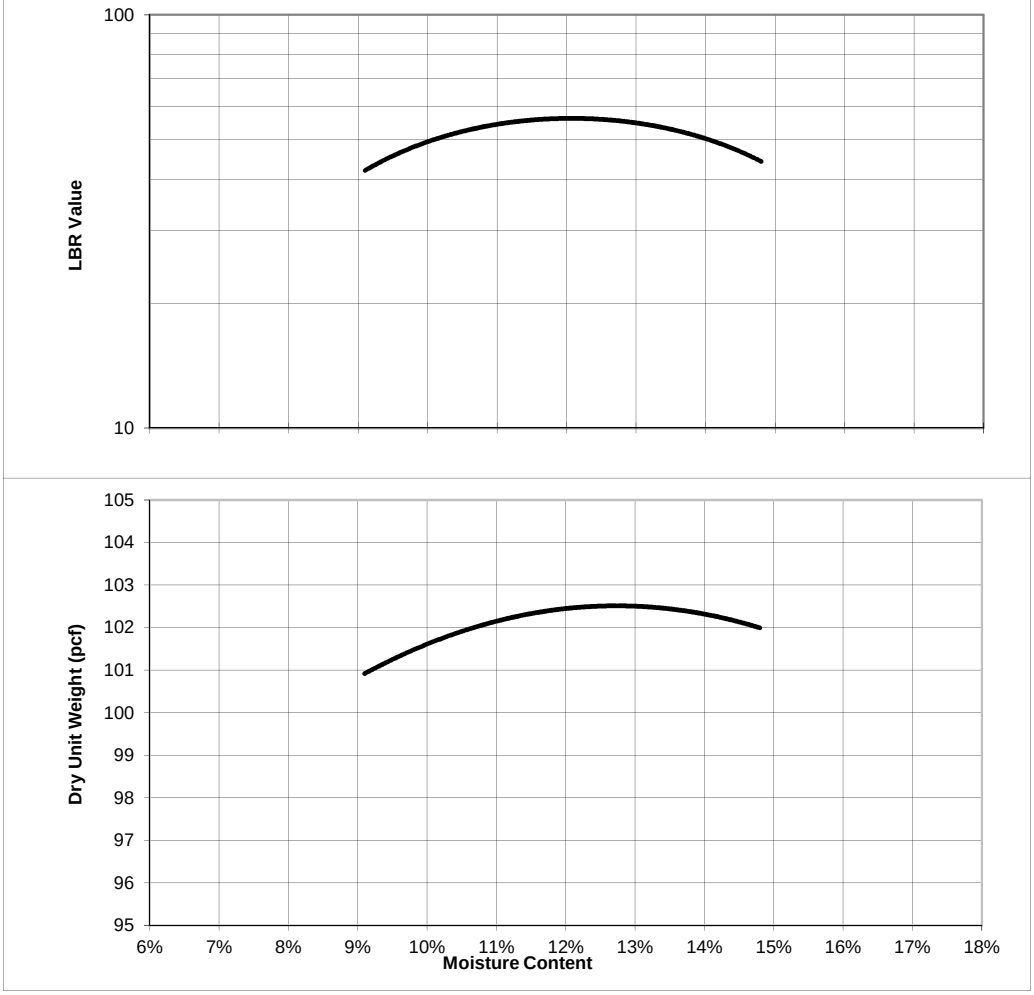
Project: Corkscrew Road Widening
BHG Parkway to Alico Road

Project No.: 6511-19-046

Date: 12/20/2019

Report No.: LBR # 2

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	56	
Maximum Density	102.6 pcf	Description: Light Brown Fine Sand (A-3)
Optimum Moisture	12.8 %	
Test Method:	FSTM FM 5-515	Sample Location: AB-813L
Tested By:	M. Mundy	Sample Depth: 1-2 feet

Respectfully Submitted,
TIERRA INC.

TIERRA INC.

SUMMARY OF LIMEROCK BEARING RATIO TEST RESULTS

Tested For: Johnson Engineering, Inc.

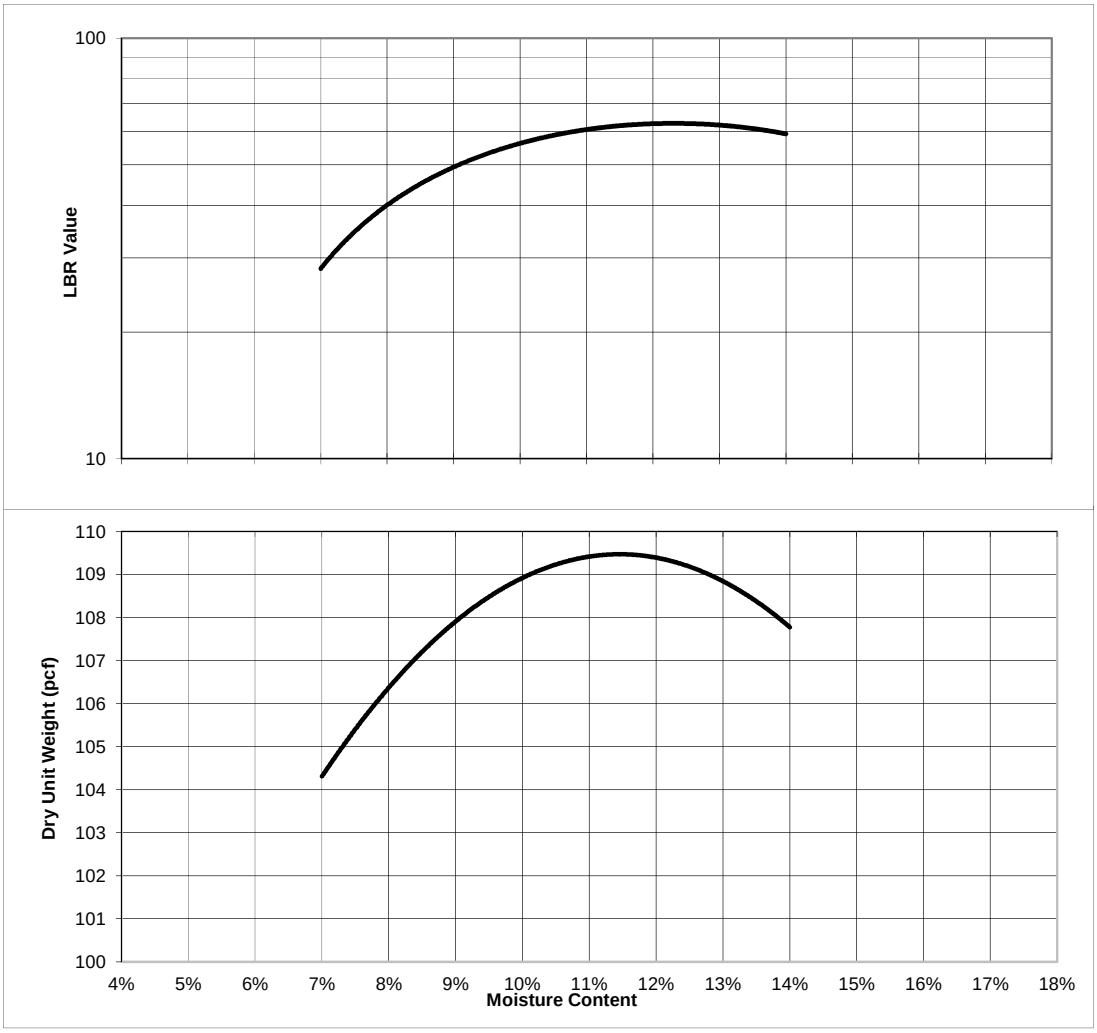
Project: Corkscrew Road Widening
BHG Parkway to Alico Road

Project No.: 6511-19-046

Date: 11/14/2019

Report No.: LBR # 3

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	62		
Maximum Density	109.6 pcf	Description:	Light Brown Sand w/Silt (A-3)
Optimum Moisture	11.5 %		
Test Method:	FSTM FM 5-515	Sample Location:	AB-816R
Tested By:	M. Mundy	Sample Depth:	1-2 feet

Respectfully Submitted,
TIERRA INC.

TIERRA INC.

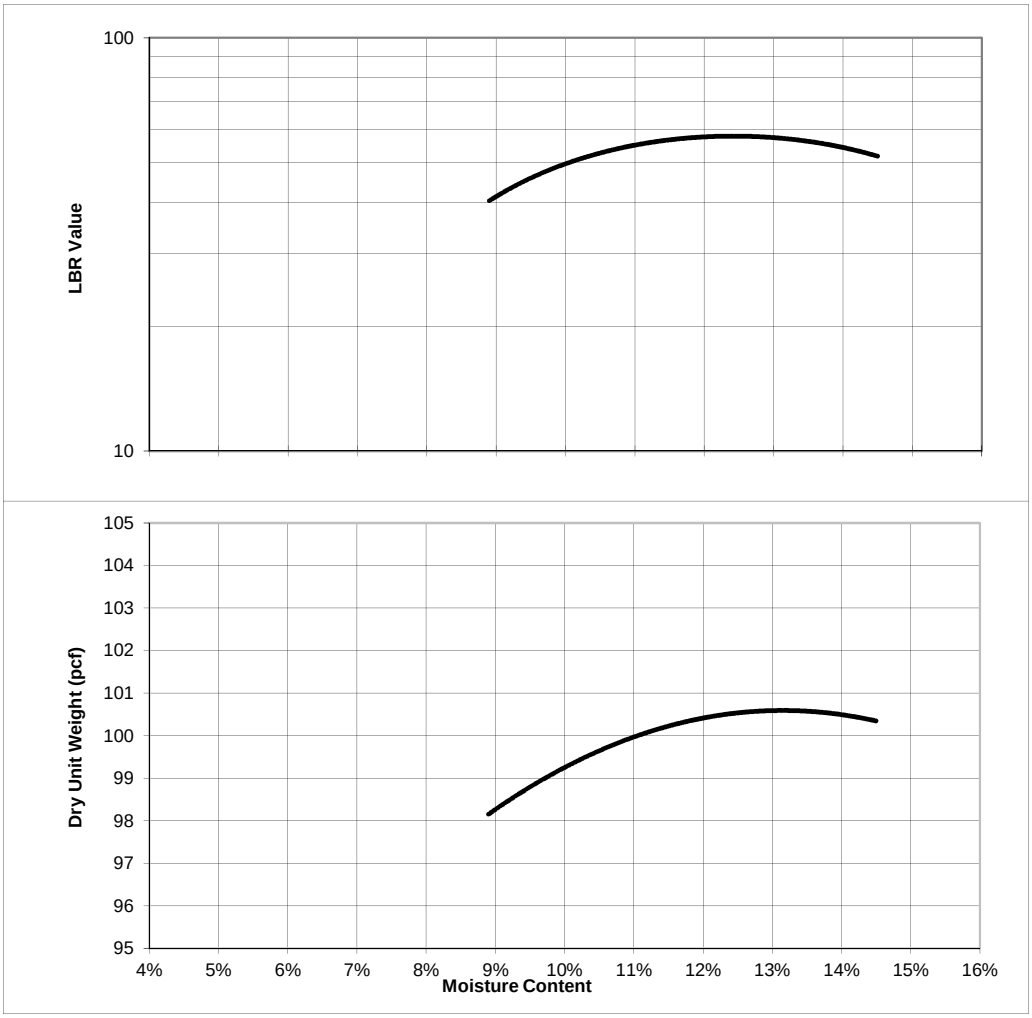
SUMMARY OF LIMEROCK BREARING RATIO TEST RESULTS

Tested For: Johnson Engineering, Inc.

Project: Corkscrew Road Widening
BHG Parkway to Alico Road

Project No.: 6511-19-046
Date: 12/20/2019 Report No.: LBR # 4

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value: 57
Maximum Density: 100.6 pcf
Optimum Moisture: 13 %
Test Method: FSTM FM 5-515
Tested By: M. Mundy

Description: Light Brown Fine Sand (A-3)

Sample Location: AB-826L
Sample Depth: 1-2 feet

Respectfully Submitted,
TIERRA INC.

TIERRA INC.

SUMMARY OF LIMEROCK BEARING RATIO TEST RESULTS

Tested For: Johnson Engineering, Inc.

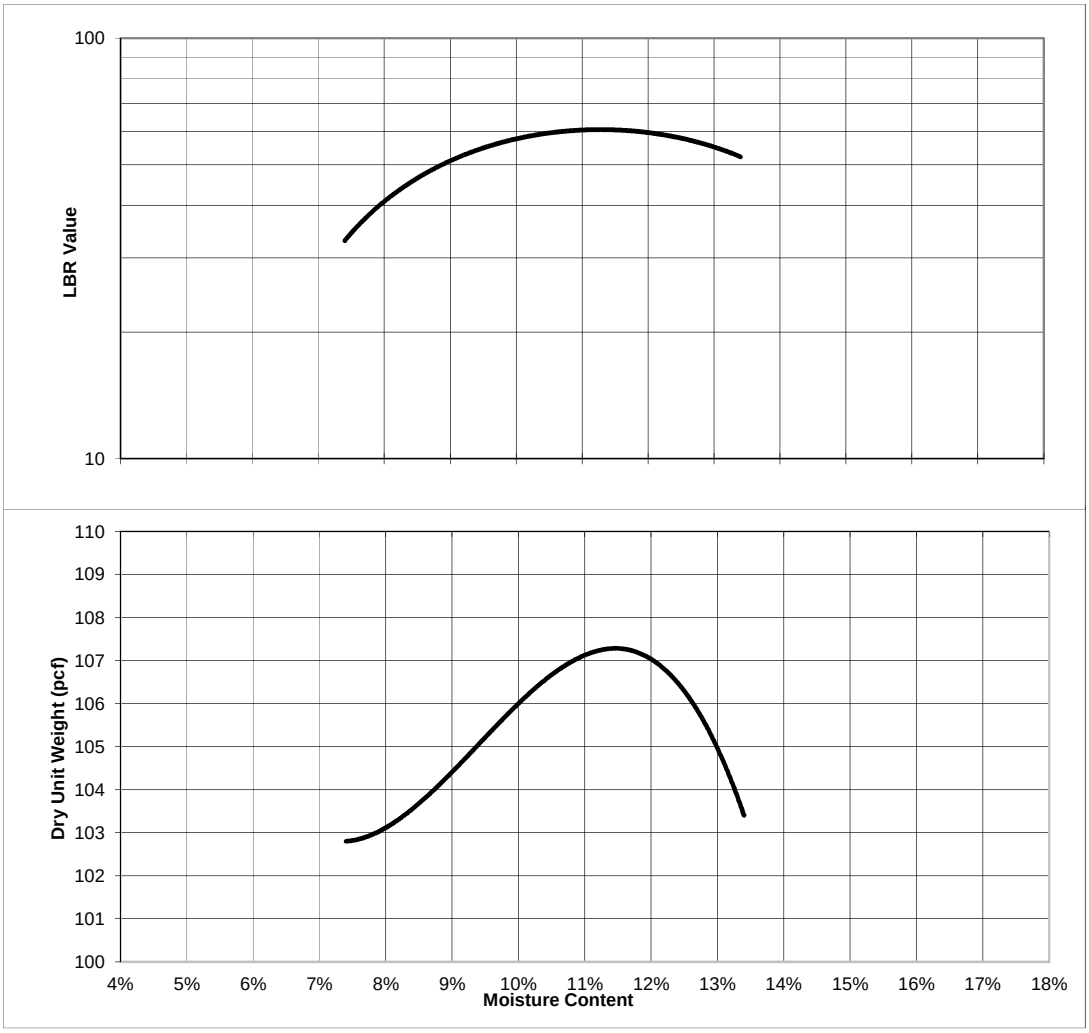
Project: Corkscrew Road Widening
BHG Parkway to Alico Road

Project No.: 6511-19-046

Date: 11/14/2019

Report No.: LBR # 5

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	60		
Maximum Density	107.3 pcf	Description:	Light Brown Sand (A-3)
Optimum Moisture	11.4 %		
Test Method:	FSTM FM 5-515	Sample Location:	SH-843R
Tested By:	M.Mundy	Sample Depth:	1-2 feet

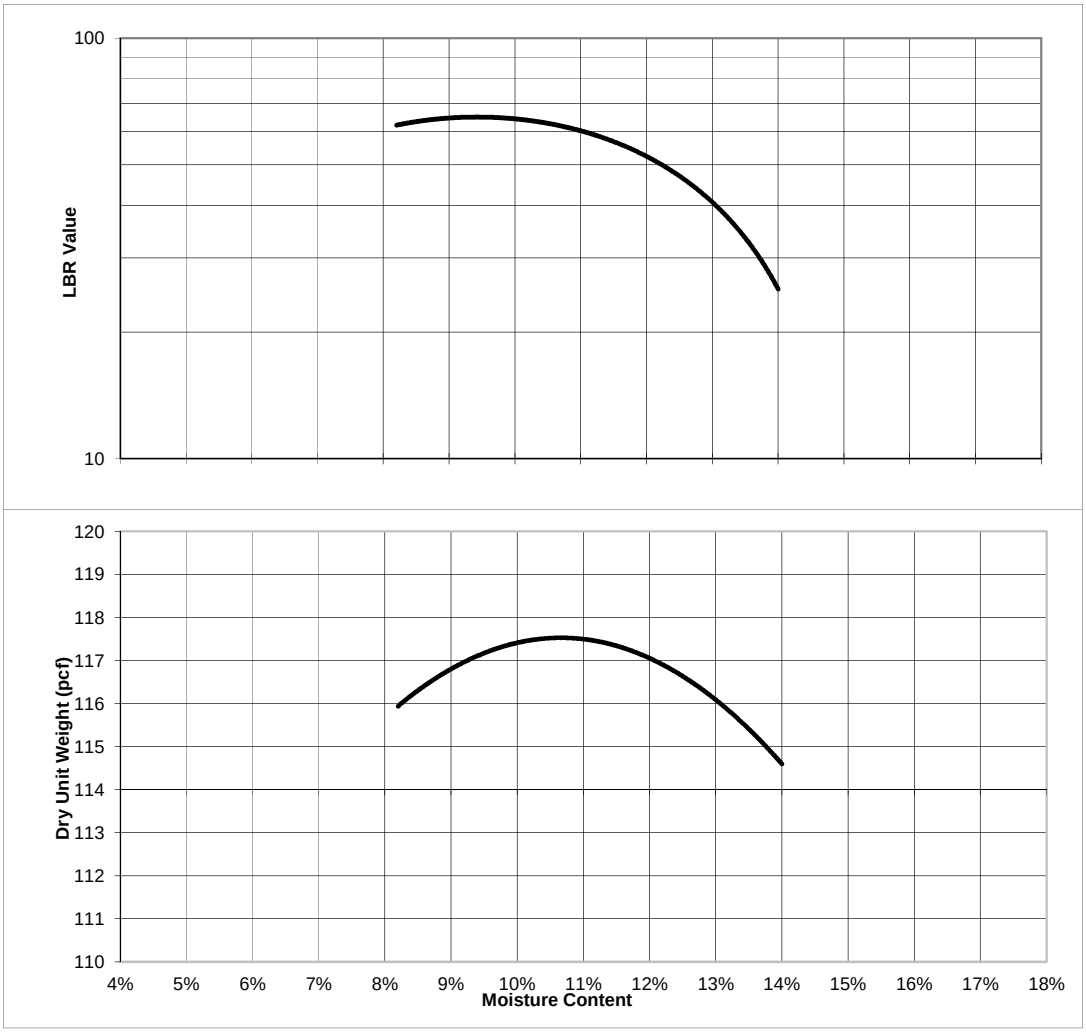
Respectfully Submitted,
TIERRA INC.

TIERRA INC.

SUMMARY OF LIMEROCK BEARING RATIO TEST RESULTS

Tested For:	Johnson Engineering, Inc.	Project:	Corkscrew Road Widening BHG Parkway to Alico Road
		Project No.	6511-19-046
Date:	11/14/2019	Report No.	LBR # 6

LBR & MOISTURE-DENSITY RELATIONSHIP



LBR Value	67		
Maximum Density	117.5 pcf	Description:	Light Brown Sand with Clay
Optimum Moisture	10.7 %		Nodules (A-3)
Test Method:	FSTM FM 5-515	Sample Location:	AB-868R
Tested By:	M. Mundy	Sample Depth:	1-2 feet

Respectfully Submitted,
TIERRA INC.