

TECHNICAL SPECIFICATIONS
FOR

LEE COUNTY UTILITIES

DANIELS PARKWAY
WATERMAIN RELOCATION

TECHNICAL SPECIFICATIONS

Prepared By:
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1514 Broadway, Suite 301
Fort Myers, FL 33901

January 2025

REFERENCE DOCUMENTS

The Contractor shall complete all work in conformance with the Lee County Utilities Design Manual, latest revision, and as provided herein these technical specifications. The latest version of the Design Manual is available at Lee County website:
<http://www.leegov.com/utilities/design-manual>

Contractor shall complete all applicable work in conformance with the latest version of the FDOT indices: <http://www.fdot.gov/design/standardplans/current/default.shtm>

All utility related materials shall comply with Lee County Utilities Approved Materials List: <http://www.leegov.com/utilities/design-manual/approved-materials>

SEAL SHEET

Engineering and design responsibilities for this project were performed by various individuals whose seals appear hereon and on work within this project for which they are responsible as indicated below:

Lead Engineering Design: Heather M. Ripley, P.E.

TECHNICAL SPECIFICATIONS

DRAWINGS: As indicated on individual drawings.

Kimley-Horn and Associates, Inc.

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Lee County Limited Development Order

FDEP General Permit for Construction of Water Main Extensions for Public Water System

FDOT Utility Permit

SECTION 01 11 00
SUMMARY OF WORK

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description of Work
- B. Constraints
- C. Work by Others
- D. CONTRACTOR's Use of Site
- E. Work Sequence
- F. Owner Occupancy

1.2 DESCRIPTION OF WORK

- A. General: The Work to be done under this Contract consists of the relocation of a 30-inch watermain along Daniels Parkway at the intersection of I-75 in Fort Myers, FL, as shown and specified in Contract Documents entitled Daniels Parkway Water Main Relocation.
- B. The Work includes:
 - 1. Furnishing of all labor, material, superintendence, plant, power, light, heat, fuel, water, tools, appliances, equipment, supplies, services and other means of construction necessary or proper for performing and completing the Work.
 - 2. Sole responsibility for adequacy of piping and appurtenances.
 - 3. Maintaining the Work area and site in a clean and acceptable manner.
 - 4. Maintaining existing facilities in service at all times except where specifically provided for otherwise herein.
 - 5. Protection of finished and unfinished Work.
 - 6. Repair and restoration of Work damaged during construction.

7. Furnishing as necessary proper equipment and machinery, of a sufficient capacity, to facilitate the Work and to handle all emergencies normally encountered in Work of this character.
 8. Furnishing, installing, and protecting all necessary guides, track rails, bearing plates, anchor and attachment bolts, and all other appurtenances needed for the installation of the devices included in the equipment specified. Make anchor bolts of appropriate size, strength and material for the purpose intended. Furnish substantial templates and shop drawings for installation.
 9. Obtaining any and all other permits required for prosecution of the Work.
- C. Implied and Normally Required Work: It is the intent of these Specifications to provide the OWNER with complete operable systems, subsystems and other items of Work. Any part or item of Work which is reasonably implied or normally required to make each installation satisfactorily and completely operable is deemed to be included in the Work and the Contract Amount. All miscellaneous appurtenances and other items of Work incidental to meeting the intent of these Specifications are included in the Work and the Contract Amount even though these appurtenances may not be specifically called for in these Specifications.
- D. Quality of Work: Regard the apparent silence of the Contract Documents as to any detail, or the apparent omission from them of a detailed description concerning any Work to be done and materials to be furnished as meaning that only the best general practice is to prevail and that only materials and workmanship of the best quality are to be used. Interpretation of these specifications will be made upon this basis.

1.3 CONSTRAINTS

- A. The Contract Documents are intended to allow the CONTRACTOR flexibility in construction of the Work; however, the following constraints apply:

The linestop, cut, and cap of the existing watermain shall be performed only after the new water main has been tested and accepted by the OWNER and ENGINEER and has been connected to the existing system as to not disrupt public water service to customers.

1.4 CONTRACTOR'S USE OF SITE

- A. In addition to the requirements of the General Conditions, limit use of site and premises for work and storage to allow for the following:

1. Coordination of the Work under this CONTRACT with the Work of the other contractors where Work under this CONTRACT encroaches on the Work of other contractors.
2. OWNER occupancy and access to operate existing facilities.
3. Coordination of site use with ENGINEER.
4. Responsibility for protection and safekeeping of products under this CONTRACT.
5. Providing additional off-site storage at no additional cost to OWNER as needed.

1.5 WORK SEQUENCE

- A. Construct Work in stages to maintain public water supply and accommodate OWNER's use of premises during construction period and in accordance with the limitations on the sequence of construction specified. Coordinate construction schedules and operations with OWNER and ENGINEER.
- B. Coordinate Work of all Subcontractors.
- C. The following sequence is presented as a general work plan. CONTRACTOR shall develop his own sequence as specific steps and procedures may vary depending on the unique requirements, field conditions, the CONTRACTOR's equipment and experience. The sequence shall follow all applicable site evaluation and pipeline path evaluation procedures, as needed permitting approvals and coordination, drilling bore plans, and site preparation including equipment mobilization and setup.
- D. Horizontal Directional Drill
 1. Determine the exact location of the bore path and mark the starting and receiving pits based on several factors including but not limited to: terrain, soil conditions, and the location of the determined entry and exit pits.
 2. Prepare the HDPE pipe for installation at the laydown area which includes but is not limited to cutting, attaching the pull head, butt welding the pipe sections together, low pressure testing, and adding ballast to the pipe.
 3. Drill a pilot hole incrementally to the desired diameter using progressively larger reaming tools each pass.

4. Perform a final ream to ensure the bore hole is smooth and free of obstructions while simultaneously pulling the pipe through the borehole.
5. Use the pull head attached to the final reamer to pull the pipe through the borehole during the final ream pass, leaving a portion exposed above ground at both ends. During this operation, the pipe is to be filled with ballast water. Survey along drill path as specified in Contract Documents.
6. Install the caps on both ends of the pipe and ensure the caps are secure.
7. Backfill the launch and reception pits and restore the site to its original condition.
8. Plan for the HDPE to DIP transition connection process, including any necessary excavation or trenching.
9. Conduct a pressure test on the installed pipe to ensure the integrity.

E. Jack and Bore Installation

1. Determine the exact location of the bore path and mark the starting and receiving pits based on several factors including but not limited to: terrain, soil conditions, and the location of the determined entry and exit pits.
2. Conduct equipment mobilization and set up, transport the rig, casing pipe and carrier pipe.
3. Excavate a pit at the start point of the bore path to accommodate the jacking machine, the head of the casing pipe and any necessary equipment for handling the spacers.
4. Excavate a pit at the end point of the bore path to receive the tail end of the casing pipe and facilitate sealing.
5. Assemble and configure the jack and bore rig at the launch pit location.
6. If necessary, drill a pilot hole to guide the casing pipe through the borehole.
7. Gradually push the casing pipe into the ground using the jacking machine.
8. Weld casing pipe sections as needed to achieve the desired length.
9. Continuously monitor the jacking process to ensure proper alignment and avoid obstructions.

10. Install the casing spacers on the carrier pipe, ensuring proper spacing and alignment.
11. Insert the carrier pipe, ensuring proper alignment and fit.
12. Seal the ends of the carrier pipe to prevent backfill materials from entering during the backfilling process.
13. Allow the sealing material to cure completely before backfilling the pits.
14. Backfill the launch and receiving pits with suitable backfill material. Restore the site to its original condition, including but not limited to repairing roads, sidewalks, and landscaping affected by the Work.

F. Open Cut Installation

1. Mark the trench path and remove any obstructions such as trees, shrubs or debris from the excavation site.
2. Transport the necessary equipment, tools, machinery and materials including but not limited to the pipeline, fittings, bedding materials and backfill.
3. Excavate the trench to the required depth and width for proper installation of pipe. Ensure the trench sides are sloped or shored to prevent cave-ins. Clear the trench of any loose soils, rocks or debris that could interfere with the pipe installation.
4. Set up pipe beddings and support to stabilize the pipe after installation.
5. Clean the pipe ends and apply an approved joint sealant or lubricant.
6. Carefully lower the pipe into the trench ensuring proper alignment and support. Be sure any other utilities are protected and supported.
7. Assemble and connect the pipe sections using appropriate fittings, mechanical joints, appurtenances and gaskets.
8. HDPE to DIP Transitions
 - a. Cut the pipes to the correct lengths.
 - b. Remove caps and clean the ends of the both pipes to remove any debris or dirt. Ensure the HDPE and DI pipes have been disinfected by swabbing ends.
 - c. Prepare the transition fittings as needed.

- d. Secure the fittings to the HDPE and the DIP sections.
 - e. Ensure the connections are tight and free of leaks.
9. Gradually backfill the trench with suitable material and compact the trench to the proper density.
 10. Repair and restore the disturbed surfaces.
- G. CONNECT NEW WATER MAIN TO EXISTING WATER MAIN VIA HOT TAPPING
1. Field locate the existing water main including size, material and depth.
 2. Notify OWNER and ENGINEER in writing 7 days prior to performing tapping of the existing water main.
 3. Prepare the tapping machine, saddle and other necessary components for tapping.
 4. Isolate area and implement safety measures to prevent accidents and protect the public.
 5. Dig and expose the existing water main.
 6. Restrain the existing main at the installation points.
 7. Install the restrained joints and concrete deadman to the existing water main as specified in the Contract Documents.
 8. Once the existing water main is clean and prepared, install the tapping saddle and secure it in place.
 9. Connect the tapping valve to the saddle and attach the tapping machine. Close the new gate valve prior to moving forward.
 10. Begin drilling a hole in the water main using the tapping machine. Ensure the water pressure in the existing main remains constant during the drilling process by using gauges or pressure recorders to monitor the drilling process and to prevent damaging the water main.
 11. Attach the new water main to the tapping gate valve.
 12. Perform the procedure at both points of connection, ensuring no service interruptions.

H. FLUSHING

1. Provide written notification to the OWNER and ENGINEER a week before flushing is to commence.
2. After approval from OWNER, connect a meter and backflow preventor to the existing 30-inch watermain connection in Daniels Parkway.
3. Open all valves along the new water main to allow water to flow freely throughout the pipe.
4. Flush the main by connecting to the existing 30-inch watermain to dislodge any debris or sediment.
5. Monitor the water quality during the flushing process until the water runs clear and free of contaminants.

I. TESTING

1. Prior to testing, provide written notification to OWNER and ENGINEER when Work is ready for testing.
2. Conduct a Leakage Test to verify the integrity of the pipe and joints are sealed properly.

J. DISINFECTION AND DECHLORINATION

1. Following acceptable flushing and pressure testing, disinfect all sections of the new water main and receive approval from OWNER, ENGINEER and FDEP prior to placing into service. At least 24-hours prior to disinfecting, provide written notification to the OWNER and ENGINEER.
2. Conduct disinfection process according to Section 33 11 12 and AWWA C651.
3. Free chlorine concentration shall be maintained of at least 50 ppm for 12 hours or more.
4. Following contact with chlorine solution, system shall be thoroughly flushed out and samples shall be taken by the CONTRACTOR and delivered by him to County Health Department or approved laboratory for analysis. Satisfactory results shall be demonstrated, or process shall be repeated per specifications.

5. Dechlorinate water prior to releasing water into the environment per approved dechlorination plan and agency recommendations and approvals.

K. Backfill and Compaction

1. Gradually fill the trench with suitable backfill material, ensuring proper compaction to prevent future settlement. Use equipment to achieve desired density and conduct third party compaction testing.
2. Repair and restore the disturbed surface including roads, sidewalks and grass areas.

L. Installing Line Stops, Capping and Abandoning Existing Water Main

1. After new water main is tested, accepted and placed into operation, provide written notification seven days prior to installing line stops, caps or abandoning existing water main to OWNER and ENGINEER.
2. Open gate valves on new water mains for relocated main to be in operation. After, install line stops on the existing water at the specified locations according to the manufacturer's instructions.
3. Place line stops into operation at both east and west locations, to isolate the existing water main section that will be abandoned.
4. Test the seal to ensure that the stops are in place and no water is leaking past.
5. Drain the existing water main section that is to be abandoned and dechlorinate water prior to releasing into the environment.
6. After existing water main section that will be abandoned is drained, cut the isolated water main at both east and west ends at least 5-feet from the line stops, providing enough space to install caps.
7. Excavate and remove 20 feet of the newly abandoned main at both the east and west ends to facilitate installation of the caps and thrust blocks.
8. Install caps at both east and west end to section that is dry and to be abandoned.
9. Clean and disinfect the isolated ends of the water main closest to the line stops.

10. Securely attach end caps to both east and west end of each water main sections still in service, closest to the line stops.
11. Inspect the capped ends for signs of leakage.
12. Install concrete thrust blocks as specified in the Contract Documents.
13. After installation is completed, remove line stops.
14. Fill trenches with appropriate backfill, compact, and restore surface as to its original condition.

1.6 OWNER OCCUPANCY

- A. Conduct operations so as to inconvenience the general public in the least.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

- A. Starting Work: Start Work on or before the date stated in the Notice to Proceed and execute with such progress as may be required to prevent delay to other contractors or to the general completion of the project. Execute Work at such items and in or on such parts of the project, and with such forces, material and equipment, as to complete the Work in the time established by the Contract. At all times, schedule and direct the Work so that it provides an orderly progression to completion within the specified time for completion.

END OF SECTION

SECTION 01 22 13

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Explanation and Definitions
- B. Measurement
- C. Payment
- D. Schedule of Values

1.2 EXPLANATION AND DEFINITIONS

- A. The following explanation of the Measurement and Payment for the bid form items is made for information and guidance. The omission of reference to any item in this description shall not, however, alter the intent of the bid form or relieve the CONTRACTOR of the necessity of furnishing such as a part of the Contract.

1.3 MEASUREMENT

- A. The quantities set forth in the bid form are approximate and are given to establish a uniform basis for the comparison of bids. The OWNER reserves the right to increase or decrease the quantity of any class or portion of the Work during the progress of construction in accord with the terms of the Contract.

1.4 PAYMENT

- A. Payment shall be made for the items listed on the Bid Form on the basis of the Work actually performed and completed, such Work including but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, clean up, restoration of disturbed areas, and all other appurtenances to complete the construction and installation of the Work as shown on the drawings and described in the specifications.
- B. Unit prices are used as a means of computing the final figures for bid and Contract purposes, for periodic payments for Work performed, for determining value of additions or deletions and wherever else reasonable.

1.5 SCHEDULE OF VALUES

- A. Approval of Schedule: Submit for approval a preliminary schedule of values, in duplicate, for all of the Work. Prepare preliminary schedule in accordance with the General Conditions. Submit preliminary schedule of values within ten (10) calendar days after the Effective Date of the Agreement. Submit final schedule of values in accordance with the General Conditions.
- B. Format: Utilize a format similar to the Table of Contents of the Project Specifications. Identify each line item with number and title of the major specification. Identify site mobilization, bonds and insurance. Include within each line item, a direct proportional amount of CONTRACTOR's overhead profit.
- C. Revisions: With each Application for Payment, revise schedule to list approved Change Orders.



1.6 APPLICATION FOR PAYMENT

- A. Required Copies: Submit three copies of each application on EJCDC Form No. 1910-8-E (1990) or approved equal. Present required information in typewritten form or on electronic media printout.
- B. Execute certification by signature of authorized officer.
- C. Use data from approved Schedule of Values.
- D. Stored Materials: When payment for materials stored is permitted, submit a separate schedule for Materials Stored showing line item, description, previous value received, value incorporated into the Work and present value.
- E. Change Orders: Once approved, list each authorized Change Order as an extension on continuation sheet, listing Change Order number and dollar amount as for an original item of Work.
- F. Final Payment: Prepare Application for Final Payment as required in the General Conditions.
- G. Submit an updated construction schedule for each Application for Payment.

PART 2 EXECUTION

2.1 MEASUREMENT AND PAYMENT


- A. Payment shall be made on the basis of Work actually performed completing each item in the Bid, such Work including, but not limited to, the furnishing of all necessary labor, materials, equipment, transportation, cleanup, and all other appurtenances to complete the construction and installation of the Work to the configuration and extent as shown on the drawings and described in the specifications. Payment for each item includes compensation for cleanup and restorations. Cleanup and surface restorations (including pavement replacement) will be considered as ten percent (10%) of each pay item and complete payment will not be made until cleanup, restorations and as-builts are completed.
1. Mobilization: Payment for mobilization will be made at the Contract lump sum price for the CONTRACTOR's cost for mobilization, demolition, survey, field staking, submittals, materials testing, Health and Safety Plan (HASp), Hurricane Preparedness Plan, insurance, preparing a field office, identifying and securing a staging area and other applicable administrative charges as outlined in the Contract Documents and specified herein. Payment for mobilization will be twenty-five percent (25%) of the lump sum amount to be included with the final payment request.
 2. Performance and Payment Bond Premiums and Insurance: Payment shall be divided equally over the number of pay request anticipated from the Notice to Proceed. No additional payments shall be made due to time extension.
 3. Pre/Post Construction Audio/Video Recording: Payment for preconstruction audio/video will be made at the Contract lump sum price for the CONTRACTOR'S cost for conducting an audio/video tape recording of pre and post construction conditions as outlined in the Contract Documents and specified herein. The Work includes coverage necessary to document existing conditions on public and private property. The CONTRACTOR may be required to restore private properties to conditions better than existing, at no additional cost to the OWNER, if CONTRACTOR fails to sufficiently document existing conditions. The preconstruction video is only valid for six (6) months.
 4. As-Built Survey: Payment for as-built surveys will be made at the Contract lump sum price for the CONTRACTOR'S cost at four increments during the Project. Payments will be made after the OWNER receives the 25% As-Built Survey, 50% As-Built Survey, 75% As-Built Survey, and 100% As-Built survey.

5. Clearing and Grubbing: Payment for clearing and grubbing will be made at the Contract lump sum price for the CONTRACTOR's cost of clearing and grubbing as outlined in the Contract Documents and specified herein. This item includes all labor, equipment, tools, and materials; and performing all operations required to furnish to the OWNER the Project in accordance with the Contract Documents.
6. Maintenance of Traffic: Payment for maintenance of traffic will be made at the Contract lump sum price for the CONTRACTOR's cost of the maintenance of traffic as outlined in the Contract Documents and specified herein. This item includes all labor, equipment, tools, and materials necessary to meet the requirements of the Contract Documents.
7. Furnish and Install Erosion Control Measures: Payment for furnishing, installing and maintaining erosion control measures by single row silt fence shall be made at the Contract unit price per lineal foot. Payment for furnishing, installing and maintaining erosion control measures by inlet protection shall be made at the Contract unit price per each. Payment for furnishing, installing and maintaining erosion control measures by temporary stormwater facilities shall be made at the Contract lump sum price. These items include all necessary components for the furnishing, installation and maintenance of the erosion control measures to safeguard the area from any construction debris as required per the project Stormwater Pollution Prevention Plan. The items include all labor, equipment, tools and materials necessary to meet the requirements of the Contract Documents.
-  8. Furnish and Install Open Cut Pipelines: Payment for furnishing and installing open cut pipelines will be made at the Contract unit price per lineal foot for the pipe in place. This item includes all necessary bends, including 11.25, 22.5, 45, and 90 degree bends, connections to existing mains, labor, equipment and materials for the furnishing and laying of the pipe, signs, dewatering, compaction, pipe bedding, backfilling, excavation support, sheeting, restrained joints, mylar detectable tape, tracer wire, clamps, harnessing, plugs and caps, adapters, excavation of all material encountered including rock, backfill, pavement, driveways, and other surface materials not specifically designated in the Bid, and clean-up. All required silt fence, turbidity barriers, erosion protection, de-chlorination and flushing are included. The pipeline must be pigged/swabbed prior to the full-bore flush. Measurement of the pipe shall be to the nearest foot along the centerline including the lengths valves and fittings. Lineal footage measurement shall be horizontal.
-  9. Install Owner Provided Open Cut Pipelines: Payment for installing owner provided open cut pipelines will be made at the Contract unit price per lineal foot for the pipe in place. 180 feet of 30-inch ductile iron pipe will be supplied

by OWNER. Two (2) 30-inch MJ sleeves will be provided by the OWNER for CONTRACTOR use during the connection Work. Seventeen (17) Mega-Lugs MJ Restraints will be provided by the OWNER for CONTRACTOR use. Additional Mega-Lugs MJ Restraints that are required for the Work shall be provided by the CONTRACTOR. This item includes all necessary bends, including 11.25, 22.5, 45, and 90 degree bends, connections to existing mains, labor, signs, dewatering, compaction, pipe bedding, backfilling, excavation support, sheeting, restrained joints, mylar detectable tape, tracer wire, clamps, harnessing, plugs and caps, adapters, excavation of all material encountered including rock, backfill, pavement, driveways, and other surface materials not specifically designated in the Bid, and clean-up. All required silt fence, turbidity barriers, erosion protection, de-chlorination and flushing are included. The pipeline must be pigged/swabbed prior to the full-bore flush. Measurement of the pipe shall be to the nearest foot along the centerline including the lengths of valves and fittings. Lineal footage measurement shall be horizontal.



10. Furnish and Install Water Main Appurtenances: Not in contract.
11. Install Owner Provided Water Main Appurtenances: Payment for installing OWNER provided water main appurtenances will be made at the Contract unit price per installation of the four (4) 45 degree bends and two (2) restrained caps acceptably installed. This item includes all necessary fittings, excavation of all material encountered including rock, backfill, culverts, storm sewers, and other surface materials not specifically designated in the Bid, clean-up and labor.
12. Furnish and Install Horizontal Directional Drills: Payment for furnishing and installing horizontal directional drill piping will be made at the Contract lump sum price for the CONTRACTOR's cost of the horizontal directional drilling as outlined in the Contract Documents and specified herein. This item includes all necessary pipes, sizes and materials, fittings, connections to existing or proposed mains, drill depth surveys approximately every 50 feet, labor, signs, dewatering, compaction, pipe bedding, backfilling, excavation support, sheeting, restrained joint piping, tracer wire, conduit and accessories, conduit, clamps, harnessing, plugs, caps, and adapters. For drill depth surveys across I-75 pavement may exceed 50 feet as needed and shall be taken on both sides of each paved section. Excavation of all material encountered including rock, removal or disposition of excess material, backfill, culverts, storm sewers, and other surface materials not specifically designated in the Bid, and clean-up. All required silt fence, turbidity barriers, erosion protection, de-chlorination, and flushing are included. The pipeline must be pigged/swabbed prior to the full-bore flush. The Drawings show a suggested path for the drill that includes an entry angle, exist angle with a radius show for each drill. The Contractor may

deviate from these criteria but will only be paid a lump sum price regardless of length. The Contractor will be responsible for providing all necessary fittings, appurtenances, and materials. Contractor shall provide imported backfill, if needed. Any deviations will need to be reviewed and approved by LCU and Engineer.

13. Furnish and Install Jack and Bores: Payment for furnishing and installing jack and bore piping will be made at the Contract unit price per lineal foot for the pipe in place. This item includes all necessary pipes, sizes and materials, including carrier pipe and steel casing, spacers, end seals, fittings, connections to existing or proposed mains, labor, signs, dewatering, compaction, pipe bedding, backfilling, excavation support, sheeting, restrained joint piping, tracer wire and accessories, clamps, harnessing, plugs and caps, adapters, excavation of all material encountered including rock, removal or disposition of excess material, backfill, culverts, storm sewers, and other surface materials not specifically designated in the Bid, and clean-up. All required silt fence, turbidity barriers, erosion protection, de-chlorination, and flushing are included. The pipeline must be pigged/swabbed prior to the full-bore flush. Measurement of the pipe shall be to the nearest foot along the centerline including the lengths of valves and fittings. Lineal footage measurement shall be horizontal.
14. Furnish and Install Air Release Valves: Payment for furnishing and installing air release valves will be made at the Contract unit price per air release valve assembly and bollards acceptably installed. This item includes all necessary labor, materials and equipment for installation, including the tapping saddle, corporation stop, polytubing, brass elbows, brass piping, ball valve, schedule 80 PVC pipe, air release valve fixture, vented pedestal housing with stainless steel post, an odor control bio-filter and bedding stone in accordance with the details shown in the project Drawings. Payment for furnishing and installing bollards will be made at the Contract unit price per bollard acceptably installed. This item includes excavating footer, painting bollard, furnishing and installing concrete pad, furnishing and installing an expansion joint if set adjacent to concrete pavement, and foundation stone. All bollards shall conform to the details shown in the drawings and/or Lee County Standards.
-  15. Furnish and Install Water Main Connections: Payment for water main connections will be made at the Contract price per line stop and concrete block, thrust block, tapping sleeve, valve, concrete deadman, and mechanical joint split bell restraint acceptably furnished and installed. This item includes all piping, making pipe connections, tapping sleeves, valves, valve stem and valve box extensions, joints, concrete pads, base material below the valve, labor, equipment, materials, and excavation of all material encountered including rock, backfill, culverts, storm sewers, and other

surface materials not specifically designated in the Bid, concrete testing as specified in Section 03 30 53, and clean-up for a complete installation in accordance with the Contract Documents,

Payment shall be made at the Bid Form unit price, which will be full compensation for all labor, materials, and equipment necessary to perform the task. This shall include excavation, tapping the existing line, acquiring and preserving pipe coupons, maintaining service upstream of the line stop, completing the connection and repairing the point of line stop.

16. Existing Pipe Removal: Payment for removal and disposal of existing 30-inch pipe will be made at the Contract unit price per lineal foot. These items include the removal of required sections of pipe to acceptably install the line stop and associated appurtenances, excavation of all material encountered including rock, backfill, culverts, storm sewers, and other surface materials not specifically designated in the Bid, and clean-up.
-  17. Flushing, Pressure Testing, Sampling Points, and Disinfection: Payment for flushing, pressure testing, sampling points, and disinfection will be made at the Contract lump sum price for the CONTRACTOR'S cost for furnishing and performing all necessary labor, materials and equipment for flushing, pressure testing, sampling, disinfection and dechlorination. OWNER shall provide a 30-inch flushing pig.
-  18. Sidewalk Restoration: Payment for sidewalk restoration will be made at the Contract unit price per square yard of sidewalk disturbed. The sidewalk shall be 6-inches thick. All unreinforced concrete shall conform to the technical specifications. All unreinforced concrete installed in the Work not shown on the Plans and not ordered by the ENGINEER in writing will not be measured for payment. All sidewalk should be restored in accordance to FDOT standard plans and details.
19. Grass Restoration: Payment for grass restoration will be made at the Contract unit price per square yard of grass disturbed. All grass restoration shall conform to the Contract Documents.
20. Tree Mitigation: Payment for tree mitigation will be made at the Contract unit price per tree for the CONTRACTOR'S cost for tree protection and removal as outlined in the Contract Documents.

END OF SECTION

SECTION 01 31 13
PROJECT COORDINATION

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Work Progress
- B. Private Land
- C. Work Locations
- D. Open Excavations
- E. Test Pits
- F. Maintenance of Traffic
- G. Maintenance of Flow

1.2 WORK PROGRESS

- A. Furnish personnel and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of Work and a rate of progress which will allow the completion of the Work within the time stipulated in the Bid of these Specifications. If at any time such personnel appears to the ENGINEER to be inefficient, inappropriate or insufficient for securing the quality of Work required or for producing the rate of progress aforesaid, he may order the CONTRACTOR to increase the efficiency, change the character or increase the personnel and equipment, and the CONTRACTOR shall conform to such order. Failure of the ENGINEER to give such order shall in no way relieve the CONTRACTOR of his obligations to secure the quality of the Work and rate of progress.

1.3 PRIVATE LAND

- A. Do not enter or occupy private land outside of Rights of Way or easements, except by permission of OWNER. Construction operations shall be conducted in accordance with Section 01 57 00.

1.4 WORK LOCATIONS

- A. Structures and pipelines shall be located substantially as indicated on the Drawings, but the ENGINEER reserves the right to make such modifications in locations as may be found desirable to avoid interference noted on the Drawings, such notation is for the CONTRACTOR's convenience and does not relieve him from laying and jointing different or additional items where required.

1.5 OPEN EXCAVATIONS

- A. All open excavations shall be adequately safeguarded by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons, and damage to property. The CONTRACTOR shall, at his own expense, provide suitable and safe bridges and other crossings for accommodating travel by the public and workmen.

1.6 TEST PITS

- A. Test pits for the purpose of locating underground pipeline or structures in advance of the construction shall be excavated and backfilled by the CONTRACTOR. Test pits shall be backfilled immediately after their purpose has been satisfied and maintained in a manner satisfactory to the ENGINEER. The costs for such test pits shall be borne by the CONTRACTOR.

1.7 MAINTENANCE OF TRAFFIC

- A. Maintenance of traffic shall be in accordance with FDOT and Section 01 55 26.
- B. All projects and Work on highways, roads, and streets, shall have a traffic control plan, (TCP), as required by Florida Statute and Federal regulations. All Work shall be executed under the established plan and Department approved procedures. The TCP is the result of considerations and investigations made in the development of a comprehensive plan for accommodating vehicular and pedestrian traffic through the construction zone.
- C. The complexity of the TCP varies with the complexity of the traffic problems associated with a project. Many situations can be covered adequately with reference to specific sections from the Manual on Uniform Traffic Control Devices (MUTCD), the Traffic Control Devices Handbook (TCDH), or Roadway and Traffic Design Standard Series 600.

1.8 MAINTENANCE OF FLOW

- A. Provide for the flow of sewers, drains, courses interrupted during the progress of the Work, and shall immediately cart away and remove all offensive matter. The

entire procedure of maintaining existing flow shall be fully discussed with the ENGINEER well in advance of the interruption of any flow.

PART 2 PRODUCTS

2.1 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. All newly constructed Work shall be carefully protected from damage in any way. No wheeling or walking or placing of heavy loads on it shall be allowed and all portions damaged shall be reconstructed by the CONTRACTOR at his own expense.
- B. All structures shall be protected in a manner approved by the ENGINEER. Should any of the floors or other parts of the structures become heaved, cracked or otherwise damaged, all such damaged portions of the Work shall be completely repaired and made good by the CONTRACTOR at his own expense and to the satisfaction of the ENGINEER. Special attention is directed to substructure bracing requirements, described in Section 31 40 00. If, in the final inspection of the Work, any defects, faults or omissions are found, the CONTRACTOR shall cause the same to be repaired or removed and replaced by proper materials and workmanship without extra compensation for the materials and labor required. The CONTRACTOR shall be fully responsible for the satisfactory maintenance and repair of the construction and other Work undertaken herein, for at least the guarantee period described in the contract.
- C. Take all necessary precautions to prevent damage to any structure due to water pressure during and after construction and until such structure is accepted and taken over by the OWNER.

PART 3 EXECUTION

3.1 PROTECTION OF CONSTRUCTION AND EQUIPMENT

- A. Sequence and schedule Work in a manner to preclude delays and conflicts between the Work of various trades and contractors. Each trade shall keep informed as to the Work of other trades on the project and shall execute their Work in a manner that will not interfere with the Work of other trades.

3.2 DIAGRAMMATIC NATURE OF DRAWINGS

- A. Where layout is diagrammatic, such as pipelines, conduits, ductwork, etc., it shall be followed as closely as other Work will permit. Changes from diagrams shall be made as required to conform to the construction requirements.

- B. Before running lines, carefully verify locations, depths and sizes and confirm that lines can be run as contemplated without interfering with other construction. Any deviation shall be referred to the ENGINEER for approval before lines are run. Minor changes in location of the equipment, fixtures, piping, etc., from those shown on the Drawings, shall be made without extra charge if so directed by the ENGINEER before installation.
- C. Determine the locations and sizes of equipment, fixtures, conduit, ducts, openings, etc., in order that there will be no interference in the installation of the Work or delay in the progress of other Work. In the event that interferences develop, the ENGINEER's decision regarding relocation of Work will be final.
- D. Any changes made necessary through failure to make proper arrangements to avoid interference shall not be considered as extras. Cooperate with those performing other Work in preparation of interference drawings, to the extent that the location of piping, ductwork, etc., with respect to the installations of other trades shall be mutually agreed upon by those performing the Work.

3.3 PROVISIONS FOR LATER INSTALLATION

- A. Where any Work cannot be installed as the construction is progressing, provide for boxes, sleeves, inserts, fixtures or devices as necessary to permit installation of the omitted Work during later phases of construction. Arrange for chases, holes, and other openings in the masonry, concrete or other Work and provide for subsequent closure after placing equipment. Arrangement for and closure of openings shall be subject to the approval of the ENGINEER and all costs therefor shall be included in the contract price for the Work.

3.4 COORDINATION

- A. The CONTRACTOR shall be fully responsible for the coordination of his Work and the work of his employees, Subcontractors, and suppliers with the OWNER, and regulatory agencies, and assure compliance with schedules.

END OF SECTION

SECTION 01 31 19
PROJECT MEETINGS**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Coordination
- B. Preconstruction Conference
- C. Progress Meetings

1.2 COORDINATION

- A. General: Coordinate scheduling, submittals, and Contract Work to assure efficient and orderly sequence of installation of interdependent construction elements.

1.3 PRECONSTRUCTION CONFERENCE

- A. General: Prior to commencement of the Work, in accordance with the General Conditions, the OWNER will conduct a preconstruction conference to be held at a predetermined time and place.
- B. Delineation of Responsibilities: The purpose of the conference is to designate responsible personnel, to establish a working relationship among the parties and to identify the responsibilities of the OWNER, plant personnel and the CONTRACTOR/VENDOR. Matters requiring coordination will be discussed and procedures for handling such matters, established herein. The agenda will include:
 - 1. Submittal procedures
 - 2. Partial Payment procedures
 - 3. Maintenance of Records
 - 4. Schedules, sequences and maintenance of facility operations
 - 5. Safety and First Aid responsibilities
 - 6. Change Orders and Field Directive Changes
 - 7. Use of site
 - 8. Housekeeping
 - 9. OWNER provided Material Coordination
- C. Attendees: The preconstruction conference is to be attended by the representatives of the CONTRACTOR/VENDOR, the OWNER and plant

personnel that will be associated with the project. Representatives of regulatory agencies, Subcontractors, and principal suppliers may also attend when appropriate.

- D. Chair and Minutes: The preconstruction conference will be chaired by the OWNER who will also arrange for the keeping and distribution of minutes to all attendees.

1.4 PROGRESS MEETINGS

- A. Meeting Frequency and Format: Schedule progress meetings on at least a bi-weekly basis (twice per month) or more frequently as warranted by the complexity of the Project, to review the Work, discuss changes in schedules, maintain coordination and resolve potential problems. Invite OWNER, ENGINEER and all Subcontractor/ VENDORS. Suppliers may be invited as appropriate. Minutes of the meeting will be maintained by CONTRACTOR/VENDOR and reviewed by ENGINEER prior to distribution by the CONTRACTOR/VENDOR. Distribute reviewed minutes to attendees within seven (7) calendar days after each meeting.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 32 16
PROGRESS SCHEDULE

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Form of Schedules
- B. Content of Schedules: Submit for approval, a preliminary progress schedule in accordance with the General Conditions.
- C. Schedule Revisions
- D. Submittal Requirements

1.2 FORM OF SCHEDULES

- A. Prepare schedules in form of a horizontal bar chart.
 - 1. Provide separate horizontal bar for each trade or operation.
 - 2. Utilize a horizontal time scale and identify first workday of each week.
 - 3. Utilize scale and spacings to allow space for notations and future revisions.
- B. Utilize a listing format which chronologically indicates the order of start of each item of Work.
- C. Identify each listing by major specification section numbers.

1.3 CONTENT OF SCHEDULES

- A. Completion Dates: Show the beginning and ending contract dates stated in documents. Schedules showing completion prior to the contract completion date will be accepted but in no event will they be considered basis for a claim for delay against the OWNER by the CONTRACTOR for the period between the early completion date and the completion date provided in the Contract Documents.

- B. Show complete sequence of construction by activity.
- C. Show dates for beginning and completion of each major element of construction and installation dates for major items of equipment. Elements shall include, but not be limited to, the following:
 - 1. Shop drawing receipt from supplier/manufacture submitted to ENGINEER, review and return to supplier/manufacture
 - 2. Material and equipment order, manufacturer, delivery, installation, and checkouts
 - 3. Performance tests and supervisory services activity
 - 4. Construction of various facilities
 - 5. Demolition
 - 6. Excavation, sheeting, shoring, dewatering
 - 7. Concrete placement sequence
 - 8. Structural steel erection
 - 9. Wall and roof construction
 - 10. Piping and equipment installation
 - 11. Electrical Work activity
 - 12. Heating, ventilating, and air conditioning Work activity
 - 13. Plumbing Work activity
 - 14. Sewer installation
 - 15. Connection to existing sewers
 - 16. Water main installation
 - 17. Miscellaneous concrete placement
 - 18. Subcontractor's items of Work
 - 19. Backfilling, grading, seeding, sodding, landscaping, fence construction, and paving

- 20. Final cleanup
- 21. Allowance for inclement weather
- 22. Coordination with concurrent Work on site
- D. Show projected percentage of completion for each item as of first day of each month.

1.4 SCHEDULE REVISIONS

- A. As a minimum, revise construction schedule every thirty (30) calendar days to reflect changes in progress of Work for duration of Contract.
- B. Indicate progress of each activity at date of submittal.
- C. Show changes occurring since previous submittal of schedule.
 - 1. Major change in scope
 - 2. Activities modified since previous submittal
 - 3. Revised projections of progress and completion
 - 4. Other identifiable changes
- D. Provide a written report as needed to define:
 - 1. Problem areas, anticipated delays, and impact on schedule
 - 2. Corrective action recommended and its effect
 - 3. Effect of changes on schedules of other contractors

1.5 SUBMITTAL REQUIREMENTS

- A. Schedule: Submit final progress schedule in accordance with the General Conditions.
- B. For preliminary and final submittal of construction progress schedule and subsequent revisions thereof furnish three (3) copies to ENGINEER.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 33 00**SUBMITTALS****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Description of Requirements
- B. Submittal Procedures
- C. Specific Submittal Requirements
- D. Action on Submittals
- E. Repetitive Review

1.2 DESCRIPTION OF REQUIREMENTS

- A. This section specifies procedural requirements for Shop Drawings, product data, samples, and other miscellaneous Work-related submittals.
- B. Procedures concerning items such as listing of manufacturers, suppliers, Subcontractors, construction progress schedule, schedule of Shop Drawing submissions, bonds, payment applications, insurance certificates, and schedule of values are specified elsewhere.
- C. Work-Related Submittals:
 - 1. Substitution or "Or Equal" Items:
 - a. Includes material or equipment CONTRACTOR requests ENGINEER to accept, after Bids are received, as substitute for items specified or described in Specifications by using name of a proprietary item or name of particular supplier.
 - 2. Shop Drawings:
 - a. Includes technical data and drawings specially prepared for this Project, including fabrication and installation drawings, diagrams, actual performance curves, data sheets, schedules, templates, patterns, reports, instructions, design mix formulas, measurements, and similar information not in standard printed form.

- b. Standard information prepared without specific reference to the Project is not considered a Shop Drawing.
- 3. Product Data:
 - a. Includes standard printed information on manufactured products, and systems that has not been specially prepared for this Project, including manufacturer's product specifications and installation instructions, catalog cuts, standard wiring diagrams, printed performance curves, mill reports, and standard color charts.
- 4. Samples:
 - a. Includes both fabricated and manufactured physical examples of materials, products, and units of Work, partial cuts of manufactured or fabricated Work, swatches showing color, texture, and pattern, and units of Work to be used for independent inspection and testing.
 - b. Mock-ups are special forms of samples which are too large or otherwise inconvenient for handling in manner specified for transmittal of sample submittals.
- 5. Working Drawings:
 - a. When used in the Contract Documents, the term "working drawings" shall be considered to mean the CONTRACTOR'S plans for temporary structures such as temporary bulkheads, support of open cut excavation, support of utilities control systems, forming and falsework for underpinning; temporary by-pass pumping and for such other Work as may be required for construction but does not become an integral part of the project.
 - b. Copies of working drawings shall be submitted to the ENGINEER at least fourteen (14) calendar days (unless otherwise specified by the ENGINEER) in advance of the required Work.
 - c. Working drawings shall be signed by a registered Professional ENGINEER currently licensed to practice in the State of Florida and shall convey, or be accompanied by, calculation or other sufficient information to completely explain the structure, machine, or system described and its intended manner of use.

6. Miscellaneous Submittals:

- a. Work-related submittals that do not fit in the previous categories, such as guarantees, warranties, certifications, experience records, maintenance agreements, Health and Safety Plan (HASP), Hurricane Preparedness Plan, Operating and Maintenance Manuals, workmanship bonds, survey data and reports, physical Work records, quality testing and certifying reports, copies of industry standards, record drawings, field measurement data, and similar information, devices, and materials applicable to the Work.

1.3 SUBMITTAL PROCEDURES

A. Scheduling:

1. Submit for approval, a preliminary schedule of shop drawings and samples submittals, in duplicate, and in accordance with the General Conditions.
2. Prepare and transmit each submittal to ENGINEER sufficiently in advance of scheduled performance of related Work and other applicable activities.

B. Coordination:

1. Coordinate preparation and processing of submittals with performance of Work. Coordinate each submittal with other submittals and related activities such as substitution requests, testing, purchasing, fabrication, delivery, and similar activities that require sequential activity.
2. Coordinate submission of different units of interrelated Work so that one submittal will not be delayed by ENGINEER's need to review a related submittal. ENGINEER may withhold action on any submittal requiring coordination with other submittals until related submittals are forthcoming.

C. Submittal Preparation:

1. Stamp and sign each submittal certifying to review of submittal, verification of products, field measurement, field construction criteria, coordination of information within submittal with requirements of the Work and the Contract Documents, coordination with all trades, and verification that product will fit in space provided.
2. Transmittal Form: In the transmittal form forwarding each specific submittal to the ENGINEER include the following information as a minimum.

- a. Date of submittal and dates of previous submittals containing the same material.
- b. Project title and number.
- c. Submittal and transmittal number.
- d. Contract identification.
- e. Names of:
 - (1) Contractor
 - (2) Supplier
 - (3) Manufacturer
- f. Identification of equipment and material with equipment identification numbers, model numbers, and Specification section number.
- g. Variations from Contract Documents and any limitations which may impact the Work.
- h. Drawing sheet and detail number as appropriate.

D. Resubmittal Preparation:

- 1. Comply with the requirements described in Submittal Preparation. In addition:
 - a. Identify on transmittal form that submittal is a resubmission.
 - b. Make any corrections or changes in submittals required by ENGINEER's notations on returned submittal.
 - c. Respond to ENGINEER's notations:
 - (1) On the transmittal or on a separate page attached to CONTRACTOR's resubmission transmittal, answer or acknowledge in writing all notations or questions indicated by ENGINEER on ENGINEER's transmittal form returning review submission to CONTRACTOR.
 - (2) Identify each response by question or notation number established by ENGINEER.
 - (3) If CONTRACTOR does not respond to each notation or question, resubmission will be returned without action by ENGINEER until CONTRACTOR provides a written response to all ENGINEER's notations or questions.
 - d. CONTRACTOR initiated revisions or variations:

- (1) On transmittal form identify variations or revisions from previously reviewed submittal, other than those called for by ENGINEER.
- (2) ENGINEER's responsibility for variations or revisions is established in the General Conditions.

1.4 SPECIFIC SUBMITTAL REQUIREMENTS

- A. Specific submittals required for individual elements of Work are specified in the individual Specification sections. Except as otherwise indicated in Specification sections, comply with requirements specified herein for each indicated type of submittal.
- B. Requests for Substitution or "Or Equal"
 1. Collect data for items to be submitted for review as substitution into one submittal for each item of material or equipment in accordance with the General Conditions.
 2. Submit with other scheduled submittals for the material or equipment allowing time for ENGINEER to evaluate the additional information required to be submitted.
 3. If CONTRACTOR requests to substitute for material or equipment specified but not identified in Specifications as requiring submittals, schedule substitution submittal request in Submittal schedule and submit as scheduled.
- C. Shop Drawings:
 1. Check all drawings, data and samples before submitting to the ENGINEER for review. Each and every copy of the drawings and data shall bear CONTRACTOR's stamp showing that they have been so checked. Shop drawings submitted to the ENGINEER without the CONTRACTOR's stamp will be returned to the CONTRACTOR for conformance with this requirement. All shop drawings shall be submitted through the CONTRACTOR, including those from any Subcontractors.
 2. Submit newly prepared information, with graphic information at accurate scale. Indicate name of manufacturer or supplier (firm name). Show dimensions and clearly note which are based on field measurement; identify materials and products which are included in the Work; identify revisions. Indicate compliance with standards and notation of coordination requirements with other Work. Highlight, encircle or otherwise indicate variations from Contract Documents or previous submittals.

3. Include on each drawing or page:
 - a. Submittal date and revision dates.
 - b. Project name, division number and descriptions.
 - c. Detailed specifications section number and page number.
 - d. Identification of equipment, product or material.
 - e. Name of CONTRACTOR and Subcontractor.
 - f. Name of Supplier and Manufacturer.
 - g. Relation to adjacent structure or material.
 - h. Field dimensions, clearly identified.
 - i. Standards or Industry Specification references.
 - j. Identification of deviations from the Contract Documents.
 - k. CONTRACTOR's stamp, initialed or signed, dated and certifying to review of submittal, certification of field measurements and compliance with Contract.
 - l. Physical location and location relative to other connected or attached material at which the equipment or materials are to be installed.
4. Provide 8-inch by 3-inch blank space for CONTRACTOR and ENGINEER stamps.
5. Submittals:
 - a. Submit one (1) electronic PDF file. One (1) PDF file will be returned.
6. Distribution:
 - a. Do not proceed with installation of materials, products or systems until copy of applicable product data showing only approved information is in possession of installer.
 - b. Maintain one set of printed product data (for each submittal) at Project site.

D. Product Data:

1. Preparation:

- a. Collect required data into single submittal for each element of Work or system. Where product data has been printed to include information on several similar products, some of which are not required for use on Project or are not included in submittal, mark copies to clearly show such information is not applicable.
- b. Where product data must be specially prepared for required products, materials or systems, because standard printed data are not suitable for use, submit data as a Shop Drawing and not as product data.

2. Submittals:

- a. Submittal is for information and record, and to determine that products, materials, and systems comply with Contract Documents. Submittal is final when returned by ENGINEER marked "Approved" or "Approved as Noted".

3. Distribution:

- a. Do not proceed with installation of materials, products or systems until copy of applicable product data showing only approval information is in possession of installer.
- b. Maintain one set of product data (for each submittal) at Project site, available for reference by ENGINEER and others.

E. Samples:

1. Preparation:

- a. Where possible, provide samples that are physically identical with proposed materials or products to be incorporated into the Work. Where variations in color, pattern or texture are inherent in material or product represented by sample, submit multiple units (not less than 3 units) showing approximate limits of variations.
- b. Provide full set of optional samples where ENGINEER's selection required. Prepare samples to match ENGINEER's selection where so indicated.

- c. Include information with each sample to show generic description, source or product name and manufacturer, limitations, and compliance with standards.
 - d. Submit samples for ENGINEER's visual review of general generic kind, color, pattern, texture, and for final check of coordination of these characteristics with other related elements of Work.
 - 2. Submittals:
 - a. At CONTRACTOR's option, and depending upon nature of anticipated response from ENGINEER, initial submittal of samples may be either preliminary or final submittal.
 - b. A preliminary submittal, consisting of a single set of samples, is required where specifications indicate ENGINEER's selection of color, pattern, texture or similar characteristics from manufacturer's range of standard choices is necessary. Preliminary submittals will be reviewed and returned with ENGINEER's "Action" marking.
 - c. Final Submittals: Submit three (3) sets of samples in final submittal, one (1) set will be returned.
 - 3. Distribution:
 - a. Maintain returned final set of samples at Project site, in suitable condition and available for quality control comparisons throughout course of performing Work.
 - b. Returned samples intended or permitted to be incorporated in the Work are indicated in Specification sections, and shall be in undamaged condition at time of use.
- F. Mock-Ups:
- 1. Mock-ups and similar samples specified in Specification sections are recognized as special type of samples. Comply with samples submittal requirements to greatest extent possible. Process transmittal forms to provide record of activity.

G. Miscellaneous Submittals:

1. Inspection and Test Reports:
 - a. Classify each inspection and test report as being either "Shop Drawings" or "product data", depending on whether report is specially prepared for Project or standard publication of workmanship control testing at point of production. Process inspection and test reports accordingly.
2. Guarantees, Warranties, Maintenance Agreements, and Workmanship Bonds:
 - a. Refer to Specification sections for specific requirements. Submittal is final when returned by ENGINEER marked "Approved" or "Approved as Noted".
 - b. In addition to copies desired for CONTRACTOR's use, furnish two (2) executed copies. Provide two (2) additional copies where required for maintenance data.
3. Survey Data:
 - a. Refer to Specification sections for specific requirements on property surveys, building or structure condition surveys, field measurements, quantitative records of actual Work, damage surveys, photographs, and similar data required by Specification sections. Copies will not be returned.
 - (1) Survey Copies: Furnish two (2) copies. Provide two (2) copies of final property survey (if any).
 - (2) Condition Surveys: Furnish two (2) copies.
4. Certifications:
 - a. Refer to Specification sections for specific requirement on submittal of certifications. Submit seven (7) copies. Certifications are submitted for review of conformance with specified requirements and information. Submittal is final when returned by ENGINEER marked "Approved".
5. Closeout Submittals:
 - a. Refer to Specification Section 01 77 00 for specific requirements on submittal of closeout information, materials, tools, and similar items.

- (1) Record Documents: Section 01 77 00.
- (2) Materials and Tools: Spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.
- (3) Operating and maintenance data.

H. Operation and Maintenance Manuals:

1. Submit Operation and Maintenance Manuals in accordance with Section 01 78 23.

I. General Distribution:

1. Unless required elsewhere, provide distribution of submittals to Subcontractors, suppliers, governing authorities, and others as necessary for proper performance of Work.

1.5 ACTION ON SUBMITTALS

A. ENGINEER's Action:

1. General:

- a. Except for submittals for record and similar purposes, where action and return on submittals are required or requested, ENGINEER will review each submittal, mark with appropriate action, and return. Where submittal must be held for coordination, ENGINEER will also advise CONTRACTOR without delay.
- b. ENGINEER will stamp each submittal with uniform, self-explanatory action stamp, appropriately marked with submittal action.

B. Action Stamp:

1. Approved:

- a. Final Unrestricted Release: Where submittals are marked "Approved", Work covered by submittal may proceed PROVIDED IT COMPLIES WITH CONTRACT DOCUMENTS. Acceptance of Work will depend upon that compliance.

2. Approved As Noted:

- a. When submittals are marked "Approved as Noted", Work covered by submittal may proceed PROVIDED IT COMPLIES WITH BOTH

ENGINEER'S NOTATIONS OR CORRECTIONS ON SUBMITTAL AND WITH Contract Documents. Acceptance of Work will depend on that compliance. Re-submittal is not required.

3. Comments Attached - Confirm or Resubmit:
 - a. When submittals are marked "Verify and Make Corrections", do not proceed with Work covered by submittal. Do not permit Work covered by submittal to be used at Project site or elsewhere where Work is in progress.
 - b. Revise submittal or prepare new submittal in accordance with ENGINEER's notations in accordance with Paragraph 1.3D of this section. Resubmit submittal without delay. Repeat if necessary to obtain different action marking.

1.6 RE-SUBMITTAL REVIEW

- A. Cost of Subsequent Reviews: Shop Drawings and Operation and Maintenance Manuals submitted for each item will be reviewed no more than twice at the OWNER's expense. All subsequent reviews will be performed at times convenient to the ENGINEER and at the CONTRACTOR's expense based on the ENGINEER's then prevailing rates including all direct and indirect costs and fees. Reimburse the OWNER for all such fees invoiced to the OWNER by the ENGINEER.
- B. Time Extension: Any need for more than one resubmission, or any other delay in ENGINEER's review of submittals, will not entitle CONTRACTOR to extension of the Contract Time.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 38 50**COLOR AUDIO-VIDEO CONSTRUCTION RECORD****PART 1 GENERAL****1.1 SCOPE**

- A. Prior to the commencement of any work, including Contractor mobilization, the Contractor shall have a continuous color digital audio-video recording taken of the interior and exterior areas of any areas of the existing wastewater treatment facilities that are likely to be impacted by construction activities. The audio-video record is to serve as a record of preconstruction conditions. The recording shall be suitable for viewing on standard laptop and/or desk top computers used by the Engineer, Owner, and Project Representative. Two copies of the recording shall be kept at the temporary construction office, one with the Project Representative and one with the Contractor until completion of the work at which time at least one copy shall be turned over to the Owner.

1.2 CONSTRUCTION SCHEDULE

- A. Digital recordings shall not be made more than 30 days prior to construction in any area. No construction shall begin prior to review and approval of the digital recordings covering the construction area by the Engineer. The Engineer shall have the authority to reject all or any portion of the digital recording not conforming to the specifications and order that it be redone at no additional charge. The Contractor shall reschedule unacceptable coverage within five (5) days after being notified. The Engineer shall designate those areas, if any, to be omitted from or added to the audio-video coverage. All master digital copies and written records shall be well maintained without any damage and shall become the property of the Owner.

1.3 PROFESSIONAL VIDEOGRAPHERS

- A. The Contractor shall engage the services of a professional videographer. The color audio video digital recordings shall be prepared by a responsible commercial firm known to be skilled and regularly engaged in the business of pre-construction color audio-video digital documentation. The videographer shall furnish to the Engineer a list of all equipment to be used for the audio-video recording, i.e., manufacturer's name, model number, technical specifications and other pertinent information. Additional information to be furnished by the videographer shall include the names and addresses of two (2) references that the videographer has performed color audio-videotaping for on projects of a similar nature, including one (1) within the last twelve (12) months.

PART 2 PRODUCT

2.1 GENERAL

- A. The total audio-video digital recording system and the procedures employed in its use shall be such as to produce a finished product that will fulfill the technical requirements of the project. The video portion of the recording shall produce bright, sharp, and clear pictures with accurate colors and shall be free from distortion or any other form of picture imperfection. All video recordings shall, by electronic means, display on the screen the day, the time, the month, and the year of the recording. This date and time information must be continuously and simultaneously generated with the actual recording. The audio portion of the recording shall produce the commentary of the camera operator with proper volume, clarity, and be free from distortion.

2.2 EQUIPMENT

- A. Audio/Video Recorder: Digital voice and video recorder, MPEG-4 recording technology for TV quality video recording, built-in microphone for high quality voice and sound recording, 3.15 Mega Pixel CDD Sensor with up to 640 x 480 video resolution, 4X digital zoom, 16 MB internal memory, SD/MMC compatible, compatible with software needed and cabling provided to interface with a Windows 10 based computer for creating high quality digital file records.
- B. Video Storage Devices: Used to create and store digital video, audio and multimedia files. Stores up to 4.7 GB or more than two hours of MPEG-2 Video, compatible for playback with most Windows 10 based computers. The storage devices shall be new and shall not have been used for any previous recording.

PART 3 EXECUTION

3.1 COVERAGE

- A. The recordings shall contain coverage of all surface features located within the construction areas and shall include but not be limited to: all roadways, pavements, detention ponds, ditches, walls, piping, equipment, curbs, driveways, sidewalks, culverts, headwalls, retaining walls, buildings, landscaping, trees, shrubbery, fences, and electrical power poles and equipment. Of particular concern shall be the existence of any faults, fractures, or defects.
- B. Recording coverage shall be grouped by structure providing both exterior and interior coverage for all areas that will be affected by the work. The outside areas of the work for the general area grounds shall be covered in grid format to cover the property for the construction areas that will be affected by the work. Coverage

shall include all surface conditions located within the zone of influence of construction supported by appropriate audio description.

3.2 AUDIO CONTENT

- A. Accompanying the video recording shall be a corresponding and simultaneously recorded audio recording. This audio recording, exclusively containing the commentary of the camera operator, shall assist in viewer orientation and in any needed identification, differentiation, clarification, or objective description of the features being shown in the video portion of the recording including the location relative to construction activities planned. The audio recording shall be free from any conversations between the camera operator and any other production technicians. Panning, zoom-in and zoom-out rates shall be sufficiently controlled to maintain a clear view of all subjects.

3.3 VIDEO LOGS

- A. Video Logs: Each video recording digital file shall have a log of that video recording's contents and what the recording file is stored on. The log shall describe the various segments of coverage contained on that video recording in terms of the location within the plant, extent of coverage, beginning and end points, directions of coverage, and date.

3.4 TIME OF EXECUTION:

- A. Visibility: All recording shall be performed during times of good visibility. No recording shall be done during periods of significant precipitation, mist, or fog. The recording shall only be done when sufficient sunlight is present for outdoor recordings to properly illuminate the subject, and to produce bright, sharp video recordings of those subjects. For indoor recordings, the Contractor shall provide adequate lighting to produce bright, sharp video recordings. No recording shall be performed when more than 10% of the area to be recorded contains debris or obstructions unless otherwise authorized by the Engineer.

3.5 CONTINUITY OF COVERAGE:

- A. In order to increase the continuity of the coverage, the coverage shall consist of a single, continuous, unedited recording which begins at one end of a particular construction area and proceeds uninterrupted to the other end of that area. Coverage shall reflect an organized, interrelated sequence of recordings from one construction area to another. Coverage shall be obtained by walking or by other conveyance approved by the Engineer.

3.6 COVERAGE RATES

- A. The rate of travel during a particular segment of coverage shall be related to the amount of the surface features within a construction area being recorded. For interior and exterior of existing structures, average rate of travel shall not exceed thirty feet per minute from approximately 10 feet from subject. For open areas within the existing plant, average rate of travel shall not exceed forty-eight feet per minute. For open areas within the new property area, average rate of travel shall not exceed sixty feet per minute.

3.7 CAMERA OPERATION

- A. Camera Stability: The camera shall be firmly held such that the movement of the camera during the recording process does not cause an unsteady picture.
- B. Camera Control: Camera pan, tilt, zoom-in, and zoom-out rates shall be sufficiently controlled such that recorded objects will be clearly viewed during video playback. In addition, all other camera and recording system controls such as lens focus and aperture, video level, pedestal, chroma, white balance, and electrical focus shall be properly controlled or adjusted to maximize picture quality.
- C. Viewer Orientation Techniques: The audio and video portions of the recording shall maintain viewer orientation. To this end overall establishing views and visual displays of all visible building distinguishing characteristics shall be incorporated at the beginning of each recording. The narrator shall regularly call out changes in direction, viewing angle, focus zoom, and distinguishing subjects as the video recording progresses.
- D. Operator Experience: The operator in charge must have had previous experience with audio-video documenting preconstruction work. Any apprentice operator(s) must be continuously supervised by an experienced operator.

3.8 VIDEO VIEWING

- A. The video recordings shall be suitable for playing video and audible recordings on standard computer desktop or laptop computers.

END OF SECTION

SECTION 01 42 00**REFERENCE STANDARDS****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Abbreviations and Symbols
- B. Reference Standards
- C. Definitions

1.2 RELATED SECTIONS

- A. Information provided in this section is used where applicable in individual Specification Sections, Divisions 2 through 16.

1.3 REFERENCE ABBREVIATIONS

- A. Reference to a technical society, trade association or standards setting organization, may be made in the Specifications by abbreviations in accordance with the following list:

AABC	Associated Air Balance Council
AAMA	Architectural Aluminum Manufacturers Association
AASHTO	American Association of State Highway and Transportation Officials
AATCC	American Association of Textile Chemists and Colorists
ACI	American Concrete Institute
ADC	Air Diffusion Council
AFBMA	Anti-friction Bearing Manufacturers Association
AGA	American Gas Association
AGMA	American Gear Manufacturers Association
AHA	Association of Home Appliance Manufacturers
AISC	American Institute of Steel Construction
AISI	American Iron and Steel Institute
AMCA	Air Movement and Control Association, Inc.
ANSI	American National Standards Institute
APA	American Plywood Association
ARI	American Refrigeration Institute
ASCE	American Society of Civil Engineers
ASHRAE	American Society of Heating, Refrigerating and Air Conditioning Engineers

ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineers
ASTM	American Society for Testing and Materials
AWI	Architectural Woodwork Institute
AWPA	American Wood Preservers Association
AWS	American Welding Society
AWWA	American Water Works Association
BHMA	Builders' Hardware Manufacturers Association
BIA	Brick Institute of American
CABO	Council of American Building Officials
CAGI	Compressed Air and Gas Institute
CISPI	Cast Iron Soil Pipe Institute
CMAA	Crane Manufacturers Association of America
CRD	U.S. Corps of Engineers Specifications
CRSI	Concrete Reinforcing Steel Institute
CTI	Cooling Tower Institute
DHI	Door and Hardware Institute
DOH	Department of Health
DOT	Department of Transportation
Fed. Spec.	Federal Specifications
FGMA	Flat Glass Marketing Association
FM	Factory Mutual
HMI	Hoist Manufacturing Institute
HPMA	See HPVA
HPVA	Hardwood Plywood Veneer Association
ICEA	Insulated Cable Engineers Association
IEEE	Institute of Electrical and Electronics Engineers
IFI	Industrial Fasteners Institute
MIL	Military Specifications
MSS	Manufacturer's Standardization Society
NAAMM	National Association of Architectural Metal Manufacturers
NACM	National Association of Chain Manufacturers
NBS	National Bureau of Standards, See NIST
NEBB	National Environmental Balancing Bureau
NEC	National Electrical Code
NEMA	National Electrical Manufacturers Association
NETA	National Electrical Testing Association
NFPA	National Fire Protection Association
NFPA	National Forest Products Association
NFPA	National Fluid Power Association
NIST	National Institute of Standards and Technology
NLMA	National Lumber Manufacturers Association
NSF	National Sanitation Foundation
OSHA	Occupational Safety and Health Act
PCI	Prestressed Concrete Institute

PDI	Plumbing and Drainage Institute
SAE	Society of Automotive Engineers
SCPRF	Structural Clay Products Research Foundation
SMACNA	Sheet Metal and Air Conditioning Contractors' National Association
SPI	Society of the Plastics Industry
SSPC	Steel Structures Painting Council
STI	Steel Tank Institute
TCA	Tile Council of American
TIMA	Thermal Insulation Manufacturers' Association
UL	Underwriters' Laboratories, Inc.
USBR	U. S. Bureau of Reclamation
USBS	U. S. Bureau of Standards, See NIST

1.4 REFERENCE STANDARDS

- A. Latest Edition: Construe references to furnishing materials or testing, which conform to the standards of a particular technical society, organization, or body, to mean the latest standard, code, or specification of that body, adopted and published as of the date of bidding this Contract. Standards referred to herein are made a part of these Specifications to the extent which is indicated or intended.
- B. Precedence: The duties and responsibilities of the OWNER, CONTRACTOR or ENGINEER, or any of their consultants, agents or employees are set forth in the Contract Documents and are not changed or altered by any provision of any referenced standard specifications, manuals or code, whether such standard manual or code is or is not specifically incorporated by reference in the Contract Documents. Any duty or authority to supervise or direct the furnishing or performance of the Work or any duty or authority, to undertake responsibility contrary to the powers of the ENGINEER as set forth in the Contract Documents cannot be assigned to the ENGINEER or any of the ENGINEER's consultants, agents or employees.

1.5 DEFINITIONS

- A. In these Contract Documents the words furnish, install and provide are defined as follows:
 - 1. Furnish (Materials): to supply and deliver to the project ready for installation and in operable condition.
 - 2. Install (services or labor): to place in final position, complete, anchored, connected in operable condition.
 - 3. Provide: to furnish and install complete. Includes the supply of specified services. When neither furnish, install or provide is stated, provided is implied.

1.6 LCU APPROVED MATERIALS LIST

- A. The CONTRACTOR shall refer to the most recent Approved Materials List, as of the date of the advertisement for these contract documents.
- B. The Approved Materials List located on LCU website constitutes a part of these contract documents.

1.7 LCU STANDARD DETAILS

- A. The CONTRACTOR shall refer to the most recent LCU Standard Details, as of the date of the advertisement for these contract documents.
- B. The Standard Details located on LCU website constitutes a part of these contract documents.

1.8 LCU DESIGN MANUAL

- A. The CONTRACTOR shall refer to the most recent LCU Design Manual, as of the date of the advertisement for these contract documents.
- B. The Design Manual located on LCU website constitutes a part of these contract documents.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 42 13**ABBREVIATIONS****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Abbreviations
- B. Standards for Abbreviations

1.2 RELATED SECTIONS

- A. Abbreviations provided in this section are used where applicable in individual Specification Sections, Divisions 2 through 33.

1.3 ABBREVIATIONS

- A. Abbreviations which may be used in Divisions 1 through 33 for units of measure are as follows:

alternating current ac
 American wire gauge.....AWG
 ampere(s)..... amp
 ampere-hour(s) AH
 annual ann
 Ampere Interrupting
 Capacity AIC
 atmosphere(s) atm
 average avg
 biochemical oxygen demand..... BOD
 Board Foot FBM
 brake horsepower..... bhp
 Brinell Hardness BH
 British thermal unit(s) Btu
 calorie (s) cal
 carbonaceous biochemical
 oxygen demand..... CBOD
 Celsius (centigrade) C
 Center to Center..... C to C
 centimeter(s) cm
 chemical oxygen demand..... COD
 coefficient, valve flow C_v

cubic cu
 cubic centimeter(s) cc
 cubic feet per day cfd
 cubic feet per hour cfh
 cubic feet per minute cfm
 cubic feet per minute,
 standard conditions scfm
 cubic feet per second cfs
 cubic foot (feet)..... cu ft
 cubic inch(es) cu in
 cubic yard(s) cu yd
 decibels dB
 decibels (A scale) dBa
 degree(s) deg
 dewpoint temperature dpt
 diameter dia
 direct current..... dc
 dissolved oxygen DO
 dissolved solids DS
 dry-bulb temperature dbt
 efficiency eff
 elevation el

LEE COUNTY UTILITIES

DANIELS PARKWAY WATERMAIN RELOCATION

entering water temperature ewt
 entering air temperature eat
 equivalent direct radiation edr
 face area fa
 face to face..... f to f
 Fahrenheit F
 feet per day fpd
 feet per hour..... fph
 feet per minute fpm
 feet per second fps
 foot (feet)..... ft
 foot-candle fc
 foot-pound ft-lb
 foot-pounds per minute ft-lb/min
 foot-pounds per second.....ft-lb/sec
 formazin turbidity unit(s) FTU
 frequency freq
 gallon(s) gal
 gallons per day..... gpd
 gallons per day per
 cubic foot..... gpd/cu ft
 gallons per day per
 square foot gpd/sq ft
 gallons per hour gph
 gallons per minute..... gpm
 gallons per second gps
 gas chromatography and
 mass spectrometry GC-MS
 gauge ga
 grain(s) gr
 gram(s) g
 grams per cubic centimetergm/cc
 Heat Transfer Coefficient U
 height hgt
 Hertz..... Hz
 horsepower hp
 horsepower-hourhp-hr
 hour(s)..... hr
 humidity, relative rh
 hydrogen ion concentration pH
 inch(es) in
 inches per second ips
 inside diameter..... ID
 Jackson turbidity unit(s)..... JTU
 kelvin K

kiloampereskA
 kilogram(s)..... kg
 kilometer(s)..... km
 kilovar (kilovolt-amperes
 reactive)..... kvar
 kilovolt(s)kV
 kilovolt-ampere(s) kVA
 kilowatt(s)kW
 kilowatt-hour(s)kWh
 linear foot (feet) lin ft
 liter(s) L
 megavolt-ampere(s) MVA
 meter(s)m
 micrograms per liter..... ug/L
 miles per hour..... mph
 milliamperes(s) mA
 milligram(s) mg
 milligrams per liter mg/L
 milliliter(s) mL
 millimeter(s)..... mm
 million gallons MG
 million gallons per day mgd
 millisecond(s)..... ms
 millivolt(s)..... mV
 minute(s)..... min
 mixed liquor suspended
 solids MLSS
 nephelometric turbidity
 unit..... NTU
 net positive suction headNPSH
 noise criteria nc
 noise reduction coefficient NRC
 numberno
 ounce(s) oz
 outside airoa
 outside diameter OD
 parts per billion ppb
 parts per million ppm
 percent pct
 phase (electrical) ph
 pound(s) lb
 pounds per cubic foot pcf
 pounds per cubic foot
 per hourpcf/hr
 pounds per day..... lbs/day

pounds per day per
 cubic foot..... lbs/day/cu ft
 pounds per day per
 square foot..... lbs/day/sq ft
 pounds per square foot psf
 pounds per square foot
 per hour..... psf/hr
 pounds per square inch..... psi
 pounds per square inch
 absolute..... psia
 pounds per square inch
 gauge psig
 power factor PF
 pressure drop or
 difference dp
 pressure, dynamic
 (velocity)..... vp
 pressure, vapor vap pr
 quart(s)..... qt
 Rankine R
 relative humidity rh
 resistance..... res
 return air..... ra
 revolution(s) rev
 revolutions per minute rpm
 revolutions per second rps
 root mean squared rms
 safety factor..... sf
 second(s) sec
 shading coefficient..... SC
 sludge density index..... SDI
 Sound Transmission
 Coefficient STC
 specific gravity..... sp gr
 specific volume..... Sp Vol
 sp ht at constant pressure Cp
 square sq
 square centimeter(s)sq cm
 square foot (feet)..... sq ft
 square inch (es)..... sq in
 square meter(s)..... sq m

square yard(s) sq yd
 standard std
 static pressurest pr
 supply air sa
 suspended solids..... SS
 temperature temp
 temperature difference TD
 temperature entering TE
 temperature leaving..... TL
 thousand Btu per hour Mbh
 thousand circular mils..... kcmil
 thousand cubic feet Mcf
 threshold limit value..... TLV
 tons of refrigeration..... tons
 torque TRQ
 total dissolved solids..... TDS
 total dynamic head TDH
 total kjeldahl nitrogen..... TKN
 total oxygen demand TOD
 total pressure..... TP
 total solids..... TS
 total suspended solids TSS
 total volatile solids TVS
 vacuum..... vac
 viscosity..... visc
 volatile organic chemical VOC
 volatile solids VS
 volatile suspended solids..... VSS
 volt(s)..... V
 volts-ampere(s)..... VA
 volume vol
 watt(s)..... W
 watthour(s)..... Wh
 watt-hour demand..... WHD
 watt-hour demand meter WHDM
 week(s)..... wk
 weight wt
 wet-bulb..... WB
 wet bulb temperature..... WBT
 yard(s) yd
 year(s) yr

1.4 STANDARD FOR ABBREVIATIONS

- A. Use ASME Y1.1-1989, "Abbreviations for use on Drawings and in Text" for abbreviations for units of measure not included in Paragraph 1.3.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 43 00
QUALITY CONTROL**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Submittals
- B. Inspection Services
- C. Inspection of Materials
- D. Quality Control
- E. Costs of Inspection
- F. Acceptance Tests
- G. Failure to Comply with Contract

1.2 RELATED SECTIONS

- A. Section 01 33 00 - Submittals: Specific Submittal Requirements

1.3 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Certificate Submittals: Furnish the ENGINEER authoritative evidence in the form of Certificates of Manufacture that the materials and equipment to be used in the Work have been manufactured and tested in conformity with the Contract Documents. Include copies of the results of physical tests and chemical analyses, where necessary, that have been made directly on the product or on similar products of the manufacturer.

1.4 INSPECTION SERVICES

- A. OWNER's Access: At all times during the progress of the Work and until the date of final completion, afford the OWNER and ENGINEER every reasonable, safe, and proper facility for inspecting the Work at the site. The observation and inspection of any Work will not relieve the CONTRACTOR of any obligations to perform proper and satisfactory Work as specified. Replace Work rejected due to

faulty design, inferior, or defective materials, poor workmanship, improper installation, excessive wear, or nonconformity with the requirements of the Contract Documents, with satisfactory Work at no additional cost to the OWNER. Replace as directed, finished or unfinished Work found not to be in strict accordance with the Contract, even though such Work may have been previously approved and payment made therefor.

- B. Rejection: The OWNER and the OWNER's Authorized Representatives have the right to reject materials and workmanship which are defective or require correction. Promptly remove rejected Work and materials from the site.
- C. Inferior Work Discoveries: Failure or neglect on the part of the OWNER or the OWNER's Authorized Representatives to condemn or reject bad or inferior Work or materials does not imply an acceptance of such Work or materials. Neither is it to be construed as barring the OWNER or the OWNER's Authorized Representatives at any subsequent time from recovering damages or a sum of money needed to build anew all portions of the Work in which inferior Work or improper materials were used.
- D. Removal for Examination: Should it be considered necessary or advisable by the OWNER or the OWNER's Authorized Representatives, at any time before final acceptance of the Work, to make examinations of portions of the Work already completed, by removing or tearing out such portions, promptly furnish all necessary facilities, labor, and material, to make such an examination. If such Work is found to be defective in any respect, defray all expenses of such examination and of satisfactory reconstruction. If, however, such Work is found to meet the requirements of the Contract, the cost of examination and restoration of the Work will be considered a change in the Work to be paid for in accordance with applicable provisions of the Contract.
- E. Operation Responsibility: Assume full responsibility for the proper operation of equipment during tests and instruction periods. Make no claim for damage which may occur to equipment prior to the time when the OWNER accepts the Work.
- F. Rejection Prior to Warranty Expiration: If at anytime prior to the expiration of any applicable warranties or guarantees, equipment is rejected by the OWNER, repay to the OWNER all sums of money received for the rejected equipment on progress certificates or otherwise on account of the Contract lump sum prices, and upon the receipt of the sum of money, OWNER will execute and deliver a bill of sale of all its rights, title, and interest in and to the rejected equipment. Do not remove the equipment from the premises of the OWNER until the OWNER obtains from other sources, equipment to take the place of that rejected. The OWNER hereby agrees to obtain other equipment within a reasonable time and the CONTRACTOR agrees that the OWNER may use the equipment furnished by the

CONTRACTOR without rental or other charge until the other new equipment is obtained.

1.5 INSPECTION OF MATERIALS

- A. Premanufacture Notification: Give notice in writing to the ENGINEER sufficiently in advance of the commencement of manufacture or preparation of materials especially manufactured or prepared for use in or as part of the permanent construction. When required, notice to include a request for inspection, the date of commencement, and the expected date of completion of the manufacture or preparation of materials. Upon receipt of such notice, ENGINEER will arrange to have a representative present at such times during the manufacture or testing as may be necessary to inspect the materials, or will notify CONTRACTOR that the inspection will be made at a point other than the point of manufacture or testing, or that the inspection will be waived. Comply with these provisions before shipping any materials. Such inspection will not constitute a release from the responsibility for furnishing materials meeting the requirements of the Contract Documents.
- B. Testing Standards: Tests of electrical and mechanical equipment and appliances shall be conducted in accordance with recognized, applicable test codes except as may otherwise be stated herein.

1.6 QUALITY CONTROL

A. Testing

1. Field and Laboratory

- a. Provide personnel to assist the ENGINEER in performing the following periodic observation and associated services.
 - (1) Soils: Observe and test excavations, placement and compaction of soils. Determine suitability of excavated material. Observe subgrade soils and foundations.
 - (2) Concrete: Observe forms and reinforcement; observe concrete placement; witness air entrainment tests, facilitate concrete cylinder preparation and assist with other tests performed by ENGINEER.
 - (3) Masonry: Sample and test mortar, bricks, blocks and grout; inspect brick and block samples and sample panels; inspect placement of reinforcement and grouting.
- b. When specified in Divisions 2 through 16 of the Contract Documents, provide an independent laboratory testing facility to perform required

testing. Qualify the laboratory as having performed previous satisfactory Work. Prior to use, submit to the ENGINEER for approval.

- c. Cooperate with the ENGINEER and laboratory testing representatives. Provide at least 24 hours notice prior to when specified testing is required. Provide labor and materials, and necessary facilities at the site as required by the ENGINEER and the testing laboratory.
2. Equipment: Coordinate and demonstrate test procedures as specified in the Contract Documents or as otherwise required during the formal tests.
3. Pipeline and Other Testing: Conform to test procedures and requirements specified in the appropriate Specification Section.

B. Reports

1. Certified Test Reports: Where transcripts or certified test reports are required by the Contract Documents, meet the following requirements:
 - a. Before delivery of materials or equipment submit and obtain approval of the ENGINEER for all required transcripts, certified test reports, certified copies of the reports of all tests required in referenced specifications or specified in the Contract Documents. Perform all testing in an approved independent laboratory or the manufacturer's laboratory. Submit for approval reports of shop equipment tests within thirty (30) days of testing. Transcripts or test reports are to be accompanied by a notarized certificate in the form of a letter from the manufacturer or supplier certifying that tested material or equipment meets the specified requirements and the same type, quality, manufacture and make as specified. The certificate shall be signed by an officer of the manufacturer or the manufacturer's plant manager.
2. Certificate of Compliance: At the option of the ENGINEER, or where not otherwise specified, submit for approval a notarized Certificate of Compliance. The Certificates may be in the form of a letter stating the following:
 - a. Manufacturer has performed all required tests
 - b. Materials to be supplied meet all test requirements
 - c. Tests were performed not more than one year prior to submittal of the certificate

- d. Materials and equipment subjected to the tests are of the same quality, manufacture and make as those specified
- e. Identification of the materials

1.7 COSTS OF INSPECTION

- A. OWNER's Obligation: Initial inspection and testing of materials furnished under this Contract will be performed by the OWNER or his authorized Representatives or inspection bureaus without cost to the CONTRACTOR, unless otherwise expressly specified. If subsequent testing is necessary due to failure of the initial tests or because of rejection for noncompliance, reimburse the OWNER for expenditures incurred in making such tests.
- B. CONTRACTOR's Obligation: Include in the Contract Price, the cost of all shop and field tests of equipment and other tests specifically called for in the Contract Documents.
- C. Reimbursements to OWNER:
 - 1. Materials and equipment submitted by the CONTRACTOR as the equivalent to those specifically named in the Contract may be tested by the OWNER for compliance. Reimburse the OWNER for expenditures incurred in making such tests on materials and equipment which are rejected for noncompliance.
 - 2. Reimburse OWNER for the costs of any jobsite inspection between the hours of 7:00 p.m. and 6:00 a.m.
 - 3. Reimburse OWNER for all costs associated with Witness Tests which exceed five (5) calendar days per kind of equipment.

1.8 ACCEPTANCE TESTS

- A. Preliminary Field Tests: As soon as conditions permit, furnish all labor and materials and services to perform preliminary field tests of all equipment provided under this Contract. If the preliminary field tests disclose that any equipment furnished and installed under this Contract does not meet the requirements of the Contract Documents, make all changes, adjustments and replacements required prior to the acceptance tests.
- B. Final Field Tests: Upon completion of the Work and prior to final payment, subject all equipment, piping and appliances installed under this Contract to specified acceptance tests to demonstrate compliance with the Contract Documents.

1. Furnish all labor, fuel, energy, water and other materials, equipment, instruments and services necessary for all acceptance tests.
 2. Conduct field tests in the presence of the ENGINEER. Perform the field tests to demonstrate that under all conditions of operation each equipment item:
 - a. Has not been damaged by transportation or installation
 - b. Has been properly installed
 - c. Has been properly lubricated
 - d. Has no electrical or mechanical defects
 - e. Is in proper alignment
 - f. Has been properly connected
 - g. Is free of overheating of any parts
 - h. Is free of all objectionable vibration
 - i. Is free of overloading of any parts
 - j. Operates as intended
 3. Operate Work or portions of Work for a minimum of 100 hours or fourteen (14) days continuous service, whichever comes first. For those items of equipment which would normally operate on wastewater or sludge, plant effluent may be used if available when authorized by ENGINEER. If water can not properly exercise equipment, conduct 100-hour test after plant startup. Conduct test on those systems which require load produced by weather (heating or cooling) exercise only when weather will produce proper load.
- C. Failure of Tests: If the acceptance tests reveal defects in material or equipment, or if the material or equipment in any way fails to comply with the requirements of the Contract Documents, then promptly correct such deficiencies. Failure or refusal to correct the deficiencies, or if the improved materials or equipment, when tested again, fail to meet the guarantees or specified requirements, the OWNER, notwithstanding its partial payment for Work and materials or equipment, may reject said materials or equipment and may order the CONTRACTOR to remove the defective Work from the site at no addition to the Contract Price, and replace it with material or equipment which meets the Contract Documents.

1.9 FAILURE TO COMPLY WITH CONTRACT

- A. Unacceptable Materials: If it is ascertained by testing or inspection that the material or equipment does not comply with the Contract, do not deliver said material or equipment, or if delivered remove it promptly from the site or from the Work and replace it with acceptable material without additional cost to the OWNER. Fulfill all obligations under the terms and conditions of the Contract

even though the OWNER or the OWNER's Authorized Representatives fail to ascertain noncompliance or notify the CONTRACTOR of noncompliance.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 55 26
TRAFFIC REGULATION**PART 1 GENERAL****1.1 SECTION INCLUDES:**

- A. General Requirements
- B. Traffic Control

1.2 RELATED SECTIONS

- A. Section 01 31 13 – Project Coordination

1.3 GENERAL REQUIREMENTS

- A. All projects and Work on highways, roads, and streets, shall have a traffic control plan (TCP), as required by Florida Statute and Federal regulations. All Work shall be executed under the established plan and Department approved procedures. The TCP is the result of considerations and investigations made in the development of a comprehensive plan for accommodating vehicular and pedestrian traffic through the construction zone.
- B. The complexity of the TCP varies with the complexity of the traffic problems associated with a project. Many situations can be covered adequately with reference to specific sections from the Manual on Uniform Traffic Control Devices (MUTCD), the Traffic Control Devices Handbook (TCDH), or Roadway and Traffic Design Standard Series 600.
- C. The CONTRACTOR shall be responsible for providing safe and expeditious movement of traffic through construction zones. A construction zone is defined as the immediate areas of actual construction and all abutting areas which are used by the CONTRACTOR and which interfere with the driving or walking public.
- D. Remove temporary equipment and facilities when no longer required, restore grounds to original, or to specified conditions.
- E. Before starting Work, the CONTRACTOR shall submit to the Lee County Department of Transportation, with copy to the ENGINEER, a detailed schedule of their operations a minimum of fourteen (14) days prior to beginning Work for approval. This shall include, but not be limited to, type and extent of temporary

paving, and drawings and lists describing materials and traffic control methods to be used. Approval shall not relieve the CONTRACTOR of their obligation to provide a safe and proper crossing.

1.4 TRAFFIC CONTROL

- A. The necessary precautions shall include, but not be limited to, such items as proper construction warning signs, signals, lighting devices, marking, barricades, channelization, and hand signaling devices. The CONTRACTOR shall be responsible for installation and maintenance of all devices and requirements for the duration of the Construction period.
- B. The CONTRACTOR shall provide at least 72 hours notification to the State, County, or municipal Department of Transportation of the necessity to close any portion of a roadway carrying vehicles or pedestrians so that the final approval of such closings can be obtained at least 48 hours in advanced. At no time will more than one (1) lane of roadway be closed to vehicles and pedestrians. With any such closings adequate provision shall be made for the safe expeditious movement of each.
- C. The CONTRACTOR shall also be responsible for notifying Police, Fire, and other Emergency Departments whenever construction is within roadways and of the alternate routes. Monthly status reports shall be provided to these Departments, as a minimum.
- D. The CONTRACTOR shall be responsible for removal, relocation, or replacement of any traffic control device in the construction area which exists as part of the normal pre-construction traffic control scheme. Any such actions shall be performed by the CONTRACTOR under the supervision, and in accordance with the Specifications, of the OWNER, unless otherwise specified.
- E. The CONTRACTOR shall immediately notify the OWNER of any vehicular or pedestrian safety or efficiency problems incurred as a result of the construction of the project.
- F. The CONTRACTOR shall be responsible for notifying all residents of any road construction and limited access at least 72 hours in advance.

LEE COUNTY UTILITIES

DANIELS PARKWAY
WATERMAIN RELOCATION

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 57 00

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. General Requirements
- B. Temporary Utilities
- C. Temporary Construction
- D. Barricades and Enclosures
- E. Fences
- F. Security
- G. Temporary Controls
- H. Traffic Regulation
- I. Field Offices and Sheds

1.2 GENERAL REQUIREMENTS

- A. Plant and Facilities: Furnish, install, maintain and remove all false Work, scaffolding, ladders, hoistways, braces, pumping plants, shields, trestles, roadways, sheeting, centering forms, barricades, drains, flumes, and the like, any of which may be needed in the construction of any part of the Work and which are not herein described or specified in detail. The CONTRACTOR shall accept responsibility for the safety and efficiency of such Works and for any damage that may result from their failure or from their improper construction, maintenance or operation.
- B. First Aid: Maintain a readily accessible, completely equipped first aid kit at each location where Work is in progress.
- C. Safety Responsibility: Accept sole responsibility for safety and security at the site. Indemnify and hold harmless the OWNER and the OWNER's Authorized

Representatives, including the ENGINEER, for any safety violation, or noncompliance with governing bodies and their regulations, and for accidents, deaths, injuries, or damage at the site during occupancy or partial occupancy of the site by CONTRACTOR's forces while performing any part of the Work.

- D. Hazard Communication: Furnish two (2) copies of the CONTRACTOR's Hazard Communication Program required under OSHA regulations before beginning on site activities. Furnish two (2) copies of amendments to Hazard Communications Program as they are prepared.

1.3 TEMPORARY UTILITIES

- A. Water: Provide all necessary and required water without additional cost to the County, unless otherwise specified. If necessary, provide and lay water lines to the place of use; secure all necessary permits; pay for all taps to water mains and hydrants and for all water used at the established rates.
- B. Light and Power: Provide without additional cost to the OWNER temporary lighting and power facilities required for the proper construction and inspection of the Work. If, in the ENGINEER's opinion, these facilities are inadequate, do NOT proceed with any portion of the Work affected thereby. Maintain temporary lighting and power until the Work is accepted.
- C. Heat: Provide temporary heat, whenever required, for Work being performed during cold weather to prevent freezing of concrete, water pipes, and other damage to the Work or existing facilities.
- D. Sanitary Facilities: Provide sufficient sanitary facilities for construction personnel. Prohibit and prevent nuisances on the site of the Work or on adjoining property. Discharge any employee who violates this rule. Abide by all environmental regulations or laws applicable to the Work.
- E. Connections to Existing Utilities:
 - 1. Unless otherwise specified or indicated, make all necessary connections to existing facilities including structures, drain lines, and utilities such as water, sewer, gas, telephone, and electricity. In each case, obtain permission from the OWNER or the owning utility prior to undertaking connections. Protect facilities against deleterious substances and damage.
 - 2. Thoroughly plan in advance all connections to existing facilities. Have on hand at the time of undertaking the connections, all material, labor and required equipment. Proceed continuously to complete connections in

minimum time. Arrange for the operation of valves or other appurtenances on existing utilities, under the direct supervision of the owning utility.

1.4 TEMPORARY CONSTRUCTION

- A. Bridges: Design and place suitable temporary bridges where necessary for the maintenance of vehicular and pedestrian traffic. Assume responsibility for the sufficiency and safety of all such temporary Work or bridges and for any damage which may result from their failure or their improper construction, maintenance, or operation. Indemnify and save harmless the OWNER and the OWNER's representatives from all claims, suits or actions, and damages or costs of every description arising by reason of failure to comply with the above provisions.

1.5 BARRICADES AND ENCLOSURES

- A. Protection of Workmen and Public: Effect and maintain at all times during the prosecution of the Work, barriers and lights necessary for the protection of Workmen and the Public. Provide suitable barricades, lights, "danger" or "caution" or "street closed" signs and watchmen at all places where the Work causes obstructions to normal traffic, excavation sites, or constitutes in any way a hazard to the public.
- B. Barricades and Lights:
 - 1. Protect all streets, roads, highways, excavations and other public thoroughfares which are closed to traffic; use effective barricades which display acceptable warning signs. Locate barricades at the nearest public highway or street on each side of the blocked section.
 - 2. Statutory Requirements: Install and maintain all barricades, signs, lights, and other protective devices within highway rights-of-way in strict conformity with applicable statutory requirements by the authority having jurisdiction.

1.6 FENCES

- A. Existing Fences: Obtain written permission from the OWNER prior to relocating or dismantling fences which interfere with construction operations. Reach agreements with the fence OWNER as to the period the fence may be left relocated or dismantled. Install adequate gates where fencing must be maintained. Keep gates closed and locked at all times when not in use.
- B. Restoration: Restore all fences to their original or better condition and to their original location on completion of the Work.

1.7 SECURITY

A. Preservation of Property:

1. Preserve from damage, all property along the line of the Work, in the vicinity of or in any way affected by the Work, the removal or destruction of which is not called for by the Drawings. Preserve from damage, public utilities, trees, lawn areas, building monuments, fences, pipe and underground structures, and public streets. Note: Normal wear and tear of streets resulting from legitimate use by the CONTRACTOR are not considered as damage. Whenever damages occur to such property, immediately restore to its original condition. Costs for such repairs are incidental to the Contract.
2. In case of failure on the part of the CONTRACTOR to restore property or make good on damage or injury, the OWNER may, upon 24 hours written notice, proceed to repair, rebuild, or otherwise restore such property as may be deemed necessary, and the cost thereof will be deducted from any moneys due or which may become due the CONTRACTOR under this Contract. If removal, repair or replacement of public or private property is made necessary by alteration of grade or alignment authorized by the OWNER and not contemplated by the Contract Documents, the CONTRACTOR will be compensated, in accordance with the General Conditions, provided that such property has not been damaged through fault of the CONTRACTOR or the CONTRACTOR's employees.

B. Public Utility Installations and Structures:

1. Public utility installations and structures include all poles, tracks, pipes, wires, conduits, vaults, manholes, and other appurtenances and facilities, whether owned or controlled by public bodies or privately-owned individuals, firms or corporations, used to serve the public with transportation, gas, electricity, telephone, storm and sanitary sewers, water, or other public or private utility services. Facilities appurtenant to public or private property which may be affected by the Work are deemed included hereunder.
2. The Contract Documents contain data relative to existing public utility installations and structures above and below the ground surface. Existing public utility installations and structures are indicated on the Drawings only to the extent such information was made available to, or found by, the ENGINEER in preparing the Drawings. These data are not guaranteed for completeness or accuracy, and the CONTRACTOR is responsible for making necessary investigations to become fully informed as to the

character, condition, and extent of all public utility installations and structures that may be encountered and that may affect the construction operations.

3. Contact utility locating service sufficiently in advance of the start of construction to avoid damage to the utilities and delays to the completion date.
 4. Remove, replace, relocate, repair, rebuild, and secure any public utility installations and structures damaged as a direct or indirect result of the Work under this Contract. Costs for such Work are incidental to the Contract. Be responsible and liable for any consequential damages done to or suffered by any public utility installations or structures. Assume and accept responsibility for any injury, damage, or loss which may result from or be consequent to interference with, or interruption or discontinuance of, any public utility service.
 5. Repair or replace any water, electric, sewer, gas, irrigation, or other service connection damaged during the Work with no addition to the Contract price.
 6. At all times in performance of the Work, employ proven methods and exercise reasonable care and skill to avoid unnecessary delay, injury, damage, or destruction to public utility installations and structures. Avoid unnecessary interference with, or interruption of, public utility services. Cooperate fully with the OWNERS thereof to that end.
 7. Give written notice to the OWNERS of all public utility installations and structures affected by proposed construction operations, sufficiently in advance of breaking ground in any area or on any unit of the Work, to obtain their permission before disrupting the lines and to allow them to take measures necessary to protect their interests. Advise the Chiefs of Police, Fire and Rescue Services of any excavation in public streets or the temporary shut-off of any water main. Provide at least 24 hours notice to all affected property OWNERS whenever service connections are taken out of service.
- C. Miscellaneous Structures: Assume and accept responsibility for all injuries or damage to culverts, building foundations and walls, retaining walls, or other structures of any kind met with during the prosecution of the Work. Assume and accept liability for damages to public or private property resulting therefrom. Adequately protect against freezing all pipes carrying liquid.
- D. Protection of Trees and Lawn Areas:

1. Protect with boxes, trees and shrubs, except those ordered to be removed. Do not place excavated material so as to cause injury to such trees or shrubs. Replace trees or shrubs destroyed by accident or negligence of the CONTRACTOR or CONTRACTOR's employees with new stock of similar size and age, at the proper season, at no additional cost to the OWNER.
2. Leave lawn areas in as good condition as before the start of the Work. Restore areas where sod has been removed by sodding.

1.8 TEMPORARY CONTROLS

A. During Construction:

1. Keep the site of the Work and adjacent premises free from construction materials, debris, and rubbish. Remove this material from any portion of the site if such material, debris, or rubbish constitutes a nuisance or is objectionable.
2. Remove from the site all surplus materials and temporary structures when they are no longer needed.
3. Neatly stack construction materials such as concrete forms and scaffolding when not in use. Promptly remove splattered concrete, asphalt, oil, paint, corrosive liquids, and cleaning solutions from surfaces to prevent marring or other damage.
4. Properly store volatile wastes in covered metal containers and remove from the site daily.
5. Do not bury or burn on the site or dispose of into storm drains, sanitary sewers, streams, or waterways, any waste material. Remove all wastes from the site and dispose of in a manner complying with applicable ordinances and laws.

B. Smoke Prevention:

1. Strictly observe all air pollution control regulations.

C. Noises:

1. Maintain acceptable noise levels in the vicinity of the Work. Limit noise production to acceptable levels by using special mufflers, barriers, enclosures, equipment positioning, and other approved methods.

2. Supply written notification to the OWNER sufficiently in advance of the start of any Work which violates this provision. Proceed only when all applicable authorizations and variances have been obtained in writing.
- D. Hours of Operation:
1. Refer to the supplemental conditions section for hours of operation.
 2. Do not carry out nonemergency Work, including equipment moves, on Sundays without prior written authorization by the OWNER. No Work shall be performed on holidays or weekends unless otherwise specified or approved.
- E. Dust Control:
1. Take measures to prevent unnecessary dust. Keep earth surfaces exposed to dusting moist with water or a chemical dust suppressant. Cover materials in piles or while in transit to prevent blowing or spreading dust.
 2. Adequately protect buildings or operating facilities which may be affected adversely by dust. Protect machinery, motors, instrument panels, or similar equipment by suitable dust screens. Include proper ventilation with dust screens.
- F. Temporary Drainage Provisions:
1. Provide for the drainage of stormwater and any water applied or discharged on the site in performance of the Work. Provide adequate drainage facilities to prevent damage to the Work, the site, and adjacent property.
 2. Supplement existing drainage channels and conduits as necessary to carry all increased runoff from construction operations. Construct dikes as necessary to divert increased runoff from entering adjacent property (except in natural channels), to protect the OWNER's facilities and the Work, and to direct water to drainage channels or conduits. Provide ponding as necessary to prevent downstream flooding.
 3. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.
- G. Pollution: Prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. Do

not permit sanitary wastes to enter any drain or watercourse other than sanitary sewers. Do not permit sediment, debris, or other substances to enter sanitary sewers. Take reasonable measures to prevent such materials from entering any drain or watercourse.

1.9 TRAFFIC REGULATION

- A. Parking: Provide and maintain suitable parking areas for the use of all construction workers and others performing Work or furnishing services in connection with the Contract, to avoid any need for parking personal vehicles where they may interfere with public traffic or construction activities.
- B. Access: Conduct Work to interfere as little as possible with public travel, whether vehicular or pedestrian. Provide and maintain suitable and safe bridges, detours, or other temporary expedients for the accommodation of public and private travel. Whenever it is necessary to cross, obstruct, or close roads, driveways, and walks, whether public or private, give reasonable notice to OWNERS of private drives before interfering with them. Such maintenance of traffic will not be required when the CONTRACTOR has obtained permission from the OWNER or tenant of private property, or from the authority having jurisdiction over the public property involved, to obstruct traffic at the designated point.

1.10 FIELD OFFICES AND SHEDS

- A. CONTRACTOR's Office: Erect, furnish, and maintain a field office with a telephone. Have an authorized agent present at this office at all times while the Work is in progress. Keep readily accessible copies of the Contract Documents, required record documents, and the latest approved shop drawings at this field office.
- B. Material Sheds and Temporary Structures: Provide material sheds and other temporary structures of sturdy construction and neat appearance.
- C. Location: Coordinate location of field offices, material sheds and temporary structures with ENGINEER and OWNER.

END OF SECTION

SECTION 01 60 00**REGULATORY REQUIREMENTS AND NOTIFICATIONS****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Obtain and pay for all permits and licenses as required for construction of the project.
- B. Schedule all inspections and obtain all written approvals of the agencies required by the permits and licenses.
- C. Comply with all conditions specified in each of the permits and licenses.
- D. The CONTRACTOR shall keep a copy of all permits and easements complete with conditions, attachments, exhibits, and modifications at the Work site and provide copies of the permits to the appropriate Subcontractors. The CONTRACTOR is responsible for ensuring that the permit conditions are explained to the appropriate construction personnel.

1.2 PERMITS OBTAINED BY OWNER

- A. The OWNER will apply and pay for the following permits. The FDEP and FDOT permit for the project has been obtained by the OWNER. A copy of the permit has been included in the Appendix.
- B. The CONTRACTOR shall conform to the conditions of permits provided by the following agencies as part of this Contract:
 - 1. Florida Department of Environmental Protection (FDEP)
 - 2. Florida Department of Transportation (FDOT)
 - 3. Lee County
 - 4. South Florida Water Management District (SFWMD)

1.3 PERMITS OBTAINED BY CONTRACTOR

- A. CONTRACTOR shall obtain any and all other permits required for prosecution of the Work.
- B. CONTRACTOR shall prepare, submit and obtain the appropriate dewatering permits and/or any temporary stormwater discharge permits from the South Florida Water Management District (SFWMD) and/or Florida Department of Environmental Protection (FDEP).

1.4 NOTIFICATION

- A. The CONTRACTOR is required to notify the OWNER and any applicable permitting agency who requires notification as part of their permit condition within the timeframe stated on the permit. If no time exists, notification shall be a minimum of 48 hours prior to initiating construction.
- B. Utility Companies: CONTRACTOR shall notify the Sunshine State One Call of Florida (SSOCF) service at 811, 48 hours prior to digging for direct bury and 10 days prior to digging or initiating construction of underwater construction activities, as required by Florida Statutes Chapter 556 throughout the duration of the construction project.
- C. The CONTRACTOR shall give the Engineer not less than seven (7) calendar days notice of the time and place (or places) where they will start the work.

1.5 PERMIT CONDITIONS

- A. CONTRACTOR shall comply with and furnish all items necessary to satisfy any general or specific conditions that are a part of the OWNER obtained permits.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01 61 00
MATERIAL AND EQUIPMENT**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Description
- B. Substitutions
- C. Manufacturer's Written Instructions
- D. Owner Procured Equipment
- E. Transportation and Handling
- F. Storage, Protection and Maintenance
- G. Manufacturer's Field Quality Control Services
- H. Post Startup Services
- I. Special Tools and Lubricating Equipment
- J. Lubrication

1.2 DESCRIPTION

- A. Proposed Manufacturers List: Within fifteen (15) calendar days of the date of the Notice to Proceed, submit to the ENGINEER a list of the names of proposed manufacturers, materialmen, suppliers and Subcontractors, obtain approval of this list by OWNER prior to submission of any working drawings. Upon request submit evidence to ENGINEER that each proposed manufacturer has manufactured a similar product to the one specified and that it has previously been used for a like purpose for a sufficient length of time to demonstrate its satisfactory performance.
- B. Furnish and install Material and Equipment which meets the following:
 - 1. Conforms to applicable specifications and standards.
 - 2. Complies with size, make, type, and quality specified or as specifically approved, in writing, by ENGINEER.

3. Will fit into the space provided with sufficient room for operation and maintenance access and for properly connecting piping, ducts and services, as applicable. Make the clear spaces that will be available for operation and maintenance access and connections equal to or greater than those shown and meeting all the manufacturers' requirements. Make all provisions for installing equipment furnished at no increase in Contract Price.
4. Manufactured and fabricated in accordance with the following:
 - a. Design, fabricate, and assemble in accordance with best engineering and shop practices.
 - b. Manufacture like parts of duplicate units to standard sizes and gauges, to be interchangeable.
 - c. Provide two or more items of same kind identical, by same manufacturer.
 - d. Provide materials and equipment suitable for service conditions.
 - e. Adhere to equipment capabilities, sizes, and dimensions shown or specified unless variations are specifically approved, in writing, in accordance with the Contract Documents.
 - f. Adapt equipment to best economy in power consumption and maintenance. Proportion parts and components for stresses that may occur during continuous or intermittent operation, and for any additional stresses that may occur during fabrication or installation.
 - g. Working parts are readily accessible for inspection and repair, easily duplicated and replaced.
5. Use material or equipment only for the purpose for which it is designed or specified.

1.3 SUBSTITUTIONS

A. Substitutions:

1. CONTRACTOR's requests for changes in equipment and materials from those required by the Contract Documents are considered requests for substitutions and are subject to CONTRACTOR's representations and review provisions of the Contract Documents when one of following conditions are satisfied:

- a. Where request is directly related to an "or equal" clause or other language of same effect in Specifications.
- b. Where required equipment or material cannot be provided within Contract Time, but not as result of CONTRACTOR's failure to pursue Work promptly or to coordinate various activities properly.
- c. Where required equipment or material cannot be provided in manner compatible with other materials of Work, or cannot be properly coordinated therewith.

2. CONTRACTOR'S Options:

- a. Where more than one choice is available as options for CONTRACTOR's selection of equipment or material, select option compatible with other equipment and materials already selected (which may have been from among options for other equipment and materials).
- b. Where compliance with specified standard, code or regulation is required, select from among products which comply with requirements of those standards, codes, and regulations.
- c. "Or Equal": For equipment or materials specified by naming one or more equipment manufacturer and "or equal", submit request for substitution for any equipment or manufacturer not specifically named.

B. Conditions Which are Not Substitution:

1. Requirements for substitutions do not apply to CONTRACTOR options on materials and equipment provided for in the Specifications.
2. Revisions to Contract Documents, where requested by OWNER or ENGINEER, are "changes" not "substitutions".
3. CONTRACTOR's determination of and compliance with governing regulations and orders issued by governing authorities do not constitute substitutions and do not constitute basis for a Change Order, except as provided for in Contract Documents.

1.4 MANUFACTURER'S WRITTEN INSTRUCTIONS

- A. Instruction Distribution: When the Contract Documents require that installation, storage, maintenance and handling of equipment and materials comply with

manufacturer's written instruction's, obtain and distribute printed copies of such instructions to parties involved in installation, including six copies to ENGINEER.

1. Maintain one (1) set of complete instructions at jobsite during storage and installation, and until completion of Work.
- B. Manufacturer's Requirements: Store, maintain, handle, install, connect, clean, condition, and adjust products in accordance with manufacturer's written instructions and in conformity with Specifications.
1. Should job conditions or specified requirements conflict with manufacturer's instructions, consult ENGINEER for further instructions.
 2. Do not proceed with Work without written instructions.
- C. Performance Procedures: Perform Work in accordance with manufacturer's written instructions. Do not omit preparatory steps or installation procedures, unless specifically modified or exempted by Contract Documents.

1.5 OWNER PROCURED MATERIALS

- A. Material Pickup Coordination: CONTRACTOR shall pick up OWNER Procured Equipment at the following location:
- 5180 Tice Street, Fort Myers, FL 33905
- B. CONTRACTOR shall provide OWNER with a seven (7) day notification prior to CONTRACTOR picking up materials.
- C. CONTRACTOR shall be responsible for any damages to OWNER procured equipment during pick-up and shipping to Work site.

1.6 TRANSPORTATION AND HANDLING

- A. Coordination with Schedule: Arrange deliveries of materials and equipment in accordance with Construction Progress Schedules. Coordinate to avoid conflict with Work and conditions at site.
1. Deliver materials and equipment in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.
 2. Protect bright machined surfaces, such as shafts and valve faces, with a heavy coat of grease prior to shipment.

3. Immediately upon delivery, inspect shipments to determine compliance with requirements of Contract Documents and approved submittals and that material and equipment are protected and undamaged.
- B. Handling: Provide equipment and personnel to handle material and equipment by methods recommended by manufacturer to prevent soiling or damage to materials and equipment or packaging.

1.7 STORAGE, PROTECTION, AND MAINTENANCE

- A. On-site storage areas and buildings:
 1. Conform storage buildings to requirements of Section 01 57 00.
 2. Coordinate location of storage areas with ENGINEER and OWNER.
 3. Arrange on site storage areas for proper protection and segregation of stored materials and equipment with proper drainage. Provide for safe travel around storage areas and safe access to stored materials and equipment.
 4. Store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.
 5. Store materials such as pipe, reinforcing and structural steel, and equipment on pallets, blocks or racks, off ground.
 6. PVC Pipe may be damaged by prolonged exposure to direct sunlight and the CONTRACTOR shall take necessary precautions during storage and installation to avoid this damage. Pipe shall be stored under cover and installed with sufficient backfill to shield it from the sun.
 7. Store fabricated materials and equipment above ground, on blocking or skids, to prevent soiling or staining. Cover materials and equipment which are subject to deterioration with impervious sheet coverings; provide adequate ventilation to avoid condensation.
- B. Interior Storage:
 1. Store materials and equipment in accordance with manufacturer's instructions, with seals and labels intact and legible.
 2. Store materials and equipment, subject to damage by elements, in weathertight enclosures.

3. Maintain temperature and humidity within ranges required by manufacturer's instructions.
- C. Accessible Storage: Arrange storage in a manner to provide easy access for inspection and inventory. Make periodic inspections of stored materials or equipment to assure that materials or equipment are maintained under specified conditions and free from damage or deterioration.
1. Perform maintenance on stored materials of equipment in accordance with manufacturer's instructions, in presence of OWNER or ENGINEER.
 2. Submit a report of completed maintenance to ENGINEER with each Application for Payment.
 3. Failure to perform maintenance to notify ENGINEER of intent to perform maintenance or to submit maintenance report may result in rejection of material or equipment.
- D. OWNER's Responsibility: OWNER assumes no responsibility for materials or equipment stored in buildings or on-site. CONTRACTOR assumes full responsibility for damage due to storage of materials or equipment.
- E. CONTRACTOR's Responsibility: CONTRACTOR assumes full responsibility for protection of completed construction. Repair and restore damage to completed Work equal to its original condition.
- F. Special Equipment: Use only rubber-tired wheelbarrows, buggies, trucks, or dollies to wheel loads over finished floors, regardless if the floor has been protected or not. This applies to finished floors and to exposed concrete floors as well as those covered with composition tile or other applied surfacing.
- G. Surface Damage: Where structural concrete is also the finished surface, take care to avoid marking or damaging surface.

1.8 MANUFACTURER'S FIELD QUALITY CONTROL SERVICES

- A. General:
1. Provide manufacturer's field services in accordance with this subsection for those tasks specified in other sections.
 2. Include and pay all costs for suppliers' and manufacturers' services, including, but not limited to, those specified.

- B. Installation Instruction: Provide instruction by competent and experienced technical representatives of equipment manufacturers or system suppliers as necessary to resolve assembly or installation procedures which are attributable to, or associated with, the equipment furnished.
- C. Installation Inspection, Adjustments, and Startup Participation:
1. Provide competent and experienced technical representatives of equipment manufacturers or system suppliers to inspect the completed installation as follows.
 - a. Verify that equipment or system is installed in accordance with the manufacturer's recommendations, approved shop drawings and the Contract Documents.
 - b. Verify that nothing in the installation voids any warranty.
 - c. Detailed report by manufacturers' representatives, for review by ENGINEER of the installation, inspection and start-up services performed, including:
 - (1) Description of calibration and adjustments if made; if not in Operation and Maintenance Manuals, attach copy.
 - (2) Description of any parts replaced and why replaced.
 - (3) Type, brand name, and quantity of lubrication used, if any.
 - (4) General condition of equipment.
 - (5) Description of problems encountered, and corrective action taken.
 - (6) Any special instructions left with CONTRACTOR or ENGINEER.
- D. Field Test Participation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to participate in field testing of the equipment specified in Section 01 43 00.
- E. Trouble-Free Operation: Provide competent and experienced technical representatives of all equipment manufacturers and system suppliers as necessary to place the equipment in trouble-free operation after completion of start-up and field tests.

1.9 POST START-UP SERVICES

- A. General: Provide Post Start-up Services in accordance with this subsection for equipment specified in other sections.
- B. Site Visit: Provide the services of an authorized service representative for each equipment manufacturer or system supplier to make a final site visit after the equipment or system has been in operation for at least 6 months, but no longer than 11 months. Furnish assistance to OWNER's operating personnel in making adjustments and calibrations required to determine that the equipment and system is operating in conformance with design, manufacturer's, and specification requirements. Instruct the personnel in a review of proper operation and maintenance procedures.
- C. Certificate: Furnish "Certificate of Post Start-up Services" cosigned by ENGINEER and the manufacturer's representative, certifying that this service has been performed. Use form provided in this section, and furnish OWNER with three copies.

1.10 SPECIAL TOOLS AND LUBRICATING EQUIPMENT

- A. General: Furnish, per manufacturer's recommendations, special tools required for checking, testing, parts replacement, and maintenance. (Special tools are those which have been specially designed or adapted for use on parts of the equipment, and which are not customarily and routinely carried by maintenance mechanics.)
- B. Time of Delivery: Deliver special tools and lubricating equipment to OWNER when unit is placed into operation and after operating personnel have been properly instructed in operation, repair, and maintenance of equipment.
- C. Quality: Provide tools and lubricating equipment of a quality meeting equipment manufacturer's requirements.

END OF SECTION

SECTION 01 73 29
CUTTING AND PATCHING**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. General Requirements
- B. Scheduling of Shutdown

1.2 RELATED SECTIONS

- A. Section 32 10 01 – Pavement Repair and Restoration

1.3 GENERAL REQUIREMENTS

- A. CONTRACTOR shall be responsible for all cutting, fitting and patching, including attendant excavation and backfill, required to complete the Work or to:
 - 1. Make its several parts fit together properly.
 - 2. Uncover portions of the Work to provide for installation of ill-timed Work.
 - 3. Remove and replace defective Work.
 - 4. Remove and replace Work not conforming to requirements of Contract Documents.
 - 5. Remove samples of installed Work as specified for testing.
 - 6. Provide routine penetrations of non-structural surfaces for installation of piping and electrical conduit.
- B. Coordination: Perform all cutting, fitting or patching of the Work that may be required to make the several parts thereof join in accordance with the Contract Documents. Perform restoration with competent workmen skilled in the trade.
- C. Improperly Timed Work: Perform all cutting and patching required to install improperly timed Work, to remove samples of installed materials for testing, and to provide for alteration of existing facilities or for the installation of new Work in the existing construction.
- D. Limitations: Except when the cutting or removal of existing construction is specified or indicated, do not undertake any cutting or demolition which may affect the structural stability of the Work or existing facilities without the ENGINEER's concurrence.

1.4 SUBMITTALS

- A. Submit a written request to the ENGINEER well in advance of executing any cutting or alteration which affects:
 - 1. Work of the OWNER or any separate CONTRACTOR.
 - 2. Structural value or integrity of any element of the project or Work.
 - 3. Integrity or effectiveness of weather-exposed or moisture-resistant elements or systems.
 - 4. Efficiency, operational life, maintenance or safety of operational elements.
 - 5. Visual qualities of sight-exposed elements.
- B. Request shall include:
 - 1. Identification of the Work.
 - 2. Description of affected Work.
 - 3. The necessity for cutting, alteration, or excavation.
 - 4. Effect on Work of OWNER or any separate contract, or on structural or weatherproof integrity of Work.
 - 5. Description of proposed Work:
 - a. Scope of cutting, patching, alteration, or excavation.
 - b. Trades who will execute the Work.
 - c. Products proposed to be used.
 - d. Extent of refinishing to be done.
 - 6. Alternatives to cutting and patching.
 - 7. Cost proposal, when applicable.
 - 8. Written permission of any separate CONTRACTOR whose Work will be affected.
- C. SUBMIT WRITTEN NOTICE TO THE ENGINEER DESIGNATING THE DATE AND THE TIME THE WORK WILL BE UNCOVERED.

1.5 SCHEDULING OF SHUTDOWN

- A. Connections to Existing Facilities: If any connections, replacement, or other Work requiring the shutdown of an existing facility is necessary, schedule such Work at times when the impact on the OWNER's normal operation is minimal. Overtime, night and weekend Work without additional compensation from the OWNER, may be required to make these connections, especially if the connections are made at times other than those specified.
- B. Request for Shutdowns: Submit a written request for each shutdown to the OWNER and the ENGINEER sufficiently in advance of any required shutdown.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Comply with specifications and standards for each specific product involved.

PART 3 EXECUTION

3.1 INSPECTION

- A. Inspect existing conditions of projects, including elements subject to damage or to movement during cutting and patching.
- B. After uncovering Work, inspect conditions affecting installation of products, or performance of the Work.
- C. Report unsatisfactory or questionable conditions to the ENGINEER in writing; do not proceed with Work until the ENGINEER has provided further instructions.

3.2 PREPARATION

- A. Provide adequate temporary support as necessary to assure structural value or integrity or affected portion of Work.
- B. Provide devices and methods to protect other portions of project from damage.
- C. Provide protection from elements for that portion of the project which may be exposed by cutting and patching Work, and maintain excavations free from water.
- D. Material Removal: Cut and remove all materials to the extent shown or as required to complete the Work. Remove materials in a careful manner with no damage to adjacent facilities. Remove materials which are not salvageable from the site.

3.3 PERFORMANCE

- A. Execute cutting and demolition by methods which will prevent damage to other Work, and will provide proper surfaces to receive installation of repairs.
- B. Execute excavating and backfilling by methods which will prevent settlement or damage to other Work.
- C. Employ original installer or fabricator to perform cutting and patching for:
 - 1. Weather-exposed or moisture-resistant elements.
 - 2. Sight-exposed finished surfaces.
- D. Execute fitting and adjustment of products to provide a finished installation to comply with specified products, functions, tolerances, and finishes.

- E. Restore Work which has been cut or removed; install new products to provide completed Work in accord with requirements of contract documents.
- F. Fit Work airtight to pipes, sleeves, ducts, conduit and other penetrations through surfaces.
- G. Refinish entire surfaces as necessary to provide an even finish to match adjacent finishes:
 - 1. For continuous surfaces, refinish to nearest intersection.
 - 2. For an assembly, refinish entire unit.

3.4 PAVEMENT RESTORATION

- A. Restore all pavement or roadway surfaces in accordance with Section 32 10 01 – Pavement Repair and Restoration.
- B. The restoration of existing street paving, including underdrains, if any are encountered, where damaged, shall be restored by the CONTRACTOR and shall be replaced or rebuilt using the same type of construction as was in the original. The CONTRACTOR shall be responsible for restoring all such Work, including subgrade, base courses, curb and gutter or other appurtenances where present. The CONTRACTOR shall obtain and pay for at his own expense such local or other governmental permits as may be necessary for the opening of streets and shall satisfy himself as to any requirements other than those herein set forth which may affect the type, quality and manner of carrying on the restoration of surfaces by reason of jurisdiction of such governmental bodies.
- C. This section does not describe the construction of new road surfaces or the complete resurfacing of existing pavements.
- D. In all cases, the CONTRACTOR will be required to maintain, without additional compensation, all permanent replacement of street paving, done by him under this Contract for a period of 12 months after the acceptance of the Contract, including the removal and replacement of such Work wherever surface depressions or underlying cavities result from settlement of trench backfill.
- E. The CONTRACTOR shall do all the final resurfacing or repaving of streets or roads, over the excavations that he has made and he shall be responsible for relaying paving surfaces of roads that have failed or been damaged, at any time before the termination of the maintenance period on account of Work done by him and he shall resurface or repave over any tunnel jacking, or boring excavation that shall settle or break the surface, shall be repaved to the satisfaction of the OWNER and at the CONTRACTOR's sole expense. Backfilling of trenches and

the preparation of subgrades shall conform to the requirements of excavation and backfilling of pipeline trenches.

- F. Where pipeline construction crosses paved streets, the CONTRACTOR may elect, at no additional cost to the OWNER, to place the pipe by the jacking or boring or tunneling method in lieu of cutting and patching of the paved surfaces.

END OF SECTION

SECTION 01 74 00

CLEANING

PART 1 GENERAL

1.1 SECTION INCLUDES:

- A. General Requirements
- B. Disposal Requirements

1.2 GENERAL REQUIREMENTS

- A. Execute cleaning during progress of the Work and at completion of the Work.

1.3 DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with codes, ordinances, regulations, and anti-pollution laws.

PART 2 EXECUTION

3.1 DURING CONSTRUCTION

- A. Execute daily cleaning to keep the Work, the site, and adjacent properties free from accumulations of waste materials, rubbish, and windblown debris, resulting from construction operations.
- B. Provide onsite containers for the collection of waste materials, debris and rubbish. All waste materials including containers, food debris and other miscellaneous materials must be disposed of daily in onsite containers.
- C. Remove waste materials, debris and rubbish from the site periodically and dispose of at legal disposal areas away from the site.

3.2 FINAL CLEANING

- A. Requirements: At the completion of Work and immediately prior to final inspection, clean the entire project as follows:
 - 1. Thoroughly clean, sweep, wash, and polish all Work and equipment provided under the Contract, including finishes. Leave the structures and site in a complete and finished condition to the satisfaction of the ENGINEER.

2. Direct all Subcontractors to similarly perform, at the same time, an equivalent thorough cleaning of all Work and equipment provided under their contracts.
 3. Remove all temporary structures and all debris, including dirt, sand, gravel, rubbish and waste material.
 4. Should the CONTRACTOR not remove rubbish or debris or not clean the buildings and site as specified above, the OWNER reserves the right to have the cleaning done at the expense of the CONTRACTOR.
- B. Employ experienced workers, or professional cleaners, for final cleaning.
- C. Use only cleaning materials recommended by manufacturer of surface to be cleaned.
- D. In preparation for substantial completion or occupancy, conduct final inspection of sight-exposed interior and exterior surfaces, and of concealed spaces.
- E. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from sight-exposed interior and exterior finished surfaces. Polish surfaces so designated to shine finish.
- F. Repair, patch, and touch up marred surfaces to specified finish, to match adjacent surfaces.
- G. Replace air-handling filters if units were operated during construction.
- H. Clean ducts, blowers, and coils, if air-handling units were operated without filters during construction.
- I. Vacuum clean all interior spaces, including inside cabinets.
- J. Handle materials in a controlled manner with as few handlings as possible. Do not drop or throw materials from heights.
- K. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly-painted surfaces.
- L. Clean interior of all panel cabinets, pull boxes, and other equipment enclosures.
- M. Wash and wipe clean all lighting fixtures, lamps, and other electrical equipment which may have become soiled during installation.
- N. Perform touch-up painting.

- O. Broom clean exterior paved surfaces; rake clean other surfaces of the grounds.
- P. Remove erection plant, tools, temporary structures and other materials.
- Q. Remove and dispose of all water, dirt, rubbish or any other foreign substances.

3.3 FINAL INSPECTION

- A. After cleaning is complete the final inspection may be scheduled. The inspection will be done with the OWNER and ENGINEER.

END OF SECTION

SECTION 01 77 00**CONTRACT CLOSE OUT****PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. Warranties and Bonds
- B. Record Drawings
- C. Special Tools

1.2 WARRANTIES AND BONDS

Prior to final payment deliver to the OWNER the original and one (1) copy of all bonds, warranties, guarantees and similar documents, including those customarily provided by manufacturers and suppliers which cover a period greater than the one year correction period. Show OWNER as beneficiary of these documents.

1.3 AS-BUILT DRAWING

At the site keep and maintain one (1) record copy of all Contract Documents, reference documents and all technical documents submitted in good order. As the Work progresses the CONTRACTOR shall record on one (1) set of reproducible drawings all changes and deviations from the original Plans. They shall record the exact location of all changes in vertical and horizontal alignment by offsets and ties at each; sewer, water, electric, gas, communication and other services by off-set distance to permanent improvements such as building and curbs.

To receive payment after 25% project completion, CONTRACTOR shall submit a 25% as-built survey for the Work that has been completed. To receive payment after 50% project completion, CONTRACTOR shall submit a 50% as-built survey for the Work that has been completed. To receive payment after 75% project completion, CONTRACTOR shall submit a 75% as-built survey for the Work that has been completed.

1.4 RECORD DRAWINGS

Prior to acceptance of the project and before final payment is made, CONTRACTOR shall submit record, as-built drawing data with a full project survey to ENGINEER, and ENGINEER shall submit one (1) set of reproducible drawings, two (2) sets of blueline or blackline prints, all marked "Drawings of

Record". These Record Drawings must be certified by the Florida Registered Professional, who prepared the plans and signed and sealed these plans, and submits AutoCAD compatible diskette copy of the drawings, and other applicable related records to the Department of Lee County Utilities.

These Record Drawings must be certified by the Florida Registered Professional Engineer, who prepared the plans and signs and seals these plans. The Record Drawings shall include vertical and horizontal alignment of all water, sewer, and effluent reuse lines, valves, tees, bends, reducers, hydrants, pump stations, service connections, meter boxes and/or pads, and other pertinent structures. Pipeline runs in excess of 500 feet (152.4 meter) without fittings shall include vertical alignment information at 500 feet (152.4 meter) intervals. Said alignment shall be tied to permanent improvements, such as roadway and/or railroad centerlines and rights-of-way, building and property corners, and shall be certified by a Professional Land Surveyor, licensed in the State of Florida. The Professional Land Surveyor can coordinate with the CONTRACTOR to install the necessary appurtenances on buried utilities to facilitate the survey after construction is completed. In addition, property strap numbers and street names shall be shown on the plan.

On a case-by-case basis, Lee County Utilities may waive the requirement for certification by a Professional Land Surveyor, licensed in the State of Florida. However, prior consent must first be obtained from Lee County Utilities. The County shall withhold final acceptance of the project until the requirement for record drawings and related records has been met. Record Drawings without detailed field verified horizontal and vertical locations of all facilities shown will be rejected.

1.5 SPECIAL TOOLS

Special tools are considered to be those tools which, because of their limited use, are not normally available but which are necessary for maintenance of particular equipment.

For each type of equipment provided under this CONTRACT, furnish a complete set of all special tools including grease guns and other lubricating devices, which may be needed for the adjustment, operation, maintenance, and disassembly of such equipment. Furnish only tools of high grade, smooth forged alloy tool steel. Manufacture grease guns of the lever type.

Furnish and erect one (1) or more neat and substantial steel wall cases or cabinets with flat key locks and clips or hooks to hold each special tool in a convenient arrangement.

END OF SECTION

SECTION 01 78 23

OPERATION AND MAINTENANCE MANUALS

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Description
- B. Quality Assurance
- C. Submittals
- D. Format and Contents

1.2 DESCRIPTION

- A. Scope: Furnish to the ENGINEER 10 copies and a PDF of an Operation and Maintenance Manual for all equipment and associated control systems furnished and installed.

1.3 QUALITY ASSURANCE

- A. Reference Codes and Specifications: No current government or commercial specifications or documents apply.

1.4 SUBMITTALS

- A. Prior to the Work Reaching 50 Percent (50%) Completion, submit to the ENGINEER for approval two copies of the manual with all specified material. Submit the approval copies with the partial payment request for the specified completion. Within 30 days after the ENGINEER's approval of the two-copy submittal, furnish to the ENGINEER the remaining eight (8) copies of the manual. Provide space in the manual for additional material. Submit any missing material for the manual prior to requesting certification of substantial completion.

1.5 FORMAT AND CONTENTS

- A. Prepare and arrange each copy of the manual as follows:
 - 1. One copy of an equipment data summary (see sample form) for each item of equipment.

2. One copy of an equipment preventive maintenance data summary (see sample form) for each item of equipment.
 3. One copy of the manufacturer's operating and maintenance instructions. Operating instructions include equipment start-up, normal operation, shutdown, emergency operation and troubleshooting. Maintenance instructions include equipment installation, calibration and adjustment, preventive and repair maintenance, lubrication, troubleshooting, parts list and recommended spare parts.
 4. Furnish all O&M Manual material on 8-1/2 by 11 commercially printed or typed forms or an acceptable alternative format.
- B. Organize each manual into sections paralleling the equipment specifications. Identify each section using heavy section dividers with reinforced holes and numbered plastic index tabs. Use 3-ring, hard-back binders Type No. VS11 as manufactured by K&M Company, Torrence, CA, or equal. Punch all loose data for binding. Arrange composition and printing so that punching does not obliterate any data. Print on the cover and binding edge of each manual the project title, and manual title, as furnished and approved by the ENGINEER.
- C. Leave all operating and maintenance material that comes bound by the equipment manufacturer in its original bound state. Cross-reference the appropriate sections of the CONTRACTOR's O&M manual to the manufacturers' bound manuals.
- D. Label binders Volume 1, 2, and so on, where more than one binder is required. Include the table of contents for the entire set, identified by volume number, in each binder.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

Lee County Utilities
Daniels Parkway Watermain Relocation

Equipment Data Summary

Equipment Name: Specification Reference:

Manufacturer:

Name:

Address:

Telephone:

Number Supplied: Location/Service:

Model No: Serial No:

Type:

Size/Speed/Capacity/Range (as applicable):

Power Requirement (Phase/Volts/Hertz):

Local Representative:

Name:

Address:

Telephone:

NOTES:

Lee County Utilities
Daniels Parkway Watermain Relocation
Preventive Maintenance Summary

Equipment Name:	Location:		
Manufacturer:			
Name:			
Address:			
Telephone:			
Model No:	Serial No:		
Maintenance Task	Lubricant/Part	D W M Q SA A	O&M Manual Reference

NOTES:

*D-Daily W-Weekly M-Monthly Q-Quarterly SA-Semi-Annual A-Annual

SECTION 01 78 36

WARRANTIES AND BONDS

PART 1 GENERAL

1.1 REQUIREMENTS INCLUDED

- A. Compile specified warranties and bonds, as in Articles 6 and 13 of the General Conditions.
- B. Co-execute submittals when so specified.
- C. Review submittals to verify compliance with Contract Documents.
- D. Submit to the ENGINEER for review and transmittal to OWNER.

1.2 SUBMITTAL REQUIREMENTS

- A. Assemble warranties, bonds and service and maintenance contracts, executed by each of the respective manufacturers, suppliers, and Subcontractors.
- B. Two (2) original signed copies are required.
- C. Table of Contents. Neatly typed in orderly sequence. Provide complete information for each items.
 - 1. Product or Work item.
 - 2. Firm, with name of principal, address and telephone number.
 - 3. Scope.
 - 4. Date of beginning warranty, bond or service and maintenance contract.
 - 5. Duration of warranty, bond or service maintenance contract.
 - 6. Provide information for OWNER's personnel:
 - a. Proper procedure in case of failure.
 - b. Instances which might affect the validity of warranty or bond.
 - 7. CONTRACTOR, name of responsible principal, address and telephone number.

1.3 FORM OF SUBMITTALS

- A. Prepare in duplicate packets.

B. Format:

1. Size 8-1/2" x 11", punch sheets for standard 3-post binder.
 - a. Fold larger sheets to fit into binders.
2. Cover: Identify each packet with typed or printed title "WARRANTIES AND BONDS" list:
 - a. Title of Project
 - b. Name of CONTRACTOR

- C. Binders: Commercial quality, three-post binder, with durable and cleanable plastic covers and maximum post width of 2-inches.

1.4 WARRANTY SUBMITTAL REQUIREMENTS

- A. For all major pieces of equipment, submit a warranty from the equipment manufacturer. The manufacturer's warranty period shall be concurrent with the CONTRACTOR's for one (1) year, unless otherwise specified, commencing at the time of substantial completion.
- B. The CONTRACTOR shall be responsible for obtaining certificates for equipment warranty for all major equipment specified under Division 11, 13, 14, 15, and 16 and which has a 1 hp motor or which lists for more than \$1,000. The ENGINEER reserves the right to request warranties for equipment not classified as major. The CONTRACTOR shall still warrant equipment not considered to be "major" in the CONTRACTOR's one-year warranty period even though certificates of warranty may not be required.

END OF SECTION

SECTION 02 21 13
LINES AND GRADES**PART 1 GENERAL****1.1 SECTION INCLUDES**

- A. General
- B. Surveys
- C. Datum Plane
- D. Protection of Survey Data

1.2 GENERAL

- A. Construct all Work in accordance with the lines and grades shown on the Drawings. Assume full responsibility for keeping all alignment and grade.

1.3 SURVEYS

- A. Reference Points: The OWNER will provide reference points for the Work as described in the General Conditions. Base horizontal and vertical control points will be designated by the ENGINEER and used as datum for the Work. Perform all additional survey, layout, and measurement Work.
 - 1. Keep ENGINEER informed, sufficiently in advance, of the times and places at which Work is to be performed so that base horizontal and vertical control points may be established, and any checking deemed necessary by ENGINEER may be done, with minimum inconvenience to the ENGINEER and at no delay to CONTRACTOR. It is the intention not to impede the Work for the establishment of control points and the checking of lines and grades set by the CONTRACTOR. However, when necessary, suspend working operations for such reasonable time as the ENGINEER may require for this purpose. Costs associated with such suspension are deemed to be included in the Contract Price, and no time extension or additional costs will be allowed.
 - 2. Provide an experienced survey crew including an instrument operator, competent assistants, and any instruments, tools, stakes, and other materials required to complete the survey, layout, and measurement of Work performed by the CONTRACTOR.

1.4 DATUM PLANE

- A. All elevations indicated or specified refer to the Mean Sea Level Datum Plane, 1988 General Adjustment, of the United States Coast and Geodetic Survey and are expressed in feet and decimal parts thereof, or in feet and inches.

1.5 PROTECTION OF SURVEY DATA

- A. General: Safeguard all points, stakes, grade marks, known property corners, monuments, and benchmarks made or established for the Work. Reestablish them if disturbed and bear the entire expense of checking reestablished marks and rectifying Work improperly installed.
- B. Records: Keep neat and legible notes of measurements and calculations made in connection with the layout of the Work. Furnish copies of such data to the ENGINEER for use in checking the CONTRACTOR's layout. Data considered of value to the OWNER will be transmitted to the OWNER by the ENGINEER with other records on completion of the Work.

END OF SECTION

SECTION 02 40 00**DEMOLITION****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: All Work necessary for the removal and disposal of buildings, structures, foundations, piping, equipment and roadways, or any part thereof including masonry, steel, reinforced concrete, plain concrete, electrical facilities, and any other material or equipment shown or specified to be removed.
- B. Basic Procedures and Schedule: Carry out demolition so that adjacent structures, which are to remain, are not endangered. Schedule the Work so as not to interfere with the day to day operation of the existing facilities. Do not block doorways or passageways in existing facilities.
- C. Additional Requirements: Provide dust control and make provisions for safety.

1.2 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
- B. Site Inspection: Visit the site and inspect all existing structures. Observe and record any defects which may exist in buildings or structures adjacent to but not directly affected by the demolition Work. Provide the OWNER with a copy of this inspection record and obtain the ENGINEER's and OWNER's approval prior to commencing the demolition.

1.3 QUALITY ASSURANCE

- A. Limits: Exercise care to break concrete sufficiently for removal in reasonably small masses. Where only parts of a structure are to be removed, cut the concrete along limiting lines with a suitable saw so that damage to the remaining structure is held to a minimum.

PART 2 EXECUTION**2.1 EXAMINATION OF EXISTING DRAWINGS**

- A. Drawings of existing structures and equipment will be available for inspection at the office of the OWNER.

2.2 PROTECTION

- A. General Safety: Provide warning signs, protective barriers, and warning lights as necessary adjacent to the Work as approved or required. Maintain these items during the demolition period.
- B. Existing Services: Undertake no demolition Work until all mechanical and electrical services affected by the Work have been properly disconnected. Cap, reroute or reconnect interconnecting piping or electrical services that are to remain in service either permanently or temporarily in a manner that will not interfere with the operation of the remaining facilities.
- C. Hazards: Perform testing and air purging where the presence of hazardous chemicals, gases, flammable materials or other dangerous substances is apparent or suspected, and eliminate the hazard before demolition is started.

2.3 DEMOLITION REQUIREMENTS

- A. Explosives: The use of explosives will not be permitted.
- B. Protection: Carefully protect all mechanical and electrical equipment against dust and debris.
- C. Removal: Remove all debris from the structures during demolition and do not allow debris to accumulate in piles.
- D. Access: Provide safe access to and egress from all working areas at all times with adequate protection from falling material.
- E. Protection: Provide adequate scaffolding, shoring, bracing railings, toe boards and protective covering during demolition to protect personnel and equipment against injury or damage. Cover floor openings not used for material drops with material substantial enough to support any loads placed on it. Properly secure the covers to prevent accidental movement.
- F. Lighting: Provide adequate lighting at all times during demolition.
- G. Closed Areas: Close areas below demolition Work to anyone while removal is in progress.
- H. Material Drops: Do not drop any material to any point lying outside the exterior walls of the structure unless the area is effectively protected.

2.4 DISPOSAL OF MATERIALS

- A. Final Removal: Remove all debris, rubbish, scrap pieces, equipment, and materials resulting from the demolition unless otherwise indicated. Take title to all demolished materials and remove such items from the site.
- B. OWNER's Property: In addition to any items which may be shown, the following items remain the property of the OWNER. Remove carefully, without damage, all items listed or shown, and stockpile as directed.

END OF SECTION

SECTION 03 11 00
CONCRETE FORMWORK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Provide concrete formwork for architectural concrete and structural concrete as specified to form concrete to profiles shown.

1. Architectural concrete is defined as concrete for the following exposed reinforced concrete surfaces:
 - a. Interior walls
 - b. Exterior walls to 6 inches below finish grade
 - c. Interior tank walls to 6 inches below normal operating water level
 - d. Beams
 - e. Columns
 - f. Undersides of floor slabs, roof slabs and stairs
2. Provide concrete with smooth rubbed finish.
3. Structural concrete is defined as all concrete that is not architectural concrete.

- B. Related Work Specified in Other Sections Includes:

1. Section 03 20 00 - Concrete Reinforcement
2. Section 03 15 00 - Concrete Accessories
3. Section 03 30 53 - Concrete for Non-Plant Work

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:

1. ACI 318 - Building Code Requirements for Reinforced Concrete
2. ACI SP-004 - Formwork for Concrete

3. ACI 303R - Guide to Cast-in-Place Architectural Concrete
4. ACI 347 – Guide to Formwork for Concrete

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
 1. CONTRACTORS Shop Drawings: Proposed form layout drawings and tie pattern layout drawings for Concrete. Review of these drawings does not relieve the CONTRACTOR of responsibility for adequately designing and constructing forms.
 2. Samples: Pieces of each type of sheeting, chamfer strips, form ties, form liners and rustication strips

1.4 QUALITY ASSURANCE

- A. Formwork Compliance: Use formwork complying with ACI SP-004, ACI 347 and ACI 303R.
- B. Mock-Up Erection: Erect, on the site where directed, a full size mock-up of a cast-in-place wall or panel a minimum of 10 feet by 10 feet by 12 inches thick as shown. Conform mock-up to requirements of ACI 303R.
 1. Reinforce the panel as shown. Use form ties the same as those approved and with the form tie pattern similar to that approved. Use one face of the panel for smooth architectural concrete including "reveal" rustication with form joints, and the opposite face for form liner concrete.
 2. Plug the tie holes as specified to determine the correct mortar mixture to match the panel color. If required, remove and replace tie hole plugging mortar until an acceptable color match is obtained. After the sample panels have been approved, intentionally damage and patch portions of the finish surface of the panels for the purpose of determining the correct mixture for patching mortar and patching technique to match the original panel color and surface.
 3. Leave the approved mock-up on the job during construction as the standard of workmanship for the project. Remove mock-up from the premises after completion of the work.

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturers are listed in the LCU Approved Materials List. Other manufacturers of equivalent products may be submitted.

2.2 MATERIALS

- A. Structural Concrete: Provide structural concrete form materials as follows:

1. Obtain approval for form material before construction of the forms.
2. Use a barrier type form release agent.
3. Use form ties, hangers, and clamps of such type that, after removal of the forms, no metal will be closer than 1 inch from concrete surface. Wire ties will not be permitted.
4. Provide ties with swaged washers or other suitable devices to prevent seepage of moisture along the ties. Leave the ties in place.
5. Use lugs, cones, washers, or other devices which do not leave holes or depressions greater than 7/8-inch in diameter.

- B. Architectural Concrete: Provide architectural concrete form materials as follows:

1. Construct forms using 3/4-inch thick, High Density Overlay (HDO) Plyform, Class 1 or 2, meeting the requirements of the American Plywood Association. Use surfacing materials having a minimum weight of 60-60.
2. Use form coating and use thinner as recommended by manufacturer of the form coating, to coat cut or raw edges.
3. Use she-bolts with water seals for form ties.
4. Use form liners (see LCU Approved Materials List) having 1-inch deep relief, in a fractured rib pattern to match existing. Furnish form liners in full height lengths with no horizontal joints, except where shown. Use wood for forms to be used with form liners.
5. Use elastomeric vertical "V-groove" rustications in the concrete bands and the horizontal rustication joints shown in the form liner concrete of the profile shown.
6. Use a barrier type VOC compliant form release agent.

PART 3 EXECUTION**3.1 DESIGN**

- A. Design Responsibility: Be responsible for the design, engineering and construction of the architectural concrete formwork and the structural concrete formwork. Conform the Work to the recommendations of ACI SP-4 and ACI 303R.
- B. Setting Time and Slag Use: The presence of fly ash or ground granulated blast furnace slag in the concrete mix for architectural concrete and structural concrete will delay the setting time. Take this into consideration in the design and removal of the forms.
- C. Responsibility During Placement: Assume and take sole responsibility for adequate design of all form elements for support of the wet concrete mixtures specified and delivered.
- D. Consistency: Design forms to produce concrete members identical in shape, lines and dimensions to members shown.

3.2 CONSTRUCTION DETAILS FOR FORMWORK

- A. Structural Concrete Details: Follow the following details for all structural concrete:
 - 1. Provide forms which are substantial, properly braced, and tied together to maintain position and shape and to resist all pressures to which they may be subjected. Make forms sufficiently tight to prevent leakage of concrete.
 - 2. Determine the size and spacing of studs and wales by the nature of the Work and the height to which concrete is placed. Make forms adequate to produce true, smooth surfaces with not more than 1/8-inch variation in either direction from a geometrical plane. Provide horizontal joints which are level, and vertical joints which are plumb.
 - 3. Supply forms for repeated use in sufficient number to ensure the required rate of progress.
 - 4. Thoroughly clean all forms before reuse and inspect forms immediately before concrete is placed. Remove deformed, broken, or defective forms from the Work.
 - 5. Provide temporary openings in forms at convenient locations to facilitate cleaning and inspection.

6. Coat the entire inside surfaces of forms with a suitable form release agent just prior to placing concrete. Form release agent is not permitted on the reinforcing steel.
 7. Assume and take responsibility for the adequacy of all forms and remedying any defects resulting from their use.
- B. Architectural Concrete Details: Follow the following details for all Architectural Concrete:
1. Conform all construction details for formwork to "Construction Details for Formwork," subsections A1, A2, A3, A4, A6 and A7 and the requirements of this section.
 2. Thoroughly clean and lightly recoat HDO plywood panels before each additional use. Do not use forms more than three times.
 3. Install form liners and rustication strips in strict accordance with the manufacturer's written instructions and recommendations. Clog the ends of the form liner pattern and tape all form joints and edges using 1/8-inch thick by 3/4-inch wide foam tape centered on the joints, then caulk in accordance with the manufacturer's recommendations each time forms are set. Have a representative of the manufacturer present at the site to supervise the installation of the form liner for the entire project.
 4. Install forms for smooth concrete in such a manner that there will be no horizontal form joints, and align the forms so that vertical joints occur only at "V-Groove" rustications. Space form ties in a uniform pattern vertically and horizontally. Position form ties in smooth concrete bands and in panels between "reveal" rustications, if any.
 5. Erect beam and girder soffits with a camber of 1/2-inch in 20 feet and sufficiently braced, shored, and wedged to prevent deflection. Clamp column sides in accordance with this specification with metal column clamps, spaced according to the manufacturer's directions.
 6. Provide external angles of walls, beams, pilasters, columns, window openings and girders with 3/4-inch bevel strips.
 7. Give surfaces of concrete panel forms one thinned coat of form film.
 8. Apply the release agent in strict accordance with the manufacturer's instructions.

3.3 FORM REMOVAL

- A. Structural Concrete Form Removal: Do not remove forms for structural concrete until the concrete has hardened sufficiently to support its own load safely, plus any superimposed load that might be placed thereon. Leave the forms in place for the minimum length of time indicated below or until the concrete has reached the minimum strength indicated as determined by testing, whichever time is reached first.

1. The times indicated represent cumulative days or hours, not necessarily consecutive, during which the air surrounding the concrete is above 50 degrees F. These times may be decreased if reshores are installed.

	Minimum Time	Minimum Strength (psi)
a. Columns	12 hours	1300
b. Columns	12 hours	1300
c. Side forms for girders and beams	12 hours	1300
d. Walls	12 hours	1300
e. Bottom forms of slabs		
Under 10 feet clear span	4 days	2300
10 to 20 feet clear span	7 days	2700
Over 20 feet clear span	10 days	2900
f. Bottom forms of beams and girders		
Under 10 feet clear span	7 days	2700
10 to 20 feet clear span	14 days	3000
Over 20 feet clear span	21 days	3500

2. Increase form removal times as required if concrete temperature following placement is permitted to drop below 50 degrees F or if fly ash or ground granulated blast furnace slag is used in the concrete mix.
3. Withdraw the removable portion of form ties from the concrete immediately after the forms are removed. Clean and fill holes left by such ties with grout as specified in Cast-In-Place Concrete, Subsection Structural Concrete Surfaces.
4. Plug tie holes flush with the surface using Portland cement mortar. Prewet tie holes with clean water and apply a neat cement slurry bond coat. Densely tamp mortar of a dry-tamp consistency into the tie holes exercising care so as not to smear mortar onto the finished concrete surface. Include

sufficient white cement in the mortar mix to cause the plugged holes to blend in with the adjacent surfaces. Make sample patches with different mixes to assure that this requirement is met.

- B. Architectural Concrete Form Removal: Remove forms for architectural concrete in accordance with the above subsection 3.3 A, except that do not remove forms for vertical surfaces sooner than 12 hours nor longer than 36 hours after placement of concrete.

3.4 RESHORING

- A. Reshoring Method: Develop a system for reshoring and early removal of forms, in the event early stripping of forms becomes necessary. Include details and schedules in this system for each element which is to be reshored.
- B. Construction Load Support: Do not support construction loads upon any unshored portion of the structure exceeding the structural design loads.

3.5 TOLERANCES

- A. Tolerance Limits: Design, construct and maintain concrete form and place the concrete to provide completed concrete Work within the tolerance limits set forth in ACI SP-4.

3.6 SURVEY OF FORMWORK

- A. Field Survey: Employ an ENGINEER or surveyor to check by instrument survey the lines and levels of the completed formwork before concrete is placed and make whatever corrections or adjustment to the formwork are necessary to correct deviations from the specified tolerances.
- B. Placement Surveying Requirements: Check formwork during the placement of the concrete to verify that the forms, braces, tie rods, clamps anchor bolts, conduits, piping, and the like, have not been knocked out of the established line, level or cross section by concrete placement or equipment.

END OF SECTION

SECTION 03 15 00
CONCRETE ACCESSORIES**PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Requirements for providing concrete accessories shown and specified herein such as waterstops, dovetail anchor slots, cast-in-place reglets, inserts, joint filler, preformed joint seal, joint sealant and neoprene pads.
- B. Products Installed: Waterstops, dovetail anchor slots, cast-in-place reglets, inserts, joint filler, preformed joint seal, joint sealant and neoprene pads.
- C. Related Work Specified in Other Sections Includes:
 - 1. Section 03 11 00 - Concrete Formwork
 - 2. Section 03 20 00 - Concrete Reinforcement
 - 3. Section 03 30 53 - Concrete for Non-Plant Work

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. AASHTO - Standard Specifications for Highway Bridges
 - 2. ASTM A240 - Heat-Resisting Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels
 - 3. ASTM A536 - Standard Specifications for Ductile-Iron Castings
 - 4. ASTM D412 - Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension
 - 5. ASTM D3545 - Test Methods for Alcohol Content and Purity of Acetate esters by Gas Chromatography
 - 6. ASTM D3575 - Test Methods for Flexible Cellular Materials Made From Olefin Polymers

7. CRD-C513 - Specifications for Rubber Waterstops
8. CRD-C572 - Specifications for Polyvinyl Chloride Waterstop
9. Fed. Spec.
TT-S-00227 - Sealing Compound, Elastomeric Type, Multicomponent (for Calking, Sealing, and Glazing in Buildings and Other Structures)
10. Fed. Spec.
TT-S-00230 - Sealing Compound, Elastomeric Type, Single Component (for Calking, Sealing, and Glazing in Buildings and Other Structures)

1.3 SUBMITTALS

- A. General: Provide all Work related submittals, including the following, as specified in Division 1.
- B. Product Data and Information:
 1. Manufacturer's Data and Specifications: Submit printed manufacturer's data and specifications for each item used on this project.
 2. Samples: Provide one sample of each item used.
 3. Joint Sealant and Preformed Joint Seal: Indicate special procedures, surface preparation and perimeter conditions requiring special attention. All products in contact with potable water, shall be "NSF Standard 61" certified. Submit certified material records indicating approval for use with potable water.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 (and as follows:)

PART 2 PRODUCTS

2.1 MANUFACTURER

- A. Acceptable manufacturers are listed in the LCU Approved Materials List. Other manufacturers of equivalent products may be submitted.

2.2 MATERIALS

- A. Extruded Waterstops: Provide waterstops made of extruded polyvinyl chloride unless otherwise shown or specified.
1. Do not use any reclaimed plastic material in their manufacture.
 2. Provide plastic waterstops meeting the requirements of CRD-C572, except as modified herein. Provide a Shore A/10 durometer hardness between 73 and 79, the tensile strength not less than 1850 psi, and specific gravity not more than 1.38.
 3. Unless otherwise shown, use waterstops for construction joints which are flat, at least 6 inches wide, and not less than 3/8-inch thick at the thinnest section. Provide these waterstops with ribbed longitudinal strips.
 4. Unless otherwise shown, provide waterstops for expansion joints at least 9 inches wide and not less than 1/4-inch thick at the narrowest point and not less than 3/8-inch thick immediately adjacent to the center of the waterstop. Provide the waterstop with ribbed longitudinal strips with a 3/4-inch inside diameter hollow bulb center. Limit joint movement to 1/4-inch under a tensile force of not more than 500 pounds per lineal inch.
- B. Stainless Steel Waterstops: Provide stainless steel waterstops where shown or specified.
1. Fabricate stainless steel waterstops from ASTM A 240 Type 316, 20 gauge stainless steel, conforming to the dimensions and profiles shown.
 2. Prefabricate and miter corners and intersections for all stainless steel waterstops. Make only butt joints in the field.
- C. Rubber Waterstops: Provide rubber water stops where shown or specified.
1. Provide rubber water stops of either the molded or extruded type, fabricated from a high grade tread type compound, either SBR or natural rubber, conforming to CRD-C513.
 2. Provide water stops for construction joints at least 6 inches wide and 3/8-inch thick and with solid end bulbs 3/4-inch in diameter.

3. Provide water stops for expansion joints 9 inches wide and 3/8-inch thick and with solid end bulbs 1-inch in diameter and a hollow center bulb 1-1/2 inches in diameter with a 3/4-inch diameter center cavity.
- D. Expansion Joint Filler: Use joint filler for all expansion joints.
1. Provide a closed cell polyethylene or PVC joint filler of the thickness shown.
- E. Joint Sealant Requirements: Finish expansion joints with a joint sealant where shown or specified.
1. Joint sealant materials may be either a single component urethane compound meeting the requirements of Fed. Spec. TT-S-00230C, or a 2-component urethane compound meeting the requirements of Fed. Spec. TT-S-00227E, except as modified in this specification.
 2. Provide the urethane sealant of 100% polymer, non-extended, containing no solvent, lime, or coal tar. Color as selected by the ENGINEER, but not black. Conform sealant properties to the following:

	Property	Value	Test Method
a.	Maximum final cure	3 days	--
b.	Minimum tensile strength	140 to 200 psi	ASTM D412
c.	Minimum elongation	400%	ASTM D412
d.	Modulus at 100% elongation	40-60 psi	ASTM D412
e.	Shore A hardness	25-40	ASTM D2240
f.	Solid content	98-100%	--
g.	Peel strength	20-40 lb/in.	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-00227E
h.	Minimum recovery	80-90%	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-00227E
i.	Initial tack-free cure	24-48 hrs.	Fed. Spec. TT-S-00230C Fed. Spec. TT-S-

- | Property | Value | Test Method |
|----------|-------|-------------|
| | | 00227E |
3. Provide primer as recommended by the manufacturer of the sealant, subject to approval.
 4. Provide fillers and backup materials in contact with sealant which are nonimpregnated and free from asphalt, creosote, oil or extractable plasticizers. Use a backup material of a closed cell polyethylene foam rod with a diameter 1/4-inch larger than the joint width.
- F. Preformed Joint Seal: Provide a preformed joint seal where shown or specified.
1. Provide joint material which is resilient, non-extrudable, impermeable, closed-cell, cross-linked, ethylene vinyl acetate, low density, polyethylene copolymer, nitrogen blown material which is ultraviolet light, weather and wear resistant, and which is concrete beige in color.
 2. Conform material properties with the following:

Property	Value	Test Method
a. Density, pcf	2.8 to 3.4	ASTM D3575 Suffix: W, Method A
b. Water Absorption total immersion 3 months	0.02% by volume	ASTM D3575 Suffix: L
c. Tensile Strength	125 psi	ASTM D3575 Suffix: T
d. Elongation before breaking	255%	ASTM D3575 Suffix: T
e. Working Temperature	-94 to 160 F	--
- G. Neoprene Pads: Use neoprene pads as shown or required where slabs or beams must be prevented from bonding to footings, walls, columns or other rigid parts of the structure.
1. Use neoprene pads of a structural grade meeting the requirements of Section 25, Division 2 of the AASHTO Standard Specifications for Highway Bridges.
 2. Do not use neoprene pads thinner than 1/4-inch.

- H. Wedge Inserts: Make wedge inserts for 5/8-inch and 3/4-inch bolts of ductile iron conforming to ASTM A 536.
- I. Dovetail Anchors: Provide dovetail anchors of one of the following types:
 - 1. Dovetail anchors having a 3/16-inch by 1-inch by 1/2-inch stainless steel dovetail section with 3/16-inch diameter stainless steel wire.
 - 2. Dovetail anchor slots of 24 gauge galvanized steel 1-inch by 1-inch by 5/8-inch throat. Fill anchor slots.
- J. Flashing Reglets: Provide flashing reglets of 24 gauge galvanized steel foam filled reglets.

PART 3 EXECUTION

3.1 INSTALLING OF WATERSTOPS

- A. Assembly of Extruded Waterstops: Prefabricate corners and intersections for all waterstops. Make only butt joints in the field. Miter and assemble corners and intersections with approved equipment, as described for field joints.
 - 1. Make field joints by cutting the ends of the sections to be spliced so they will form a smooth even butt joint. Heat the cut ends with the splicing tool until the plastic melts. Press the two ends together until the plastic cools. Do splicing in a way that limits damage to the continuity of the ribbed strips.
 - 2. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.
- B. Prefabricated Stainless Steel Waterstops: Prefabricate corners and intersections for all stainless steel waterstops. Make only butt joints in the field. Miter and weld corners and intersections.
 - 1. Provide field joints having a nominal 1-inch lap joint, with the exposed edge welded or brazed on each side.
 - 2. Make field joints with PVC waterstops as shown.

3. At expansion joints, seal the base of the expansion section of the waterstop with at least one layer of 2-inch wide duct tape.
 4. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.
- C. Splices: Use splices made in the manufacturer's plant where possible for rubber waterstops.
1. Use a preformed rubber union or fitting and splicing cement as recommended by the manufacturer when splices are made.
 2. Carry waterstops in the walls into lower slabs and join them to the waterstops in the slabs. Make all waterstops continuous. Set waterstops accurately to the position and line shown. Hold edges securely fixed in position at intervals of not more than 24 inches so that they will not move during the placing of the concrete. Do not drive nails through the waterstops.
- D. Joint Filler Placement: Place joint filler for expansion joints against the completed portion of the Work before the concrete for the next section is placed.
1. Fasten the filler to the hardened concrete with a compatible adhesive in accordance with manufacturer's instructions. Extend the filler through the thickness of the wall or slab and make it flush with the finished surface, except where a preformed joint seal or joint sealant is shown.
 2. In joints having a waterstop, fit the filler accurately on each side of the waterstop to prevent the intrusion of concrete.
- E. Preparation of 2-Component Sealants: Mix 2-component joint sealant using a slotted paddle and slow speed mixer for 5 to 8 minutes, continually working paddle from top to bottom until the sealant color is uniform. Scrape down the side of the container and paddle blade several times during the mixing operation to ensure uniform mixing.
1. Properly prepare joint surfaces by removing all foreign matter and concrete laitance so that concrete surfaces are structurally sound, clean, dry, and free of all oil, grease, wax, waterproofing compounds or form release materials prior to the application of primer and sealant.

2. Prime all concrete joint surfaces and all surfaces exposed to water prior to sealing, with no exceptions. Prime all other surfaces as recommended by the manufacturer of the sealant. Provide the prime as recommended by the manufacturer of the sealant, subject to approval. Apply the primer by either brushing or spraying on the joint surfaces. Apply and install the sealant within 2 to 24 hours after the application of primer.
 3. For horizontal joints, install the sealant by pouring directly from a suitable shaped can or by flowing from a bulk-loading gun.
 4. Fill vertical joints from a gun, starting from the bottom, to avoid bridging and the formation of air voids.
 5. Fill overhead joints from a gun, by laying a bead along each side of the joint and then filling the middle. Immediately after installation, tool in the sealant in order to establish firm contact with joint surfaces and to provide a smooth sealant surface. Tool in accordance with the manufacturer's instructions.
 6. Control joint depth with the use of joint fillers and backup materials. Make joint widths and sealant depths as shown. Do not exceed 1/2-inch for sealant depth.
- F. Preformed Joint Seal Surface Preparation: Properly prepare joint surfaces by removing all foreign matter and concrete laitance so that concrete surfaces are structurally sound, clean, dry, and free of all oil, grease, wax, water-proofing compounds or form release materials.
1. Blast clean or saw cut all existing concrete surfaces to expose a clean bare concrete surface. Allow new concrete to be well cured, and attain a minimum of 80% of the specified strength before installing sealant.
 2. Apply bonding adhesive, as recommended by the manufacturer to the concrete surfaces in strict compliance with the manufacturer's recommendations. Install the joint material under a compression of 25% and in one continuous operation, in accordance with manufacturer's recommendations. Do all splices and directional changes using heat welding method as recommended by the manufacturer.
- G. Unbonded Joints: Use unbonded horizontal joints as shown or required where slabs of beams must be prevented from bonding to footings, walls, columns or other rigid parts of the structure.

1. Prevent bonding by use of structural grade neoprene pads placed over the bearing surface of the footing, wall or other supporting part of the structure so as to isolate it from the new concrete being placed.
- H. Encasing Inserts: Encase wedge inserts, flashing reglets and dovetail anchor slots in the concrete as shown. Take special care to place and maintain them to the proper lines and grades and to compact concrete thoroughly around them to prevent the passage of water. Set these items before placing concrete and thoroughly brace them to prevent movement during the progress of the Work. Provide dovetail anchor slots spaced not more than 16 inches apart for all concrete walls faced with masonry.

END OF SECTION

SECTION 03 20 00
CONCRETE REINFORCEMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for providing concrete reinforcement as shown and specified herein. Reinforcement includes all steel bars, wire and welded wire fabric as shown and specified.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 03 11 00 - Concrete Formwork
 - 2. Section 03 30 53 - Concrete for Non-Plant Work

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ACI SP66 - ACI Detailing Manual
 - 2. ACI 318 - Latest edition "Building Code Requirements for Reinforced Concrete"
 - 3. ASTM A185 - Steel Welded Wire Fabric, Plain, for Concrete Reinforcement
 - 4. ASTM A615/A615M - Deformed and Plains Billet-Steel Bars for Concrete
 - 5. ASTM A706/A706M - Low Alloy Steel Deformed Bars for Concrete Reinforcement
 - 6. ASTM A775/A775M - Epoxy Coated Reinforcing Steel Bars
 - 7. AWS D1.4 - Structural Welding Code - Reinforcing Steel
 - 8. ACI 315 Details - Guide to Presenting Reinforcing Steel Design
 - 9. CRSI Bars - Recommended Practice for Placing Reinforcing

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
1. Product Data and Information: Submit manufacturers literature with product data, and material description of fusion bonded epoxy coating for reinforcement and reinforcement accessories, including manufacturer's recommendations for field touch-up of bars and cut ends when epoxy coated reinforcement is specified to be used.
 2. CONTRACTORS' Shop Drawings: Submit checked Working Drawings, including bar lists, schedules, bending details, placing details and placing plans and elevations for fabrication and placing reinforcing steel conforming to "ACI Detailing Manual SP-66".
 - a. Do not bill wall and slab reinforcing in sections. Show complete elevations of all walls and complete plans of all slabs, except that, when more than one wall or slab are identical, only one such elevation or plan is required. These plans and elevations need not be true views of the walls or slabs shown. Bill every reinforcing bar in a slab on a plan. Bill every reinforcing bar in a wall on an elevation. Take sections to clarify the arrangement of the steel reinforcement. Identify all bars, but do not bill on such sections.
 - b. For all reinforcing bars, unless the location of a bar is clear, give the location of such bar or bars by a dimension to some structural feature which will be readily distinguishable at the time bars are placed.
 - c. Make the reinforcing steel placing drawings complete for placing reinforcement including the location of support bars and chairs, without reference to the design drawings.
 - d. Submit Detailer certification that every reinforcing steel placing drawing and bar list is completely checked and corrected before submittal for approval.
 - e. If, after reinforcing steel placing drawings and bar lists have been submitted for approval, a review reveals that the drawings and lists obviously have not been checked and corrected they will be returned for checking and correcting by the Detailer.
 3. Samples: Submit the following samples when epoxy coated reinforcement is specified to be used.

- a. 12-inch long epoxy-coated steel reinforcing bar, of any size typical to this Project
 - b. One of each type of epoxy-coated reinforcement accessory used on this Project
 - c. 12-inch long, nylon coated tie wire
4. Certificates: Test certificates of the chemical and physical properties covering each shipment of reinforcing steel bars.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 (and as follows:)
 1. Delivery Requirements: Have reinforcing steel delivered to the Work in strongly tied bundles. Identify each group of both bent and straight bars with a metal tag giving the identifying number corresponding to the reinforcing steel placing drawings and bar lists.
 2. Storage: Properly store all bars in an orderly manner, with all bars completely off the ground. Keep bars clean after delivery to the site of the Work.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials for concrete reinforcement shall conform to FDOT standards.
- B. Steel Bars: Use new billet steel bars, deformed bars, meeting the requirements of ASTM A615/A625M Grade 60 for reinforcing steel bars.
 1. Roll all reinforcing steel bars with special deformations or identifying marks indicating the ASTM Specification and Grade.
 2. Use bars free from defects, kinks and from bends that cannot be readily and fully straightened in the field.
 3. Supply reinforcing bars in lengths which will allow convenient placement in the Work and provide the required lap of joints as shown. Provide dowels of proper length, size and shape for tying walls, beams, floors, and the like together.

- C. Epoxy Coating: Conform fusion bonded epoxy coated reinforcing steel bars to ASTM A775/A775M when used. Leave portions of the reinforcing steel bars uncoated where mechanical connections are shown.
- D. Welded Wire Fabric: Use welded wire fabric of the electrically welded type, with wires arranged in rectangular patterns, of the sizes shown or specified and meeting the requirements of ASTM A185.
- E. Supports and Accessories: Provide bar supports and other accessories and, if necessary, additional supports to hold bars in proper position while concrete is being placed.
 - 1. Use side form spacers against vertical or sloping forms to maintain prescribed side cover and cross position of bars.
 - 2. Use individual hi-chairs with welded cross ties or circular hoops to support top bars in slabs thicker than 8 inches.
 - 3. Bolsters, chairs and other accessories:
 - a. Use hot-dipped galvanized or provide plastic coated legs when in contact with forms for surfaces of concrete other than architectural surfaces.
 - b. Use stainless steel when in contact with forms for architecturally exposed surfaces.
 - c. Use epoxy coated bolsters, chairs and accessories including wire ties for epoxy coated reinforcing bars.
 - d. Use chairs of an approved type and space them properly to support and hold reinforcing bars in position in all beams and slabs including slabs placed directly on the subgrade or work mat. Do not use continuous hi-chairs for supporting of top bars in slabs over 8 inches in thickness.
- F. Mechanical Connections: Provide mechanical connections that develop at least 125% of the specified yield strength of the bar in tension.
- G. Stirrups and Ties: Provide stirrups and ties as shown and specified and meeting the requirements of ASTM A185.

2.2 FABRICATION

- A. Drawing Review Prior to Fabrication: Do not fabricate any material before final review and approval of shop drawings.
- B. Bending and Cutting: Cut bars to required length and bend accurately before placing. Bend bars in the shop unless written approval for field bending is obtained. If field bending is permitted, do it only when the air temperature, where the bending operation is performed, is above 30°F. Do not field bend bars which have been partially embedded in concrete.
- C. Splices: Use lapped splices for tension and compression splices unless otherwise noted.
- D. Cleaning: Clean and bend reinforcement in accordance with ACI 315 and ACI 318.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Placement: Place all bars in accordance with CRSI "Recommended Practice for Placing Reinforcing Bars".
- B. Tolerances: Place bars used for top reinforcement in slabs to a vertical tolerance of plus or minus 1/4-inch. Place all other reinforcement to the tolerances given to ACI 318.
- C. Cleaning: Have reinforcing steel delivered without rust other than that accumulated during transportation to the Work. At all times, fully protect reinforcing steel from moisture, grease, dirt, mortar and concrete. Before being placed in position, thoroughly clean reinforcing steel of all loose mill scale and rust and of any dirt, oil, grease coatings, or other material that might reduce the bond. If there is a delay in depositing concrete, inspect and satisfactorily clean the steel immediately before the concrete is placed.
- D. Bar Positioning: Place bars in the exact positions shown with the required spacing and cross wire bars securely in position at intersections to prevent displacement during the placing of the concrete. Fasten the bars with annealed wire of not less than 17 gauge or other approved devices.
- E. Bar Extension Beyond Formwork: On any section of the Work where horizontal bars extend beyond the length of the forms, perforate the form or head against which the Work ends or at the proper places to allow the bars to project through a distance at least equal to the lap specified.

- F. Unacceptable Materials: Do not place reinforcing steel with damaged, unsuitably bonded epoxy-coating or rusting. If approved, mars, exposed threads of mechanical connections and cut ends may be field coated with approved epoxy coating material.
- G. Review of Placement: Have reinforcing placement reviewed by the ENGINEER before concrete is placed.
- H. Welding - Not Approved: Do not use reinforcing bar assemblies made by welding of any kind, or accessories of any kind which require field welding to reinforcing bars.
- I. Welding - Approved: Where welding of reinforcing steel is shown, AWS D1.4 "Structural Welding Code - Reinforcing Steel" applies.
- J. Tension and Compression Lap Splices: Conform tension and compression lap splices to ACI 318 with all supplements. Avoid splices at points of maximum tensile stress wherever possible. Provide temperature bars with the clear spacing shown. Stagger all bar splices in hoop tension bars in circular tanks with not more than 50% of the bars spliced in any one direction. Have welded splices made by certified welders in accordance with AWS D1.4.
- K. Welded Wire Fabric: Place welded wire fabric in the positions shown, specified or required to fit the Work. Furnish and place suitable spacing chairs or supports, as specified for bars, to maintain the fabric in the correct location. Where a flat surface of fabric is required, provide flat sheets, when available. Otherwise reverse roll the fabric or otherwise straighten to make a perfectly flat surface before placing. Obtain approval for the length of laps not indicated.
- L. Concrete Cover: Place reinforcing steel and welded wire fabric and hold in position so that the concrete cover, as measured from the surface of the bar or wire to the surface of the concrete, is as shown or specified.

END OF SECTION

SECTION 03 30 53

CONCRETE FOR NON-PLANT WORK

PART 1 GENERAL

1.1 DESCRIPTION OF REQUIREMENTS

- A. The extent of concrete Work is shown on the drawings.

1.2 CODES AND STANDARDS

- A. ACI 347 "Recommended Practice for Concrete Formwork"; ACI 304 "Recommended Practice for measuring, Mixing, Transporting, and Placing Concrete"; comply with applicable provisions.
- B. Reference to standard specifications herein shall be construed as to be in reference to the latest revision or edition.

1.3 STORAGE

- A. Immediately upon receipt at the site, cement that is to be site mixed shall be stored in a dry, weather tight building, properly ventilated and with provisions for prevention of moisture absorption.
- B. Reinforcing shall be protected from the weather.

PART 2 PRODUCTS

2.1 CONCRETE MATERIALS

- A. Cement: Cement shall conform to standard specifications for "Portland Cement", ASTM C150, Type I for concrete not exposed to sewage and ASTM C150, Type II or ASTM C150, Type I with sulfide resistant properties equal to Type II for concrete exposed to sewage.
- B. Aggregate: Concrete aggregate shall conform to the current specifications for "Concrete Aggregate", ASTM Designation C33.
- C. Water: Water used in mixing concrete shall be fresh, clean, and free from injurious amounts of oil, acid, alkali or organic matter.

- D. Ready-Mix Concrete: Ready-mixed concrete may be used at the option of the CONTRACTOR provided that such concrete meets the requirements of these specifications and of ASTM Designation C94 for "Ready-Mixed Concrete".
- E. High-Early-Strength Concrete: Concrete made with high-early-strength Portland cement shall be used only when specifically authorized by the ENGINEER. The 7-day compressive strength of concrete made with high-early-strength cement shall be at least equal to the minimum 28-day compressive strength specified. All provisions of these specifications shall be applicable to high-early-strength concrete except the cement shall conform to ASTM Designation C150, Type III.

2.2 RELATED MATERIALS

- A. Reinforcing: Deformed Reinforcing Bars, ASTM A615; Grade 60 unless otherwise indicated.
- B. Welded Wire Fabric: ASTM A185.
- C. Liquid Membrane-Forming Curing Compound: ASTM C309, Type I.
- D. Form Materials:
 - 1. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.
 - 2. Exposed Concrete Surfaces: Suitable material to suit project conditions.
- E. Waterstops: To be used in joints shall be #10 gage steel sheet, 4-inch wide, welded continuous through the joint, unless detailed otherwise.
- F. Chemical Floor Hardener: Colorless aqueous solution containing a blend of magnesium fluosilicate and zinc fluosilicate combined with a wetting agent, containing not less than 2 pounds of fluosilicates per gallon.
 - 1. Apply to exposed concrete slabs not indicated or scheduled to receive subsequent finishes.

2.3 QUALITY

- A. Strength: The minimum 28-day compressive strength of reinforced concrete shall be 4,000 psi, unless shown otherwise on the drawings.
 - 1. Each cubic yard of 4,000 psi concrete shall contain no less than 517 pounds of cement. The total water content per bag of cement shall not exceed 6.0 gallons.

- B. Strength: The minimum 28-day compressive strength of non-reinforced concrete shall be 2,500 psi, unless shown otherwise on the drawings.

Each cubic yard of 2,500 psi concrete shall contain no less than 440 pounds of cement. The total water content per bag shall not exceed 7.5 gallons.

- C. Mix Proportions: All concrete materials shall be proportioned so as to produce a workable mixture with a slump between 2 inch and 4 inch.

- D. Tests:



1. The CONTRACTOR shall provide, for test purposes, one set of three cylinders taken from each day's pour or each 50 cubic yards placed, whichever is least or as directed by the ENGINEER. The CONTRACTOR at his expense shall supply test samples and an independent testing laboratory at the CONTRACTOR's expense will make tests. Sampling and testing of concrete shall be made in accordance with ASTM C-143 and ASTM C-31. The standard age of test shall be at three (3) days, seven (7) days, fourteen (14) days, and twenty-eight (28) days; and, when approved by the ENGINEER, a forty-five (45) day test may be used. If the test strength of the cylinders falls below the minimum allowable compressive strength, the ENGINEER shall have the right to order the CONTRACTOR to remove and renew that day's pour of concrete or the CONTRACTOR shall accept such deductions in the final payment as the OWNER may deem reasonable.
2. Sampling and testing of concrete materials shall be made in accordance with ASTM Designations. The CONTRACTOR at his expense shall supply test samples, and an independent testing laboratory at the CONTRACTOR's expense shall make tests. The source from which concrete aggregates are to be obtained shall be selected by the CONTRACTOR well in advance of the time when they will be required in the Work; and suitable samples, as they are to be used in the concrete, shall be furnished in advance of the time when the placing of the concrete is expected to begin.

PART 3 EXECUTION

3.1 FORMING AND PLACING CONCRETE

- A. Formwork: Construct so that concrete members and structures are of correct size, shape, alignment, elevation and position, complying with ACI 347.

Clean and adjust forms prior to concrete placement. Apply form release agents for wet forms, as required. Retighten forms during and after concrete placement if required to eliminate mortar leaks.

3.2 REINFORCEMENT

- A. Position, support and secure reinforcement against displacement. Locate and support with metal chairs, runners, bolsters, spacers and hangers, as required. Set wire ties so ends are directed into concrete, not toward exposed concrete surfaces.
- B. Install welded wire fabric in lengths as long as possible, lapping at least one mesh.
- C. Installation of Embedded Items: Set and build into the Work anchorage devices and other embedded items required for other Work that is attached to, or supported by cast-in-place concrete. Use setting diagrams, templates and instructions provided by others for locating and setting.

3.3 CONCRETE PLACEMENT

- A. Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until Work of other trades affecting concrete is completed.
- B. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into all parts of the forms.
- C. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement and curing. Concrete shall not be placed when the surrounding air temperature is below 40°F and dropping.
 - 1. In cold weather comply with ACI 306.
 - 2. In hot weather comply with ACI 305.

3.4 CONCRETE FINISHES

- A. Nonslip Broom Finish: Apply nonslip broom finish to exterior concrete and sidewalks.
 - 1. Immediately after trowel finishing, slightly roughen concrete surface by brooming with fiber bristle broom perpendicular to main traffic route. Coordinate required final finish with the ENGINEER before application.

3.5 BONDING AND GROUTING

- A. Before depositing new concrete on or against concrete that has set, existing surfaces shall be thoroughly roughened and cleaned of glaze, foreign matter, and

loose particles. An epoxy coating shall be applied for bonding the new concrete to the old.

3.6 CURING

- A. Concrete shall be kept continuously (not periodically) wet for a period of at least five (5) consecutive days by covering with water or with an approved water saturated covering. Water for curing shall be clean and free from any elements, which might cause staining, or discoloration of the concrete surface.
- B. Sidewalks and floor slabs may be cured by spraying with a Membrane-Forming curing compound, applied as per manufacturer's recommendations. This material shall not be used on any interior slabs to which an applied finish is to be bonded.

3.7 PATCHING

- A. Any concrete which is not formed as shown on the drawings, or is out of alignment or level or shows a defective surface, shall be considered as not conforming with the intent of these specifications and shall be removed from the job by the CONTRACTOR at his expense, unless the ENGINEER grants permission to patch the defective area. This shall be done in accordance with the procedures above. Honeycomb consisting of 1/2-inch diameter holes or greater shall be considered a defective surface. Permission to patch any such area shall not be considered a waiver of the ENGINEER's right to require complete removal of the defective Work if the patching does not, in his opinion, satisfactorily restore the quality of the concrete and appearance of the surface.
- B. As the forms are removed, fins, rough edges, and offsets shall be ground smooth. Holes to 1/2-inch, slight honeycomb, and minor defects shall be wet and filled with a 1:2 mix of cement mortar, matching color of surrounding concrete, and then troweled to a uniform plane. As soon as they have been troweled, the patched areas shall be sprayed with a curing compound, which will not destroy future bonding properties. Three (3) days after application of curing compound, the entire surface shall be finished by wetting and applying a 1:2 mix of cement mortar with a cement brick. Using the brick, mortar shall be rubbed into pits or indentations and excess mortar rubbed off to provide a uniformly textured surface. When the surface has dried, all loose sand and dust shall be removed and the surface then hosed down with water.

3.8 TOLERANCES

- A. Tolerances for concrete Work shall be in accordance with ACI 347.

END OF SECTION

SECTION 05 50 01**GALVANIZING****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: All galvanizing of metals when such coating is specified, except as otherwise shown, specified or required.

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:

1. ASTM A123 - Specification for Zinc-Coated (Hot-Dip Galvanized) Coatings on Iron and Steel Products
2. ASTM A153 - Specification for Zinc Coating (Hot-Dip) On Iron and Steel Hardware
3. ASTM A924 - Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
4. ASTM A385 - Practice for Providing High-Quality Zinc-Coatings (Hot-Dip)
5. ASTM A392 - Specification for Zinc-Coated Steel Chain-Link Fence Fabric
6. ASTM A53 - Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
7. ASTM A121 - Specification for Zinc-Coated (Galvanized) Steel Barbed Wire
8. ASTM A143 - Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement
9. ASTM A384 - Practice for Safeguarding Against Warpage and Distortion During Hot-Dip Galvanization of Steel Assemblies
10. ASTM B6 - Specification for Zinc (Slab Zinc)
11. MIL-P-21035B - Paint High Zinc Dust Content, Galvanizing Repair
12. MIL-P-26915C - Primer Coating Zinc Dust Pigmented for Steel Surfaces

PART 2 PRODUCTS

2.1 MATERIALS

- A. Standard: Meet the requirements of ASTM B6 and "Prime Western" grade, or equal, for zinc for galvanizing, zinc coating or plating.

PART 3 EXECUTION

3.1 PREPARATION

- A. General: Blast clean or grind smooth wrought metals and castings. Tumble and grind flush all high spots when a smooth coat is required for castings. Normalize castings to prevent cracking.
- B. Base Metal Cleaning: Thoroughly clean base metal. Remove all welding slag and burrs. Remove surface contaminants and coatings which would not be removable by the normal chemical cleaning process in the galvanizing operation, by blast cleaning, by immersion in a caustic bath, acid pickle and flux or other approved method.
- C. Product Preparation: Fabricate structural steel products and assemblies to be galvanized in accordance with ASTM A143, A384, A385 and Class I guidelines as shown in "Recommended Details of Galvanized Structures" as published by American Hot-Dip Galvanizers Association, Inc.

3.2 APPLICATION

- A. Hot Dip: Use the hot-dip process for galvanizing as required by the appropriate ASTM and American Hot-Dip Galvanizers Association, Inc. specifications.
 - 1. Do not allow the dipping to come in contact with or rest upon the dross during the operation.
 - 2. Do not use procedures tending to agitate the dross.
- B. Required Facilities: Perform the galvanizing and coating in a plant having the required facilities to produce the quality of coatings specified and with ample capacity for the volume of Work required. Handle and ship galvanized material in a manner which will avoid damage to the zinc coating.
- C. Requirements: Perform galvanizing in accordance with the requirements of the following specifications:

<u>Item</u>	<u>ASTM</u>
1. Iron and steel products	A123
2. Iron and steel hardware	A153
3. Chain for chainwheel operators	A153
4. Chainwheels and Guides	A123
5. Steel sheets	A924
6. Assembled products	A385 & A123
7. Steel chain link fence fabric	A392 Class II
8. Steel pipe	A53
9. Steel barbed wire	A121

3.3 INSTALLATION

- A. Field Coating for Touch-Up: Coat all field welds, abraided areas where damage is more than 3/16-inch wide or uncoated cut edges in material more than 1/10-inch thick with an organic zinc-rich paint complying with MIL-P-21035B or MIL-P-26915C in multiple coats to dry film thickness of 8 mils.

END OF SECTION

SECTION 05 56 00**METAL CASTINGS****PART 1 GENERAL****1.1 SUMMARY**

A. Section Includes: Miscellaneous ferrous and nonferrous castings.

1. This classification includes wheel guards, valve boxes, manhole frames and covers, manhole steps, stop plank grooves, brackets and supports for piping and gutter inlets, floor drains, cleanouts and special malleable iron castings and inserts.

1.2 REFERENCES

A. Codes and standards referred to in this Section are:

1. ASTM A27/A27M - Specification for Steel Castings, Carbon for General Applications
2. ASTM A47 - Specification for Ferric Malleable Iron Castings
3. ASTM A48 - Specifications for Gray Cast Iron Castings
4. ASTM A148/A148M - Specifications for Steel Casting
5. ASTM A536 - Specifications for Ductile Iron Castings
6. ASTM B26/B26M - Aluminum
7. ASTM B148 - Aluminum Bronze Sand Castings
8. ASTM B138 - Manganese Bronze

PART 2 PRODUCTS**2.1 WORKMANSHIP**

A. Provide castings accurately made to the approved dimensions, and plane or grind castings where marked or where otherwise necessary to secure flat and

true surfaces. Make allowance in the patterns so that the specified thickness is not reduced. Provide manhole covers which conform to the details shown and which are true and seat at all points. Supply castings showing the name of the manufacturer and the country of manufacture. No plugging or welding of defective castings will be permitted.

2.2 WEIGHTS

- A. Reject castings with a weight which is less than the theoretical weight based on required dimensions by more than 5%. Provide facilities at the site for weighing castings in the presence of the ENGINEER, or furnish invoices showing true weights, certified by the supplier.

PART 3 EXECUTION

3.1 INSTALLATION

- A. Erect all castings to accurate grades and alignment, and when placing in concrete carefully support castings to prevent movement during concreting.

3.2 PAINTING

- A. Clean metal castings thoroughly before painting. Give manhole frames and covers and valve boxes one coat of primer and two coats of an approved asphaltum varnish or other approved coating at the point of manufacture. Deliver all other castings to the job site unpainted.

END OF SECTION

SECTION 31 10 00**SITE CLEARING****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Requirements for clearing of all areas within the Contract limits and other areas shown, including Work designated in permits and other agreements, in accordance with the requirements of Division 1.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 02 40 00 - Demolition
 - 2. Section 31 23 16 - Excavation - Earth and Rock
 - 3. Section 31 23 23 - Backfilling
 - 4. Section 32 92 00 - Lawn Restoration

1.2 DEFINITIONS

- A. Clearing: Clearing is the removal from the ground surface and disposal, within the designated areas, of trees, brush, shrubs, down timber, decayed wood, other vegetation, rubbish and debris as well as the removal of fences.
- B. Grubbing: Grubbing is the removal and disposal of all stumps, buried logs, roots larger than 1-1/2 inches, matted roots and organic materials.

PART 2 EXECUTION**2.1 TREE REMOVAL**

- A. Tree Removal Within Property Limits: Remove trees and shrubs as indicated on the Contract Documents.
 - 1. Remove trees and shrubs to avoid damage to trees and shrubs designated to remain.
 - 2. Grub and remove tree stumps and shrubs felled within the project limits as required to an authorized disposal site. Fill depressions created by such removal with material suitable for backfill as specified in Section 31 23 23.

- B. Tree Removal Outside Property Limits: Do not cut or damage trees outside the right-of-way unless shown to be removed or unless written permission has been obtained from the property OWNER. Furnish three copies of the written permission before removal operations commence.
- C. If the OWNER desires the timber or small trees, the CONTRACTOR shall cut and neatly pile it in 4 foot lengths for removal by the OWNER; otherwise, the CONTRACTOR shall dispose of it by hauling it away from the project site.

2.2 TREES AND SHRUBS TO BE SAVED

- A. Protection: Protect trees and shrubs within the construction site that are so delineated or are marked in the field to be saved from defacement, injury and destruction.
 - 1. Work within the limits of the tree drip line with extreme care using either hand tools or equipment that will not cause damage to trees.
 - a. Do not disturb or cut roots unnecessarily. Do not cut roots 1-1/2 inches and larger unless approved.
 - b. Immediately backfill around tree roots after completion of construction in the vicinity of trees.
 - c. Do not operate any wheeled or tracked equipment within drip line.
 - 2. Protect vegetation from damage caused by emissions from engine-powered equipment.
 - 3. During working operations, protect the trunk, foliage and root system of all trees to be saved with boards or other guards placed as shown and as required to prevent damage, injury and defacement.
 - a. Do not pile excavated materials within the drip line or adjacent to the trunk of trees.
 - b. Do not allow runoff to accumulate around trunk of trees.
 - c. Do not fasten or attach ropes, cables, or guy wires to trees without permission. When such permission is granted, protect the tree before making fastening or attachments by providing burlap wrapping and softwood cleats.
 - d. The use of axes or climbing spurs for trimming will not be permitted.
 - e. Provide climbing ropes during trimming.

4. Remove shrubs to be saved, taking a sufficient earth ball with the roots to maintain the shrub.
 - a. Temporarily replant if required, and replace at the completion of construction in a condition equaling that which existed prior to removal.
 - b. Replace in kind if the transplant fails.
5. Have any tree and shrub repair performed by a tree surgeon properly licensed by the State of Florida and within 24 hours after damage occurred.

2.3 CLEARING AND GRUBBING

- A. Clearing: Clear all items specified to the limits shown and remove cleared and grubbed materials from the site.
 1. Do not start earthwork operations in areas where clearing and grubbing is not complete, except that stumps and large roots may be removed concurrent with excavation.
 2. Comply with erosion, sediment control and storm management measures as specified in Division 1.
- B. Grubbing: Clear and grub areas to be excavated, areas receiving less than 3 feet of fill and areas upon which structures are to be constructed.
 1. Remove stumps and root mats in these areas to a depth of not less than 18 inches below the subgrade of sloped surfaces.
 2. Fill all depressions made by the removal of stumps or roots with material suitable for backfill as specified in Section 31 23 23.
- C. Limited Clearing: Clear areas receiving more than 3 feet of fill by cutting trees and shrubs as close as practical to the existing ground. Grubbing will not be required.
- D. Dispose of all material and debris from the clearing and grubbing operation by hauling such material and debris away to an approved dump. The cost of disposal (including hauling) of cleared and grubbed material and debris shall be considered a subsidiary obligation of the CONTRACTOR; the cost of which shall be included in the prices bid for the various classes of Work.

2.4 TOPSOIL

- A. Stripping: Strip existing topsoil from areas that will be excavated or graded prior to commencement of excavating or grading and place in well-drained stockpiles in approved locations.

2.5 PRESERVATION OF DEVELOPED PRIVATE PROPERTY

- A. The CONTRACTOR shall exercise extreme care to avoid unnecessary disturbance of developed private property along the route of the construction. Trees, shrubbery, gardens, lawns, and other landscaping, which in the opinion of the ENGINEER must be removed, shall be replaced and replanted to restore the construction easement to the condition existing prior to construction.
- B. All soil preservation procedures and replanting operations shall be under the supervision of a nursery representative experienced in such operations.
- C. Improvements to the land such as fences, walls, outbuildings, and other structures which of necessity must be removed, shall be replaced with equal quality materials and workmanship.
- D. Clean up the construction site across developed private property directly after construction is completed upon approval of the ENGINEER.
- E. Any commercial signs, disturbed or removed, shall be restored to their original condition within 24 hours.

2.6 PRESERVATION OF PUBLIC PROPERTY

- A. The appropriate paragraphs of Articles 2.5 and 2.6 of these Specifications shall apply to the preservation and restoration of public lands, parks, rights-of-way, easements, and all other damaged areas.

END OF SECTION

SECTION 31 23 16

EXCAVATION - EARTH AND ROCK

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: Requirements for performing opencut excavations to the widths and depths necessary for constructing structures, pipelines and conduits including excavation of any material necessary for any purpose pertinent to the construction of the Work. All Work and products shall be in accordance with FDOT Design Standards.
- B. Related Work Specified In Other Sections Includes:
 - 1. Section 31 10 00 - Site Clearing
 - 2. Section 31 40 00 - Shoring, Sheet piling and Bracing
 - 3. Section 31 23 23 - Backfilling
 - 4. Section 03 30 53 - Concrete for Non-Plant Work

1.2 DEFINITIONS

- A. Earth: "Earth" includes all materials which, in the opinion of the ENGINEER, do not require blasting, barring, wedging or special impact tools for their removal from their original beds, and removal of which can be completed using standard excavating equipment. Specifically excluded are all ledge and bedrock and boulders or pieces of masonry larger than 1 cubic yard in volume.
- B. Rock: "Rock" includes all materials which, in the opinion of the ENGINEER, require blasting, barring, wedging and/or special impact tools such as jack hammers, sledges, chisels, or similar devices specifically designed for use in cutting or breaking rock for removal from their original beds and which have compressive strengths in their natural undisturbed state in excess of 300 psi. Boulders or masonry larger than 1 cubic yard in volume are classed as rock excavation.

1.3 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.

- B. Dewatering Excavation Plan: Develop an excavation dewatering plan that considers site ground and groundwater conditions, the type and arrangement of the equipment to be used and the proper method of groundwater disposal. Prepare the dewatering plan before beginning excavations below groundwater. Maintain one copy of the dewatering plan at the project site to be available for inspection while all dewatering operations are underway.

1.4 SITE CONDITIONS

- A. Geotechnical Investigation: A geotechnical investigation and report was prepared by Tierra, Inc. and was intended only for use by the OWNER and ENGINEER in preparing the Contract Documents.
 - 1. The geotechnical investigation report may be examined for what ever value it may be considered to be worth. However, this information is not guaranteed as to its accuracy or completeness.
 - 2. The geotechnical investigation report is not part of the Contract Documents.
- B. Actual Conditions: Make any geotechnical investigations deemed necessary to determine actual site conditions.
- C. Underground Utilities: Locate and identify all existing underground utilities prior to the commencement of Work.
- D. Quality and Quantity: Make any other investigations and determinations necessary to determine the quality and quantities of earth and rock and the methods to be used to excavate these materials.

PART 2 PRODUCTS – NOT USED

Not Used

PART 3 EXECUTION

3.1 GENERAL

- A. Clearing: Clear opencut excavation sites of obstructions preparatory to excavation. Clearing in accordance with Section 31 10 00, includes removal and disposal of vegetation, trees, stumps, roots and bushes, except those specified to be protected during trench excavation.

- B. Banks: Shore or slope banks to the angle of repose to prevent slides or cave-ins in accordance with Section 31 40 00.
- C. Safety: Whenever an excavation site or trench is left unattended by the CONTRACTOR or when an area is not within 100 feet of observation by the CONTRACTOR, the excavation site or trench shall be filled and/or, at the OWNER's discretion, protected by other means to prevent accidental or unauthorized entry. Such protection shall include barricades and other protection devices requested by the ENGINEER or OWNER, including temporary fencing, snow fencing, or temporary "structure" tape. Such safety items shall not relieve the CONTRACTOR of any site safety requirements or liabilities established by Federal, State and local laws and agencies, including OSHA, but is intended as additional safety measures to protect the general public.
- D. Hazardous Materials: If encountered, take care of hazardous materials not specifically shown or noted in accordance with Section 01 57 00.
- E. During excavation and any site Work, storm water pollution prevention measures shall be taken to ensure that water quality criteria are not violated in the receiving water body and all state and local regulatory requirements are met.

3.2 STRUCTURE EXCAVATION

- A. Excavation Size: Provide excavations of sufficient size and only of sufficient size to permit the Work to be economically and properly constructed in the manner and of the size specified.
- B. Excavation Shape: Shape and dimension the bottom of the excavation in earth or rock to the shape and dimensions of the underside of the structure or drainage blanket wherever the nature of the excavated material permits.
- C. Compaction: Before placing foundation slabs, footings or backfill, proof roll the bottom of the excavations to detect soft spots.
 - 1. For accessible areas, proof roll with a ten wheel tandem axle dump truck loaded to at least 15 tons or similarly loaded construction equipment.
 - 2. For small areas, proof roll with a smooth-faced steel roller filled with water or sand, or compact with a mechanical tamper.
 - 3. Make one complete coverage, with overlap, of the area.

4. Overexcavate soft zones and replace with compacted select fill in accordance with Part 3, Section 3.9.

3.3 TRENCH EXCAVATION

- A. Preparation: Properly brace and protect trees, shrubs, poles and other structures which are to be preserved. Unless shown or specified otherwise, preserve all trees and large shrubs. Hold damage to the root structure to a minimum. Small shrubs may be preserved or replaced with equivalent specimens.

- B. Adequate Space: Keep the width of trenches to a minimum, however provide adequate space for workers to place, joint and backfill the pipe properly.

1. The minimum width of the trench shall be equal to the outside diameter of the pipe at the joint plus 8 inches for unsheeted trench or 12 inches for sheeted trench.

The maximum width of trench, measured at the top of the pipe, shall not exceed the outside pipe diameter plus 2 feet, unless otherwise shown on the drawing details or approved by the ENGINEER. Trench walls shall be maintained vertical from the bottom of the trench to a line measured one foot above the top of the pipe. From one foot above the top of the pipe to the surface the trench walls shall conform with OSHA Regulations.

2. In sheeted trenches, measure the clear width of the trench at the level of the top of the pipe to the inside of the sheeting.
3. Should the maximum trench widths specified above be exceeded without written approval, provide concrete cradle or encasement for the pipe as directed. No separate payment will be made for such concrete cradle or encasement.

- C. Depth:

1. Excavate trenches to a minimum depth of 8 inches below the bottom of the pipe or the bottom of encasement for electrical ducts, unless otherwise shown, specified or directed, so that bedding material can be placed in the bottom of the trench and shaped to provide a continuous, firm bearing for duct encasement, pipe barrels and bells.
2. Standard trench grade shall be defined as the bottom surface of the utility to be constructed or placed within the trench. Trench grade for utilities in rock or other non-cushioning material shall be defined as additional undercuts

backfilled with #57 stone compacted in 6-inch lifts, below the standard 8-inches minimum trench undercut. Excavation below trench grade that is not ordered in writing by the ENGINEER shall be backfilled to trench grade and compacted.

- D. Unstable or Unsuitable Materials: If unstable or unsuitable material is exposed at the level of the bottom of the trench excavation, excavate the material in accordance with the subsection headed "Authorized Additional Excavation".
1. Material shall be removed for the full width of the trench and to the depth required to reach suitable foundation material.
 2. When in the judgment of the ENGINEER the unstable or unsuitable material extends to an excessive depth, the ENGINEER may advise, in writing, the need for stabilization of the trench bottom with additional select fill material, crushed stone, washed shell, gravel mat or the need to provide firm support for the pipe or electrical duct by other suitable methods.
 3. Crushed stone, washed shell, and gravel shall be as specified in Section 31 23 23.
 4. Payment for such trench stabilization will be made under the appropriate Contract Items or where no such items exist, as a change in the Work.
- E. Length of Excavation: Keep the open excavated trench preceding the pipe or electrical duct laying operation and the unfilled trench, with pipe or duct in place, to a minimum length which causes the least disturbance. Provide ladders for a means of exit from the trench as required by applicable safety and health regulations.
- F. Excavated Material: Excavated material to be used for backfill shall be neatly deposited at the sides of the trenches where space is available. Where stockpiling of excavated material is required, the CONTRACTOR shall be responsible for obtaining the sites to be used and shall maintain his operations to provide for natural drainage and not present an unsightly appearance.
- G. Water: Allow no water to rise in the trench excavation until sufficient backfill has been placed to prevent pipe or duct flotation.

3.4 SHORT TUNNEL EXCAVATION

- A. Short Tunnel Requirements: In some instances, trees, shrubs, utilities, sidewalks and other obstructions may be encountered, the proximity of which may be a

hindrance to opencut trench excavation. In such cases, excavate by means of short tunnels in order to protect such obstructions against damage.

1. Construct the short tunnel by hand, auger or other approved method approximately 6 inches larger than the diameter of pipe bells or outer electrical duct encasement.
2. Consider such short tunnel Work incidental to the construction of pipelines or conduits and all appurtenances. The need for short tunnels will not be grounds for additional payment.

3.5 EXCAVATION FOR JACKING AND AUGERING

- A. Jacking and Augering Requirements: Allow adequate length in jacking pits to provide room for the jacking frame, the jacking head, the reaction blocks, the jacks, auger rig, and the jacking pipe. Provide sufficient pit width to allow ample working space on each side of the jacking frame. Allow sufficient pit depth such that the invert of the pipe, when placed on the guide frame, will be at the elevation desired for the completed line. Tightly sheet the pit and keep it dry at all times.

3.6 ROCK EXCAVATION

- A. Rock Excavation: Excavate rock within the boundary lines and grades as shown, specified or required.
 1. Rock removed from the excavation becomes the property of the CONTRACTOR. Transport and dispose of excavated rock at an off site disposal location. Obtain the off site disposal location.
 2. Remove all shattered rock and loose pieces.
- B. Structure Depths: For cast-in-place structures, excavate the rock only to the bottom of the structure, foundation slab, or drainage blanket.
- C. Trench Width: Maintain a minimum clear width of the trench at the level of the top of the pipe of the outside diameter of the pipe barrel plus 4 feet, unless otherwise approved.
- D. Trench Depth: For trench excavation in which pipelines or electrical ducts are to be placed, excavate the rock to a minimum depth of 8 inches below the bottom of the pipe or duct encasement. Provide a cushion of sand or suitable crushed rock. Refill the excavated space with pipe bedding material in accordance with Section

- 31 23 23. Include placing, compacting and shaping pipe bedding material in the appropriate Contract Items.
- E. Manhole Depths: For manhole excavation, excavate the rock to a minimum depth of 8 inches below the bottom of the manhole base for pipelines 24 inches in diameter and larger and 6 inches below the bottom manhole base for pipelines less than 24 inches in diameter. Refill the excavated space with pipe bedding material in accordance with Section 31 23 23. Include placing, compacting and shaping pipe bedding material for manhole bases in the appropriate Contract Items.
 - F. Over-excavated Space: Refill the excavated space in rock below structures, pipelines, conduits and manholes, which exceeds the specified depths with 2,500 psi concrete, crushed stone, washed shell, or other material as directed. Include refilling of over-excavated space in rock as part of the rock excavation.
 - G. Other Requirements: Follow, where applicable, the requirements of the subsections on "Trench Excavation" and "Structure Excavation".
 - H. Payment: Rock excavation, including placing, compacting and shaping of the select fill material, will be paid for under the appropriate Contract Items.
 - I. Blasting: Perform authorized blasting by authorized and qualified workers as approved as to the number, length, placing and direction, and loading of holes. Do not use charges which will make the excavation unduly large or irregular, nor shatter the rock upon or against which masonry is to be built, nor injure masonry or existing structures at the site or in the vicinity.
 - 1. Cover each blast with a woven wire cable mat weighted with heavy timbers. Blasting will not be permitted within 25 feet of existing or of the completed pipeline or structure. Control blasts in tunnels so that the material surrounding the tunnel base proper is not loosened or displaced.
 - 2. Discontinue blasting whenever it is determined that further blasting may injure or damage adjacent rock, masonry, utility lines, or other structures. In such cases, excavate the remaining rock by barring, wedging, or other approved methods.
 - 3. Where sewers, gas, water, steam, or other utility ducts or lines, catch basin connections, or other structures have been exposed during excavation, adequately protect such structures from damage before proceeding with the blasting. Promptly repair any structure damaged by blasting at no addition to the Contract Price.

4. Take due precautions to prevent accidental discharge of electric blasting caps from current induced by radar, radio transmitters, lightning, adjacent powerlines, dust storms or other sources of extraneous electricity.
5. Keep a sufficient quantity of explosives on hand to avoid delay to the Work on the site when rock excavation is in progress. At no time keep a quantity in excess of that which will be required for use within the following 12 hours.
6. Store, handle and use such explosives in conformity with all laws, ordinances, and regulations of the County or governing body governing the storage and use of explosives at the construction site.
7. Provide a magazine keeper to keep accurate daily records and account for each piece of explosive, detonator and equipment from time of delivery at the magazine until used or removed from the site. Abandon no explosives or blasting agents.
8. Take sole responsibility for the methods of handling, use, and storage of explosives and any damage to persons or property resulting therefrom. Approval of these methods or failure to order that blasting be discontinued does not relieve the CONTRACTOR of any of this responsibility.

3.7 FINISHED EXCAVATION

- A. Finish: Provide a reasonably smooth finished surface for all excavations, which is uniformly compacted and free from irregular surface changes.
- B. Finish Methods: Provide a degree of finish which is ordinarily obtainable from blade-grade operations, except as otherwise specified in Section 31 23 23.

3.8 PROTECTION

- A. Traffic and Erosion: Protect newly graded areas from traffic and from erosion.
- B. Repair: Repair any settlement or washing away that may occur from any cause, prior to acceptance. Re-establish grades to the required elevations and slopes.
- C. It shall be the CONTRACTOR's responsibility to acquaint himself with all existing conditions and to locate all structures and utilities along the proposed utility alignment in order to avoid conflicts. Where actual conflicts are unavoidable, work shall be coordinated with the facility owner and performed so as to cause as little interference as possible with the service rendered by the facility disturbed.

Facilities or structures damaged in the prosecution of the work shall be repaired and/or replaced immediately, in conformance with current standard practices of the industry, or according to the direction of the owner of such facility, at the CONTRACTOR's expense.

- D. Other Requirements: Conduct all Work in accordance with the environmental protection requirements specified in Division 1.

3.9 AUTHORIZED ADDITIONAL EXCAVATION

- A. Additional Excavation: Carry the excavation to such additional depth and width as authorized in writing, for the following reasons:
 - 1. In case the materials encountered at the elevations shown are not suitable.
 - 2. In case it is found desirable or necessary to go to an additional depth, or to an additional depth and width.
- B. Refill Materials: Refill such excavated space with either authorized 2500 psi concrete or compacted select fill material, in compliance with the applicable provisions of Section 31 23 23.
- C. Compaction: Where necessary, compact fill materials to avoid future settlement. As a minimum, unless otherwise specified or directed, backfill layers shall not exceed 6-inches in thickness for the full trench width and compaction shall equal 95% of maximum density, or 98% if under paved area of roadway, as determined by using ASTM D1557. Compaction density tests shall be made at all such backfill areas with spacing not to exceed 100 feet apart and on each 6-inch compacted layer.
- D. Payment: Additional earth excavations so authorized and concrete or select fill materials authorized for filling such additional excavation and compaction of select fill materials will be paid for under the appropriate Contract Items or where no such items exist, as a change in the Work.

3.10 UNAUTHORIZED EXCAVATION

- A. Stability: Refill any excavation carried beyond or below the lines and grades shown, except as specified in the subsection headed "Authorized Additional Excavation", with such material and in such manner as may be approved in order to provide for the stability of the various structures.

- B. Refill Materials: Refill spaces beneath all manholes, structures, pipelines, or conduits excavated without authority with 2500 psi concrete or compacted select fill material, as approved.
- C. Payment: Refill for unauthorized excavation will not be measured and no payment will be made therefor.

3.11 SEGREGATION STORAGE AND DISPOSAL OF MATERIAL

- A. Stockpiling Suitable Materials: Stockpile topsoil suitable for final grading and landscaping and excavated material suitable for backfilling or embankments separately on the site in approved locations.
- B. Stockpile Locations: Store excavated and other material a sufficient distance away from the edge of any excavation to prevent its falling or sliding back into the excavation and to prevent collapse of the wall of the excavation. Provide not less than 2 feet clear space between the top of any stockpile and other material and the edge of any excavation.
- C. Excess Materials: CONTRACTOR shall be responsible to transport and dispose of surplus excavated material and excavated material unsuitable for backfilling or embankments at an off site disposal location secured by the CONTRACTOR.

3.12 REMOVAL OF WATER

- A. Water Removal: At all times during the excavation period and until completion and acceptance of the Work at final inspection, provide ample means and equipment with which to remove promptly and dispose of properly all water entering any excavation or other parts of the Work.
- B. Dry Excavations: Keep the excavation dry.
- C. Water Contact: Allow no water to rise over or come in contact with masonry and concrete until the concrete and mortar have attained a set and, in any event, not sooner than 12 hours after placing the masonry or concrete.
- D. Discharge of Water: Dispose of water pumped or drained from the Work in a safe and suitable manner without damage to adjacent property or streets or to other Work under construction.
- E. Protection: Provide adequate protection for water discharged onto streets. Protect the street surface at the point of discharge.

- F. Sanitary Sewers: Discharge no water into sanitary sewers.
- G. Storm Sewers: Discharge no water containing settleable solids into storm sewers.
- H. Repair: Promptly repair any and all damage caused by dewatering the Work.

END OF SECTION

SECTION 31 23 23**BACKFILLING****PART 1 GENERAL****1.1 SUMMARY**

- A. General Requirements: Backfill all excavation to the original surface of the ground or to such other grades as may be shown or required. For areas to be covered by topsoil, leave or stop backfill 12 inches below the finished grade or as shown. Obtain approval for the time elapsing before backfilling against masonry structures. Remove from all backfill, any compressible, putrescible, or destructible rubbish and refuse and all lumber and braces from the excavated space before backfilling is started. Leave sheeting and bracing in place or remove as the Work progresses.
- B. Equipment Limitations: Do not permit construction equipment used to backfill to travel against and over cast-in-place concrete structures until the specified concrete strength has been obtained, as verified by concrete test cylinders. In special cases where conditions warrant, the above restriction may be modified providing the concrete has gained sufficient strength, as determined from test cylinders, to satisfy design requirements for the removal of forms and the application of load.
- C. Related Work Specified in Other Sections Includes:
 - 1. Section 31 10 00 - Site Clearing
 - 2. Section 31 23 16 - Excavation – Earth and Rock

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ASTM D1557 - Standard Test Methods for Moisture-Density Relations of Soil and Soil-Aggregate Mixtures Using 10 lb Rammer and 18-inch Drop

PART 2 PRODUCTS**2.1 BACKFILL MATERIAL - GENERAL**

- A. General: Backfill with sound materials, free from waste, organic matter, rubbish, boggy or other unsuitable materials.

- B. General Materials Requirements: Conform materials used for backfilling to the requirements specified. Follow common fill requirements whenever drainage or select fill is not specified. Determine and obtain the approval of the appropriate test method where more than one compaction test method is specified.
- C. Frozen Materials: Do not use frozen material for backfilling.

2.2 DRAINAGE FILL

- A. Materials for Drainage Fill: Use clean gravel, crushed stone, or other suitable material conforming to the gradation specified for drainage fill. Clay and fine particles are unacceptable in drainage fill. Provide drainage fill of a grade between the following limits:

U.S. Standard Sieve	Percent Passing By Weight
1-1/2 inch	100
1 inch	95-100
1/2 inch	45-65
#4	5-15
#16	0-4

2.3 SELECT FILL

- A. Materials for Select Fill: Use clean gravel, crushed stone, washed shell, or other granular or similar material as approved which can be readily and thoroughly compacted to 95% of the maximum dry density obtainable by ASTM D1557.

1. Allowed Materials: Grade select fill between the following limits:

U.S. Standard Sieve	Percent Passing By Weight
2 inch	100
1-1/2 inch	90-100
1 inch	75-95
1/2 inch	45-70
#4	25-50
#10	15-40
#200	5-15

2. Unallowed Materials: Very fine sand, uniformly graded sands and gravels, sand and silt, soft earth, or other materials that have a tendency to flow under pressure when wet are unacceptable as select fill.

2.4 COMMON FILL

- A. Materials for Common Fill: Material from on-site excavation may be used as common fill provided that it can be readily compacted to 90% of the maximum dry density obtainable by ASTM D1557, and does not contain unsuitable material. Select fill may be used as common fill at no change in the Contract Price.
- B. Granular Materials On-Site: Granular on-site material, which is graded between the following limits may be used as granular common fill:

U.S. Standard Sieve	Percent Passing by Weight
3 inch	100
#10	50-100
#60	20-90
#200	0-20

- C. Cohesive Materials On-Site: Cohesive site material may be used as common fill.
- The gradation requirements do not apply to cohesive common fill.
 - Use material having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20.
- D. Material Approval: All material used as common fill is subject to approval. If there is insufficient on-site material, import whatever additional off-site material is required which conforms to the specifications and at no additional cost.

2.5 UTILITY PIPE BEDDING

- A. Class A (special utility bedding). Should special bedding be required due to depth of cover, impact loadings or other conditions, Class A bedding shall be installed.
- B. Class B (minimum utility bedding). The bottom of the trench shall be shaped to provide a firm bedding for the utility pipe. The utility shall be firmly bedded in undisturbed firm soil or hand shaped unyielding material. The bedding shall be shaped so that the pipe will be in continuous contact therewith for its full length

and shall provide a minimum bottom segment support for the pipe equal to 0.3 times the outside diameter of the barrel.

PART 3 EXECUTION

3.1 ELECTRICAL DUCT AND PRECAST MANHOLE BEDDING

- A. Bedding Compaction: Bed all electrical ducts and precast manholes in well graded, compacted, select fill conforming to the requirements except as otherwise shown, specified, or required. Extend electrical duct bedding a minimum of 6 inches below the bottom of the duct encasement for the full trench width. Compact bedding thickness no less than 6 inches for precast concrete manhole bases.
- B. Concrete Work Mats: Cast cast-in-place manhole bases and other foundations for structures against a 2500 psi concrete work mat in clean and dry excavations, unless otherwise shown, specified or required.
- C. Bedding Placement: Place select fill used for bedding beneath electrical ducts and precast manhole bases, in uniform layers not greater than 9 inches in loose thickness. Thoroughly compact in place with suitable mechanical or pneumatic tools to not less than 95% of the maximum dry density as determined by ASTM D1557.
- D. Use of Select Fill: Bed existing underground structures, tunnels, conduits and pipes crossing the excavation with compacted select fill material. Place bedding material under and around each existing underground structure, tunnel, conduit or pipe and extend underneath and on each side to a distance equal to the depth of the trench below the structure, tunnel, conduit or pipe.

3.2 PIPE BEDDING AND INITIAL BACKFILL

- A. Hand Placement: Place select fill by hand for initial pipe backfill from top of bedding to 1 foot over top of pipes in uniform layers not greater than 6 inches in loose thickness. Tamp under pipe haunches and thoroughly compact in place the select fill with suitable mechanical or pneumatic tools to not less than 95% of the maximum dry density as determined by ASTM D1557.
- B. Stone Placement: Do not place large stone fragments in the pipe bedding or backfill to 1 foot over the top of pipes, nor nearer than 2 feet at any point from any pipe, conduit or concrete wall.
- C. Unallowed Materials: Pipe bedding containing very fine sand, uniformly graded sands and gravels, sand and silt, soft earth, or other materials that have a tendency to flow under pressure when wet is unacceptable.

3.3 BEDDING PLACEMENT AND BACKFILL FOR PIPE IN SHORT TUNNEL

- A. Bed pipelines or electrical ducts placed in short tunnels in select fill or 2500 psi concrete. Completely fill the remainder of the annular space between the outside of the pipe wall and the tunnel wall with select fill, suitable job-excavated material, or 2500 psi concrete, as approved. Suitably support pipelines or ducts in short tunnels to permit placing of backfill suitably tamped in place.

3.4 TRENCH BACKFILL

- A. General: Backfill material shall be clean earth fill composed of sand, clay and sand, sand and stone, crushed stone, or an approved combination thereof. Backfilling shall be accomplished under two specified requirements: First Lift, from trench grade to a point 12 inches above the top of the utility, and, Second Lift, from the top of the First Lift to the ground surface. Where thrust blocks, encasements, or other below-grade concrete Work have been installed, backfilling shall not proceed until the concrete has obtained sufficient strength to support the backfill load.
- B. First Lift: Fine material shall be carefully placed and tamped around the lower half of the utility. Backfilling shall be carefully continued in compacted and tested layers not exceeding 6 inches in thickness for the full trench width, until the fill is 12 inches above the top of the utility, using the best available material from the excavation, if approved. The material for these first layers of backfill shall be lowered to within 2 feet above the top of pipes before it is allowed to fall, unless the material is placed with approved devices that protect the pipes from impact. The "First Lift" shall be thoroughly compacted and tested before the "Second Lift" is placed. Unless otherwise specified, compaction shall equal 98% of maximum density, as determined by ASTM D1557. The "First Lift" backfill shall exclude stones, or rock fragments larger than the following:

(Greatest Dimension-Inches)	
<u>Pipe Type</u>	<u>Fragment Size (Inches)</u>
Steel	2
Concrete	2
Ductile Iron	2
Plastic	1
Fiberglass	1

- C. Second Lift: The remainder of the trench, above the "First Lift", shall be backfilled and tested in layers not exceeding 6 inches. The maximum dimension of a stone, rock, or pavement fragment shall be 6 inches. When trenches are cut in pavements or areas to be paved, compaction, as determined by ASTM D1557, shall be equal to 98% of maximum density, with compaction in other areas not

less than 95% of maximum density in unpaved portions of the Rights-of-Way or 90% of maximum density in other areas.

As an alternative, or if required under roadways, Flowable Fill may be substituted. If Flowable Fill is to be used, a fabric mesh shall be installed between the "first lift" and the Flowable Fill. Flowable Fill shall be in accordance with Section 4.7.AH of the Lee County Utilities Operations Manual.

- D. **Compaction Methods:** The above specified compaction shall be accomplished using accepted standard methods (powered tampers, vibrators, etc.), with exception that the first two feet of backfilling over the pipe shall be compacted by hand-operated tamping devices. Flooding or puddling with water to consolidate backfill is not acceptable, except where sand is the only material utilized and encountered and the operation has been approved by the OWNER.
- E. **Density Tests:** Density tests for determination of the above specified compaction shall be made by an independent testing laboratory and certified by a Florida Registered, Professional Engineer at the expense of the CONTRACTOR. Test locations will be determined by the OWNER but in any case, shall be spaced not more than 100 feet apart where the trench cut is continuous. If any test results are unsatisfactory, the CONTRACTOR shall re-excavate and re-compact the backfill at his expense until the desired compaction is obtained. Additional compaction tests shall be made to each site of an unsatisfactory test, as directed, to determine the extent of re-excavation and re-compaction if necessary.

Copies of all density test results shall be furnished on a regular basis by the ENGINEER, to Lee County Utilities. Failure to furnish these results will result in the project not being recommended for acceptance by Lee County

- F. **Dropping of Material on Work:** Do trench backfilling Work in such a way as to prevent dropping material directly on top of any conduit or pipe through any great vertical distance. Do not allow backfilling material from a bucket to fall directly on a structure or pipe and, in all cases, lower the bucket so that the shock of falling earth will not cause damage.
- G. **Distribution of Large Materials:** Break lumps up and distribute any stones, pieces of crushed rock or lumps which cannot be readily broken up, throughout the mass so that all interstices are solidly filled with fine material.

3.5 STRUCTURE BACKFILL

- A. **Use of Select Fill:** Use select fill underneath all structures, and adjacent to structures where pipes, connections, electrical ducts and structural foundations are to be located within this fill. Use select fill beneath all pavements, walkways, and railroad tracks, and extend to the bottom of pavement base course or ballast.

1. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable approved mechanical or pneumatic equipment.
 2. Compact backfill to not less than 95% of the maximum dry density as determined by ASTM D1557.
- B. Use of Common Fill: Use common granular fill adjacent to structures in all areas not specified above, unless otherwise shown or specified. Select fill may be used in place of common granular fill at no additional cost.
1. Extend such backfill from the bottom of the excavation or top of bedding to the bottom of subgrade for lawns or lawn replacement, the top of previously existing ground surface or to such other grades as may be shown or required.
 2. Place backfill in uniform layers not greater than 8 inches in loose thickness and thoroughly compact in place with suitable equipment, as specified above.
 3. Compact backfill to not less than 90% of the maximum dry density as determined by ASTM D1557.
- C. Use of Clay: In unpaved areas adjacent to structures for the top 1 foot of fill directly under lawn subgrades use clay backfill placed in 6-inch lifts. Compact clay backfill to not less than 90% of the maximum dry density as determined by ASTM D1557.
1. Use clay having a liquid limit less than or equal to 40 and a plasticity index less than or equal to 20.

3.6 COMPACTION EQUIPMENT

- A. Equipment and Methods: Carry out all compaction with suitable approved equipment and methods.
1. Compact clay and other cohesive material with sheep's-foot rollers or similar equipment where practicable. Use handheld pneumatic tampers elsewhere for compaction of cohesive fill material.
 2. Compact low cohesive soils with pneumatic-tire rollers or large vibratory equipment where practicable. Use small vibratory equipment elsewhere for compaction of cohesionless fill material.

3. Do not use heavy compaction equipment over pipelines or other structures, unless the depth of fill is sufficient to adequately distribute the load.

3.7 BORROW

- A. Should there be insufficient material from the excavations to meet the requirements for fill material, borrow shall be obtained from pits secured and tested by the CONTRACTOR and approved by the OWNER. Copies of all test results shall be submitted to Lee County Utilities.

3.8 FINISH GRADING

- A. Final Contours: Perform finish grading in accordance with the completed contour elevations and grades shown and blend into conformation with remaining natural ground surfaces.
 1. Leave all finished grading surfaces smooth and firm to drain.
 2. Bring finish grades to elevations within plus or minus 0.10 foot of elevations or contours shown.
- B. Surface Drainage: Perform grading outside of building or structure lines in a manner to prevent accumulation of water within the area. Where necessary or where shown, extend finish grading to ensure that water will be carried to drainage ditches, and the site area left smooth and free from depressions holding water.

3.9 RESPONSIBILITY FOR AFTERSETTLEMENT

- A. Aftersettlement Responsibility: Take responsibility for correcting any depression which may develop in backfilled areas from settlement within one year after the Work is fully completed. Provide as needed, backfill material, pavement base replacement, permanent pavement, sidewalk, curb and driveway repair or replacement, and lawn replacement, and perform the necessary reconditioning and restoration Work to bring such depressed areas to proper grade as approved.

3.10 INSPECTION AND TESTING OF BACKFILLING

- A. Sampling and Testing: Provide sampling, testing, and laboratory methods in accordance with the appropriate ASTM Standard Specification. Subject all backfill to these tests.
- B. Compaction density tests shall be made at all such backfill areas with spacing not to exceed 100 feet apart and on each 6-inch compacted layer.

- C. Correction of Work: Correct any areas of unsatisfactory compaction by removal and replacement, or by scarifying, aerating or sprinkling as needed and recompaction in place prior to placement of a new lift.

END OF SECTION

SECTION 31 25 13**EROSION AND SEDIMENTATION CONTROL****PART 1 GENERAL****1.1 DESCRIPTION**

- A. The work specified in this Section consists of the design, provision, maintenance, and removal of temporary erosion and sedimentation controls as necessary.
- B. Temporary erosion controls include, but are not limited to, silt fencing, grassing, mulching, netting, watering, and the reseeding of on-site surfaces and spoil and borrow area surfaces, interceptor ditches at ends of berms and other such work at those locations which will ensure that erosion during construction will be either eliminated or maintained within acceptable limits as established by the OWNER.
- C. Temporary sedimentation controls include, but are not limited to, silt dams, traps, barriers, entrance and exit of stormwater structures larger than 8-inch diameter pipes or 12-inch-wide swales, and appurtenances at the foot of sloped surfaces which shall ensure that sedimentation pollution will be either eliminated or maintained within acceptable limits as established by the OWNER.
- D. The CONTRACTOR is responsible for providing effective temporary erosion and sediment control measures during construction or until final controls become effective.

1.2 REFERENCE DOCUMENTS

- A. Florida Building Code.
- B. FDEP/COE Dredge and Fill Regulations and/or Permit, as applicable.
- C. SFWMD Permit Regulations and/or Permit, as applicable.
- D. Florida Stormwater, Erosion and Sedimentation Control Inspector's Manual, latest edition. FDOT Specifications and Details, as applicable.

PART 2 PRODUCTS

2.1 EROSION CONTROL

- A. Netting - fabricated of material acceptable to the OWNER.
- B. Seed and sod.

2.2 SEDIMENTATION CONTROL

- A. Bales - clean, seed free cereal hay type.
- B. Netting - fabricated of material acceptable to the OWNER.
- C. Filter stone - crushed stone conforming to FDOT specifications.
- D. Concrete block - hollow, non-load-bearing type.
- E. Concrete - exterior grade not less than 1 inch thick.

PART 3 EXECUTION

3.1 EROSION CONTROL

- A. Minimum procedures for grassing shall be:
 - 1. Scarify slopes to a depth of not less than 6 inches and remove large clods, rock, stumps, roots larger than 1/2 inch in diameter, and debris.
 - 2. Sow seed within 24 hours after the ground is scarified with either mechanical seed drills or rotary hand seeders.
 - 3. Apply mulch loosely and to a thickness of between 3/4-inch and 1-1/2 inches.
 - 4. Apply netting over mulched areas on sloped surfaces.
 - 5. Roll and water seeded areas in a manner which will encourage sprouting of seeds and growing of grass. Reseed areas which exhibit unsatisfactory growth. Backfill and seed eroded areas.

3.2 SEDIMENTATION CONTROL

- A. The CONTRACTOR shall install and maintain silt dams, traps, barriers, and appurtenances as shown on the approved descriptions and working drawings. Deteriorated hay bales and dislodged filter stone shall be replaced by the CONTRACTOR at their expense.

3.3 PERFORMANCE

- A. The CONTRACTOR, at their own expense, shall immediately take whatever steps are necessary to correct any deficiencies of the temporary erosion and sediment control measures employed if they fail to produce results or do not comply with the requirements of the State of Florida or any other federal, governmental, or regulatory agency.

END OF SECTION

SECTION 31 40 00**SHORING, SHEETING AND BRACING****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Work required for protection of an excavation or structure through shoring, sheeting, and bracing.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 31 23 16 - Excavation - Earth and Rock
 - 2. Section 31 23 23 - Backfilling

1.2 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. CONTRACTOR's Submittals: All sheeting and bracing shall be the responsibility of the CONTRACTOR to retain qualified design services for these systems, and to be completed with strict adherence to OSHA Regulations. Submit complete design calculations and working drawings of proposed shoring, sheeting and bracing which have been prepared, signed and sealed by a Licensed Professional Engineer experienced in Structural Engineering and registered in the State of Florida, before starting excavation for jacking pits and structures. Use the soil pressure diagram shown for shoring, sheeting and bracing design. ENGINEER's review of calculations and working drawings will be limited to confirming that the design was prepared by a licensed professional engineer and that the soil pressure diagram shown was used.

1.3 REFERENCES

- A. Design: Comply with all Federal and State laws and regulations applying to the design and construction of shoring, sheeting and bracing.
- B. N.B.S. Building Science Series 127 "Recommended Technical Provisions for Construction Practice in Shoring and Sloping Trenches and Excavations.

1.4 QUALITY ASSURANCE

- A. Regulatory Requirements: Do work in accordance with the U.S. Department of Labor Safety and Health Regulations for construction promulgated under the Occupational Safety Act of 1970 (PL 91-596) and under Section 107 of the

Contract Work Hours and Safety Standards Act (PL 91-54), and the Florida Trench Safety Act. The CONTRACTOR shall also observe 29 CFR 1910.46 OSHA's regulation for Confined Space Entry.

PART 2 PRODUCTS

2.1 MANUFACTURERS AND MATERIALS

- A. Material Recommendations: Use manufacturers and materials for shoring, sheeting and bracing as recommended by the Licensed Professional Engineer who designed the shoring, sheeting, and bracing.

PART 3 EXECUTION

3.1 SHORING, SHEETING AND BRACING INSTALLATION

- A. General: Provide safe working conditions, to prevent shifting of material, to prevent damage to structures or other work, to avoid delay to the work, all in accordance with applicable safety and health regulations. Properly shore, sheet, and brace all excavations which are not cut back to the proper slope and where shown. Meet the general trenching requirements of the applicable safety and health regulations for the minimum shoring, sheeting and bracing for trench excavations.
 - 1. CONTRACTOR's Responsibility: Sole responsibility for the design, methods of installation, and adequacy of the shoring, sheeting and bracing.
- B. Arrange shoring, sheeting and bracing so as not to place any strain on portions of completed work until the general construction has proceeded far enough to provide ample strength.
- C. If ENGINEER is of the opinion that at any point the shoring, sheeting or bracing are inadequate or unsuited for the purpose, resubmission of design calculations and working drawings for that point may be ordered, taking into consideration the observed field conditions. If the new calculations show the need for additional shoring, sheeting and bracing, it should be installed immediately.
- D. Monitoring: Periodically monitor horizontal and vertical deflections of sheeting. Submit these measurements for review.
- E. Accurately locate all underground utilities and take the required measures necessary to protect them from damage. All underground utilities shall be kept in service at all times as specified in Division 1.

- F. Driven Sheet piling: Drive tight sheet piling in that portion of any excavation in paved or surface streets City collector and arterial streets and in State and County highways below the intersection of a one-on-one slope line from the nearest face of the excavation to the edge of the existing pavement or surface.
- G. Sheet piling Depth: In general drive or place sheet piling for pipelines to a depth at elevation equal to the top of the pipe as approved.
 - 1. If it is necessary to drive sheet piling below that elevation in order to obtain a dry trench or satisfactory working conditions, cut the sheet piling off at the top of the pipe and leave in place sheet piling below the top of the pipe.
 - 2. Do not cut the sheet piling until backfill has been placed and compacted to the top of the pipe.
- H. Sheet piling Removal: In general, remove sheet piling and bracing above the top of the pipe as the excavation is refilled in a manner to avoid the caving in of the bank or disturbance to adjacent areas or structures. Sheet piling shall be removed as backfilling progresses so that the sides are always supported or when removal would not endanger the construction of adjacent structures. When required to eliminate excessive trench width or other damages, shoring or bracing shall be left in place and the top cut off at an elevation 2.5 feet below finished grade, unless otherwise directed.
 - 1. Carefully fill voids left by the withdrawal of the sheet piling by jetting, ramming or otherwise.
 - 2. No separate payment will be made for filling of such voids.
- I. Permission for Removal: Obtain permission before the removal of any shoring, sheet piling or bracing. Retain the responsibility for injury to structures or to other property or persons from failure to leave such shoring, sheet piling and bracing in place even though permission for removal has been obtained.
- J. Preload internal braces to 50% of the design loads.
- K. Proof test tie backs to 133% of the design loads and lock off tie backs at 75% of the design loads.

3.2 SHEETING LEFT IN PLACE FOR PROTECTION

- A. Ordered Left in Place: In addition to sheet piling specified or shown to be left in place, the ENGINEER may order, in writing, any or all other shoring, sheet piling or

bracing to be left in place for the purpose of preventing injury to the structures, pipelines or to other property or to persons.

1. Cutoff sheeting left in place at the elevation shown or ordered, but, in general, at least 2.5 feet below the final ground surface.
 2. Drive up tight any bracing remaining in place.
- B. Right to Order: Do not construe the right to order shoring, sheeting and bracing left in place as creating any obligation to issue such orders.
- C. Payment: Shoring, sheeting and bracing left in place, by written order, will be paid for under the appropriate Contract Items or where no such items exist, as changes in the work.

END OF SECTION

SECTION 32 10 01**PAVEMENT REPAIR AND RESTORATION****PART 1 GENERAL****1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals required and remove and replace pavements over trenches excavated for installation of pipelines in compliance with FDOT Design Standards, as shown on the drawings and/or specified herein.

1.2 GENERAL

- A. All damage, as a result of Work under this project, done to existing pavement, driveways, paved areas, curbs and gutters, sidewalks, shrubbery, grass, trees, utility poles, utility pipe lines, conduits, drains, catch basins, or stabilized areas or driveways and including all obstructions not specifically named herein, shall be repaired in a manner satisfactory to the ENGINEER. Bid prices shall include the furnishing of all labor, materials, equipment, and incidentals necessary for the cutting, repair, and restoration of the damaged areas unless pay items for specific types of repair are included in the Bid Form.
- B. Keep the surface of the backfilled area of excavation in a safe condition and level with the remaining pavement until the pavement is restored in the manner specified herein. All surface irregularities that are dangerous or obstructive to traffic are to be removed. The repair shall conform to applicable OWNER or State requirements for pavement repair and as described herein.
- C. All materials and workmanship shall be first class and nothing herein shall be construed as to relieve the CONTRACTOR from this responsibility. The OWNER reserves the right to require soil bearing or loading tests or materials tests, should the adequacy of the foundation or the quality of materials used be questionable. Costs of these tests shall be borne by the OWNER, if found acceptable; the costs of all failed tests shall be borne by the CONTRACTOR.
- D. All street and road repair shall be made in accordance with the details indicated on the drawings and in accordance with the applicable requirements of these Specifications and meeting the permit requirements and approval of the governing Department of Transportation agencies.
- E. Pavement or roadway surfaces cut or damaged shall be replaced by the CONTRACTOR in equal or better condition than the original, including

stabilization, base course, surface course, curb and gutter or other appurtenances. The CONTRACTOR shall obtain the necessary permits prior to any roadway Work. Additionally, the CONTRACTOR shall provide advance notice to the appropriate authority, as required, prior to construction operations.

1. Roadway Restoration (within Lee County Department of Transportation & Engineering jurisdiction): Restoration shall be in accordance with the requirements set forth in the "Right-of-Way Utility Construction Activities Policy" and these Standards. The materials of construction and method of installation, along with the proposed restoration design for items not referred or specified herein, shall receive prior approval from Lee County DOT.
 - a. Where existing pavement is to be removed, the surface shall be mechanical saw cut prior to trench excavation, leaving a uniform and straight edge parallel or perpendicular to the roadway centerline with minimum disturbance to the remaining adjacent surfacing. The width of cut for this phase of existing pavement removal shall be minimal.
 - b. Immediately following the specified backfilling and compaction, a temporary sand seal coat surface shall be applied to the cut areas. This temporary surfacing shall provide a smooth traffic surface with the existing roadway and shall be maintained until final restoration. Said surfacing shall remain for a minimum of ten (10) days in order to assure the stability of the backfill under normal traffic conditions. Thirty (30) days following this period and prior to sixty (60) days after application, the temporary surfacing shall be removed and final roadway surface restoration accomplished.
 - c. In advance of final restoration, the temporary surfacing shall be removed and the existing pavement mechanically sawed straight and clean to the stipulated dimensions, if needed. Following the above operation, the CONTRACTOR shall proceed immediately with final pavement restoration in accordance with the requirements set forth by Lee County Department of Transportation.
2. Roadway Restoration (outside Lee County Department of Transportation jurisdiction) – Work within the rights-of-way of public thoroughfares which are not under jurisdiction of Lee County, shall conform to the requirements of the Florida Department of Transportation. Work within State Highway right-of-way shall be in full compliance with all requirements of the permit drawings, and to the satisfaction of the Florida Department of Transportation.

1.3 QUALITY ASSURANCE

- A. Applicable provisions of the latest version of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction", and Supplemental Specifications hereunder govern the Work under this Section. The Florida Department of Transportation will hereafter be referred to as FDOT.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials utilized in flexible base pavement and base course shall be as specified in the latest version of the Florida Department of Transportation "Standard Specifications for Road and Bridge Construction".

PART 3 EXECUTION

3.1 CUTTING PAVEMENT

- A. Cut and remove pavement as necessary for installing the new pipelines and appurtenances and for making connections to existing pipelines.
- B. Before removing pavement, the pavement shall be marked for cuts nearly paralleling pipelines and existing street lines. Asphalt pavement shall be cut along the markings with a jackhammer, rotary saw, or other suitable tool, leaving a uniform and straight edge with minimum disturbance to the remaining adjacent surface.
- C. No pavement shall be machine pulled until completely broken and separated along the marked cuts.
- D. The pavement adjacent to pipeline trenches shall neither be disturbed nor damaged. If the adjacent pavement is disturbed or damaged, irrespective of cause, remove the damaged pavement and shall replace it at his own expense.

3.2 GENERAL RESTORATION

- A. The restoration of existing street paving, driveways, etc., shall be restored, replaced or rebuilt using the same type of construction as was in the original. Be responsible for restoring all such Work, including sub-grade and base courses where present. Obtain and pay for such local or other governmental permits as may be necessary for the opening of streets. Meet any requirements other than those herein set forth which may effect the type, quality and manner of carrying on the restoration of surfaces by reason of jurisdiction of such governmental bodies.

- B. In all cases, maintain, without additional compensation, all permanent replacement of street paving, done by him under this Contract until accepted by the OWNER, including the removal and replacement of such Work wherever surface depressions or underlying cavities result from settlement of trench backfill.
- C. Complete all the final resurfacing or re-paving of streets or roads, over the excavations and relay paving surfaces of roadbed that have failed or been damaged prior to acceptance by the OWNER. Backfilling of trenches and the preparation of sub-grades shall conform to the requirements of Section 31 23 23.
- D. All re-paving or resurfacing shall be done in accordance with Florida Department of Transportation Specifications, to which the following requirement of trench backfill will be added: Where pipeline construction crossed paved areas such as streets, the top 24-inches of trench below the road bases or concrete slabs shall be backfilled with compacted A-4 or better matter that will provide a bearing value of not less than 75 when tested by the Florida Department of Transportation Soil Bearing Test Methods.

3.3 PRIME AND TACK COATS

- A. The Work shall consist of the application of bituminous prime and tack coats on the previously prepared base course in accordance with Section 300 of the FDOT Specifications.

3.4 WEARING COURSE

- A. The Work shall consist of the construction of plant-mixed hot bituminous pavement conforming to Type III asphaltic concrete in accordance with Section 333 of the FDOT Specifications. The requirements for plant and equipment are specified in Section 320 and the general construction requirements for asphaltic concrete pavement are contained in Section 330 of the FDOT specifications.

3.5 TESTING

- A. All field testing shall be performed by an independent laboratory employed by the OWNER. All materials shall be tested and certified by the producer. Tests repeated because sub-grade or base does not meet specified compaction shall be at the CONTRACTOR's expense.

3.6 MISCELLANEOUS RESTORATION

- A. Sidewalks cut or damaged by construction shall be restored in full sections or blocks in accordance with FDOT Standards. Concrete curb or curb gutter shall be restored to the existing height and cross section in full sections or lengths between joints. Grassed yards, shoulders and parkways shall be restored to match the existing sections with grass seed or sod of a type matching the existing grass.

3.7 CLEANUP

- A. After all repair and restoration or paving has been completed, all excess asphalt, dirt, and other debris shall be removed from the roadways. All existing storm sewers and inlets shall be checked and cleaned of any construction debris.

END OF SECTION

SECTION 32 16 00**SIDEWALKS, DRIVEWAYS AND CURBS****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Sidewalks, sidewalk ramps, driveways, curbs and drive approaches complete with concrete materials, concrete curing compounds, joint materials, field quality control and appurtenances.

1.2 REFERENCES

- A. Reference Standards: Conform the Work for this Section to the applicable portions of the following standard Specifications.
1. ASTM - American Society of Testing and Materials
 2. AASHTO - American Association of State Highway and Transportation Officials
 3. FDOT - Florida Department of Transportation - Standard Specifications for Road and Bridge Construction.
 4. FAC - Florida Accessibility Code.
 5. ADAAG - American with Disabilities Act Accessibility Guidelines
 6. UFAS - Uniform Federal Accessibility Standards

1.3 SUBMITTALS

- A. Reports: Written permission for the use of all local disposal sites Furnish copies to the ENGINEER.

1.4 JOB CONDITIONS

- A. Environmental Requirements:

1. Temperature: Comply with the requirements for concrete installation due to outside ambient air temperatures as specified under Article 3.3.I of this Section.

- B. Protection:

1. Protection Against Rain: Comply with the requirements for protecting new Work against damage from Rain, as specified under Article 3.3.I of this Section.

2. Protection Against Cold Weather: Comply with the requirements for protecting new Work against damage from cold weather, as specified under Article 3.3.I of this Section.

PART 2 PRODUCTS

2.1 MATERIALS

Concrete: Compressive strength shall be per FDOT Design Standards and Specifications. Reinforced concrete shall be 4,000 psi, and non-reinforced concrete shall be 2,500 psi concrete except as modified herein.

- A. Ready-Mixed Concrete: Use ready-mixed concrete which conforms to ASTM C94, Alternate 2.
- B. Water: Use water for mixing and curing concrete reasonably clean and free from oil, salt, acid, alkali, chlorides, sugar, vegetable, or other substances injurious to the finished product. Waters from sources approved by the local Health Department as potable may be used without test. Test water requiring testing in accordance with the current Method of Test for Quality of Water to be Used in Concrete, AASHTO T-26.
- C. Concrete Curing Compounds: Use white membrane curing compound for curing concrete which conforms to AASHTO M148, Type 1 clear, or Type 2 while per FDOT Section 925.
- D. Premolded Joint Filler: Use fiber joint filler which conforms to ASTM D1751. Use filler of the thickness, as specified herein, or as directed by the ENGINEER.
- E. Steel Hook Bolts: Use hook bolts which conform to ASTM A706, or for Grade 60 of ASTM A615, A616, or A617. Use 5/8-inch diameter hook bolts self tapping.
- F. Joint Sealant: Use hot-poured type joint sealant which conforms to ASTM D1190.

PART 3 EXECUTION

3.1 CONTRACTOR'S VERIFICATION

- A. Excavation and Forming: Prior to the installation of any concrete, examine the excavation and forms for the proper grades, lines, and levels required to receive the new Work. Ascertain that all excavation and compacted subgrades are adequate to receive the concrete to be installed.

1. Correct all defects and deficiencies before proceeding with the Work.
- B. Existing Improvements: Investigate and verify location of existing improvements to which the new Work is to be connected.
 1. Making necessary adjustment in line and grade to align the new Work with the existing improvements must be approved by the ENGINEER prior to any change.

3.2 PREPARATION

- A. Forms: Use wood or metal forms, straight and free from warp, clean, and sufficient strength to resist springing during the process of depositing concrete against them.
 1. Use full depth of the concrete forms.

3.3 INSTALLATION



- A. Sidewalks, Sidewalk Ramps, Driveways and Driveway Approaches: Construct all sidewalks and sidewalk ramps six (6) inches thick and per current FDOT Roadway and Traffic Design Standards.
- B. Removal of Existing Curb for Sidewalk Ramps and Driveway Approaches: Conform construction of sidewalk ramps within street intersections where curbed pavement existing to the current FDOT Roadway and Traffic Design Standards.
 1. Saw cut, to full depth of pavement, and remove a minimum of an 18-inch wide curb and gutter section where there is no proper curb drop for the sidewalk ramp or driveway approach. When mountable curbs are present, remove a 24-inch wide curb and gutter section for the construction of sidewalk ramps, as specified above.
 2. Remove curb and gutter as determined by the ENGINEER in the field but remove curb and gutter at least as wide as the proposed sidewalk ramp plus 1-foot on each side.
 3. Replace the removed curb and gutter section with materials, equal to what was removed and seal joint with hot poured rubber asphalt.
- C. Install 5/8 inch diameter self tapping hook bolts, in the existing concrete pavement as indicated on the Plans prior to placing concrete for the removed curb and gutter section.
- D. Placement of Forms: Use wood forms, straight and free from warp, of nominal depth for sidewalk sections less than 25 feet in length.

1. Stake forms to line and grade in a manner that will prevent deflection and settlement.
 2. When unit slab areas are to be poured, place slab division forms such that the slab division joints will be straight and continuous.
 3. Set forms for sidewalk ramps to provide a grade toward the centerline of the right-of-way in accordance with current standards. Use a uniform grade, except as may be necessary to eliminate short grade changes.
 4. Oil forms before placing concrete. Leave forms in place at least 12 hours after the concrete is placed. Place forms ahead of the pouring operations to maintain uninterrupted placement of concrete.
 5. The use of slip form pavers can be allowed when approved by the ENGINEER in lieu of the construction system described above.
- E. Joints: Construct transverse and longitudinal expansion and plane-of-weakness joints at the locations specified herein, or as indicated on the Plans or as directed by the ENGINEER.
1. Place the transverse expansion joints for the full width and depth of the new Work. Use transverse expansion joints placed against an existing pavement a minimum of 6 inches deep but no less than the thickness of the concrete being placed.
 2. Conform longitudinal expansion joints to the requirements as transverse expansion joints.
 3. Construct joints true to line with their faces perpendicular to the surface of the sidewalk. Install the top slightly below the finished surface of the sidewalk. Construct transverse joints at right angles to the centerline of the sidewalk and construct longitudinal joints parallel to the centerline or as directed by the ENGINEER.
 4. Place transverse expansion joints, 1/2-inch thick, through the sidewalk at uniform intervals of not more than 50 feet and elsewhere as shown on the Plans, or as directed by the ENGINEER.
 5. Place expansion joints, 1/2-inch thick, between the sidewalk and back of abutting parallel curb, buildings or other rigid structures, concrete driveways and driveway approaches. When directed by the ENGINEER, place the expansion joint between sidewalks and buildings 1-foot from the property line and parallel to it.

6. Form plane-of-weakness joints every 5 feet. Form joints by use of slab divisions forms extending to the full depth of the concrete or by cutting joints in the concrete, after floating, to a depth equal to $\frac{1}{4}$ the thickness on the sidewalk. Construct cut joints not less than $\frac{1}{8}$ -inch or more than $\frac{1}{4}$ -inch in width and finish smooth and at right angles to the centerline on the sidewalk.
- F. Placing and Finishing Concrete: Place all concrete on a prepared unfrozen, smooth, leveled, rolled and properly compacted base. Place concrete on a moist surface with no visible water present.
1. Deposit the concrete, in a single layer to the depth specified. Spade or vibrate and compact the concrete to fill in all voids along the forms and joints. Strike off the concrete with a strike board until all voids are removed and the surface has the required grade and cross section as indicated on the Plans, or as directed by the ENGINEER.
 2. Float the surface of the concrete just enough to produce a smooth surface free from irregularities. Round all edges and joints with an edger having a $\frac{1}{4}$ -inch radius.
 3. Broom the surface of sidewalks, driveways and approaches to slightly roughen the surface.
 4. Texture the surface of the sidewalk ramps with a coarse broom transversely to the ramp slope, and coarser roughen than the remainder of the sidewalk. Contrast the ramp slope in color (using a brick-red dye or approved equal) from the remainder of the sidewalk. Comply with minimum color contrast and slope requirements from FAC, UFAS, ADAAG, Local Government Standards, or as directed by the ENGINEER.
- G. Curing: After finishing operations have been completed and immediately after the free water has left the surface, completely coat and seal the surface of the concrete (and sides if slip-forming is used) with a uniform layer of white membrane curing compound. Do not thin the curing compound. Apply the curing compound at the rate of one gallon per 200 square feet of surface.
- H. Barricades: Place suitable barricades and lights around all newly poured sidewalks, sidewalk ramps, driveways, driveway approaches and curb and gutter sections in order to protect the new Work from damage from pedestrians, vehicles and others until the concrete has hardened.
1. Leave barricades in place for a minimum of two (2) days, except for driveway approaches and curb and gutter sections. Leave barricades in place for a minimum of three (3) days.

2. Remove and replace any concrete that suffers surface or structural damage at no additional cost.
- I. Protection:
1. Against Rain: Protect new concrete from the effects of rain before the concrete has sufficiently hardened. Have available on the job site at all times enough burlap or 6-mil thick polyurethane film to cover and protect one day's Work. Stop Work and cover completed Work when rain appears eminent. As soon as the rain ceases, uncover the concrete and burlap drag the surface where necessary. Apply curing compound to any areas where the compound has been disturbed or washed away.
 2. Against Cold Weather: If concrete is placed between December 15 and February 15, have available on the site sufficient amount of clean, dry straw or hay to cover one (1) day's production. If the temperature reaches 40°F and is falling, place the hay or straw 12 inches thick, immediately after the curing compound is applied.
 3. Concrete Temperature Limitations: Do not place concrete when the temperature of the concrete at the point of placement is above 90°F.
- J. Cleanup: After the concrete has gained sufficient strength, but no sooner than within 12 hours, remove the fixed forms and backfill the spaces on both sides with sound earth of topsoil quality. Compact, level and leave backfill in a neat condition.
- K. Gutters and Curbs: Construct gutters and curbs in accordance with Section 520 FDOT Standard Specifications for Road and Bridge Construction, latest edition, including supplements.

3.4 FIELD QUALITY CONTROL

- A. Concrete Delivery Ticket: Use a ticket system for recording the transportation of concrete from the batching plant to point of delivery. Issue this ticket to the truck operator at the point of loading and give to the ENGINEER upon delivery.
- B. Concrete Delivery Rejection: Remove concrete not permitted for inclusion in the Work by the ENGINEER from the site. Rejection of concrete will be determined through Field Quality Control and elapsed time from mixer charging to delivery.
- C. Concrete Testing at Placement: Perform tests of each batch of concrete delivered, each 50 cubic yards, or whenever consistency appears to vary. The

sampling and testing of slump, air content and strength will be performed at no cost to the COUNTY.

1. Sampling: Secure composite samples in accordance with the Method of Sampling Fresh Concrete, ASTM C172.
2. Slump Test: Test in accordance with ASTM C143. Use the least slump possible consistent with workability for proper placing of the various classifications of concrete.
 - a. Place structural concrete for walls and slabs, by means of vibratory equipment, with a slump of 4 inches.
 - b. A tolerance of up to 1-inch above the indicated maximum will be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit.
3. Air Content: Determine air content of normal weight concrete in accordance with Method of Test for Air Content of Freshly Mixed Concrete by the Pressure Method, ASTM C231, or by the volumetric method, ASTM C173, for each strength test.
4. Compressive Strength: Make two (2) strength tests of three (3) samples each for each 50 cubic yards, or fraction thereof, of each mix design of concrete placed in any one (1) day.
 - a. Handling Samples: Mold and cure three (3) specimens from each sample in accordance with Method of Making and Curing Concrete Test Specimens in the Field, ASTM C31. Record any deviations from the requirements of this Standard in the test report.
 - b. Testing: Test specimens in accordance with Method of Test for Compressive Strength of Cylindrical Concrete Specimens, ASTM C39. Test one (1) specimen at seven (7) days for information and test two (2) at twenty-eight (28) days for acceptance. Use the average of the strengths of the two (2) specimens tested at twenty-eight (28) days. Discard results if one (1) specimen in a test manifests evidence of improper sampling, molding or testing, and use the strength of the remaining cylinder. Should both specimens in test shown any of the above defects, discard the entire test.
 - c. Acceptance of Concrete: The strength level of the concrete will be considered satisfactory so long as the averages of all sets of three consecutive strength test results equal or exceed the specified 28-day

strength and no individual strength test results falls below the specified 28-day strength by more than 500 psi. If the strength test is not acceptable, perform further testing to qualify the concrete.

- d. Concrete Temperature: Determine the temperature of concrete sample for each strength test.
- D. Reductions due to deficiencies in thickness or compressive strength are additive, that is, if an area is deficient by 3/8 inch and under strength by 200 psi, the total reduction is 20% plus 02% or 40% reduction.

END OF SECTION

SECTION 32 90 01
LANDSCAPING WORK**PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Soil, soil preparation, soil tests, excavation, planting, seeding, sodding, pruning, edging, fertilizing and maintenance.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 31 23 16 - Excavation - Earth and Rock
 - 2. Section 31 23 23 - Backfilling

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. ASTM C 33 - Specification for Concrete Aggregates

1.3 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Soil Tests: Submit soil test results.
- C. Maintenance Instruction Manual: Upon completion of the landscaping work and prior to final payment, furnish a landscaping maintenance manual. Include complete and detailed instructions on the recommended maintenance procedure to be followed for maintaining lawns and each species of plant material. Include a schedule of all planted and seeded materials and all pertinent growing and maintenance information and requirements for watering, fertilizing, lime applications, spraying, cultivating, pruning and weed control.

1.4 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 (and as follows:)
- B. Top Soil: Deliver top soil in a dry state without enough moisture to allow it to be packed or squeezed into a ball.

- C. Balled and Bare Root Plants: Immediately after delivery, set all balled plants on the ground with the balls well protected with soil. Water and properly maintain all plants until planting. Plant or heel in bare rooted plants which cannot be planted immediately upon delivery. No materials heeled in for more than a week may be used. Before the roots are covered, open bundler and separate the plants. In hot weather, maintain stock in a shade house for a minimum of one week to allow plants to recover from digging shock
- D. Grass Seed: Deliver grass seed in standard size bags of the vendor, showing weight, analysis and name of vendor. Store the seed so as not to impair its effectiveness.
- E. Sod: Deliver sod to the site in fresh condition and within two days of the time it has been dug.
- F. Fertilizer: Deliver fertilizer mixed as specified, in standard size bags, showing weight, analysis and the name of the manufacturer. Store the fertilizer in a weatherproof storage place in a manner that will keep it dry without affecting its effectiveness.

1.5 ENVIRONMENTAL REQUIREMENTS

- A. Seeding and Sodding: Sow grass seed between August 15th and October 15th unless sowing between March 15th and June 1st is permitted. Sow seed when the wind velocity is below 5 mph. Place sod between August 15th and October 15th or between March 15th and June 1st, or during the season or seasons which are normal for such work as determined by weather conditions and accepted practice in the locality and as approved.
- B. Planting: Unless otherwise directed, plant deciduous material from March 1st to June 1st and from September 1st to December 1st. Plant evergreen material from April 1st to June 1st and from September 1st to November 1st.

1.6 WARRANTY

- A. General: Apply the warranty to all seeded, sodded and planted areas. Have the warranty period commence after the final acceptance of all landscaping work exclusive of all replacement plant materials.
- B. Plant Material: Warranty plant materials for a period of one year.
- C. Seeded Areas: Warranty seeded lawn areas to the time of establishment of an acceptable uniform stand of grass.
- D. Sod: Warranty sod to thirty (30) days following the first cutting.

1.7 MAINTENANCE

- A. General: Maintain all seeded, sodded and planted areas during the warranty period.
- B. Grass Areas: Maintain all seeded and sodded areas to well establish a uniform stand of weed-free grass. Reseed or resod areas failing to develop a uniform stand.
- C. Trees, Shrubs and Ground Covers: Cultivate trees, shrubs and ground covers and weed and water when necessary, but not less than twice a month, to prevent plant material from dying. Replace any plant material which is found to be dead or dying during the warranty period to original specifications upon request. Include the full cost of replacing dead or dying plant material in the Contract Amount. No separate payment will be made for replacements. Maintain plant material to be alive, in good growing condition and free of weeds.
- D. Replacement: Replace plant material and resod or reseed only during the specified planting seasons and warranty the replacement material for the same period of time as the original material.

PART 2 PRODUCTS

2.1 SOIL

- A. Topsoil: Provide a natural friable top soil of the region, rich in organic matter, without any material toxic to plant growth and of uniform quality, free of large roots, sticks, hard clay, weeds, brush, stones over 1-inch in maximum dimension or other litter or waste products. Provide topsoil containing no decomposed stone, salts or alkali, and not less than 15 parts per million of available nitrates, 3 parts per million of available phosphorus, 15 parts per million of potash, and having a pH of not less than 6.0 nor more than 7.2 at a depth of 8 inches below the surface of the field from which it is removed. Provide topsoil with a mechanical analysis as follows:

Sieve	Percentage Passing
1 inch	100
1/4 inch	97-100
No. 100	40- 60

- B. Planting Soil: Prepare planting soil by mixing 10 parts of topsoil with fertilizer and 1 part of peat moss.

2.2 GRASS SEED AND SOD

- A. Grass Seed: Provide a fresh, clean, new crop of grass. Provide seed components free of noxious weed seeds and having not less than the following purity and germination:

Component	Percent Purity	Percent Germination
Bahia Grass	95	80
Bermuda Grass	95	85
Annual Type Ryegrass	95	90

Tag each sack in accordance with the agricultural seed laws of the United States and the State of Florida. Show on each tag the producer's guarantee as to the year grown, the percentage of purity, the percentage of germination and the tests by which the percentages were determined. Provide seed for this project having a test date within six (6) months of the date of sowing.

- B. Sod: Provide nursery-grown Improved Centipede, Bahia Grass, or Bermuda Grass at the Contractor's option. Sod shall be free of weeds, a minimum of 1 1/4-inch thick of dense growth and cut with sharp edges in commercial-size rectangles, or rolls, preferably 12 by 24 inch or larger or as rolled sod at least 12 inches in width and length consistent with the equipment and methods used to handle the rolls and place the sod. Sod shall be sufficiently thick to secure a dense stand of live grass. Sod shall be live, fresh and uninjured, at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. Sod which has been grown on peat, or which has been dug more than two (2) days previous to delivery, or which has been allowed to have the roots dry out, or on which the grass has turned brown will not be accepted. A letter of certification from the grassing Contractor as to when the sod was cut, and what type shall be provided to the ENGINEER upon delivery of the sod to the job site.

2.3 PLANT MATERIALS

- A. General: Provide plant materials that are true to species or variety, sound, healthy, vigorous acclimated plants free from defects, disfiguring knots, sun-scaled injuries, abrasions of the bark, plant diseases and insect eggs, borers and all other forms of infestations. Provide material that has normal, well-developed branch systems and vigorous root systems and that is freshly dug, nursery-grown stock grown under the same climatic conditions as the Project location. Provide material grown under climatic conditions similar to those in the locality of the project for at least 2 years and transplanted or root pruned at least in the last 3 years.

- B. Plant Size: Dimension a plant as it stands in its natural position. Measure trees under 4 inches in caliper at a point 6 inches above the ground and trees more than 4 inches in caliper at a point 12 inches above ground. Provide the stock of a fair average of the minimum and maximum sizes specified. Do not cut back large shrubs to sizes specified.
- C. Balled, Burlapped and Platformed Plants: Dig balled and burlapped, as well as balled and platformed, plants with sufficient roots and a solid ball of earth securely held in place by burlap and stout natural fiber rope. Manufactured balls are not acceptable. Provide balled and platformed plants with sturdy platforms of a size equal to the diameter of the horizontal midsection of the ball of earth.
- D. Bare-Rooted Plants: Dig bare-rooted plants with sufficient root spread and depth to ensure full recovery and development of the plants. Cover roots for these plants with a uniformly thick coating of mud by being puddled immediately after they are dug.

2.4 ACCESSORIES

- A. Tree Wrap: Provide new, clean, plain, 8-ounce weight burlap material 6 inches wide for wrapping tree trunks.
- B. Weed Barrier Fabric: Provide Pro-5 fabric as manufactured by the DeWitt Co., or equal.
- C. Gravel: Provide smooth river bed gravel of solid or mixed color range to be as selected and meeting the requirements of ASTM C 33 and graded according to Size No. 467, Table II.
- D. Mulch: Provide ground corn cobs, wood chips, tree barks, buckwheat hulls or other approved materials for mulch.
- E. Edging: Provide commercial hot-rolled steel edging plate, 4 inches wide and 1/8-inch thick. Fabricate edging in sections with loops pressed from or welded to the face of sections at 30-inch centers to receive 16-inch long tapered steel stakes. Provide edging finished with the manufacturer's standard paint.

2.5 TESTS

- A. Sample: Submit a 10-ounce sample of the proposed topsoil to a testing laboratory in sealed containers to prevent contamination.
- B. Analysis: Analyze the topsoil sample to determine the amount of lime necessary and the appropriate fertilizer mix and quantity required for planting, seeding and sodding.

PART 3 EXECUTION

3.1 GRADES

- A. General: Existing and final contours shown depict finished grades after completion of landscaping work.
- B. Lawn Grades: Grade lawns to meet walks, curbs and adjoining surfaces after uniform settlement of surfaces. Correct water pockets or ridges which appear after surface settlement takes place on or before the end of the guarantee period.

3.2 EXCAVATION FOR PLANTING

- A. General: Obtain approval for all plant locations before excavation. Remove from the site all material that is surplus and unsuitable for backfill.
- B. Ground Cover and Grass Areas: Excavate for ground cover and grass areas to the required depths for grass to receive 6 inches of topsoil and for groundcover to receive 6 inches of planting soil.
- C. Plant Pits: Excavate plant pits with vertical sides and a circular outline.
 - 1. Dig tree and evergreen pits at least twice the diameter of the ball, and deep enough to permit an 8-inch layer of compacted planting soil beneath the ball.
 - 2. Dig shrub pits a minimum of twice the diameter of the ball and deep enough to allow 6 inches of compacted planting soil beneath the ball.
- D. Drain: Install french drains for all trees, ornamental trees, and evergreens planted on berms and other locations where the grade permits, from bottom of planting pit to the finished grade with a trench 9 inches wide, filled with a 6-inch thick layer of 3/4-inch washed gravel. Cover the gravel layer with a filter mat before backfilling the trench with soil.

3.3 SOIL CONDITIONING

- A. Disking: Before the application of topsoil, sodding or seeding, disk the area to be seeded, sodded or planted with groundcover to a depth of 6 inches. Continue the disking until the subsoil surface is sufficiently broken to provide a good bond between subsoil and topsoil. Spread 6 inches of planting soil over the disked area to a uniform depth and density.
- B. Ground Limestone: Incorporate ground limestone, if required by the results of the soil test report, into the upper 3 inches of planting soil. Uniformly spread fertilizer and mix into the soil to a depth of 1-1/2 inches or as recommended by the manufacturer.

3.4 SEEDING AND SODDING

- A. Seeding: Sow seed at the rate recommended by the seed producer. Evenly rake the surface after seeding with a fine-tooth rake. Mulch all newly seeded areas and cover with a minimum of 1/4-inch of straw or hay, approximately at the rate of 1 bale per 1,000 square feet, then thoroughly wet.
- B. Sodding: Lay sod in such a manner that the surface is smooth and even and all edges abut one another tightly. Water and roll sod so that a bond is produced between the prepared topsoil and the sod. On slopes greater than 3 to 1, stake installed sod with approved wooden sod stakes at a minimum rate of three stakes per square yard of sod.

3.5 PLANTING

- A. Layout: Outline locations for trees, shrubs, evergreens and bed and stake for approval. Obtain location approval prior to commencing planting operations.
- B. Setting Plants: Set plants plumb and straight with the crown at finished grade. Compact soil around the base of the ball, and fill the void 3/4 of the way up from the bottom. Water each plant immediately. After the water has completely drained, fill the plant pits to finished grade. Properly spread out roots of bare root plants and carefully work topsoil among them. Cut off any broken or frayed roots with a clean cut. Form a shallow basin, the size of the ball with a ridge of soil to facilitate watering. After that operation is completed, apply a second watering immediately. Finish all planting pits and beds within a period of 3 days following installation. Construct tree saucers, cultivate and outline planting pits with a neat edge, when necessary.
- C. Mulching: Immediately after planting operations are completed, cover all tree and shrub pits with mulch to a minimum depth of 2 inches. Limit mulch for trees to saucer diameter and, for shrubs, the entire shrub bed.
- D. Pruning: Prune each tree and evergreen with clean, sharp tools in accordance with standard horticultural practice to preserve the natural character of the plant. Remove suckers and all dead, broken or badly bruised branches.
- E. Wrapping: Wrap the tree trunks of all trees with burlap tree wrapping securely tied with suitable cord at top and bottom and at 2-foot intervals along the trunk. Overlap the wrapping 2 inches top and bottom and entirely cover the trunk from the ground to the height of the second branch, neat and snug.
- F. Guying: Guy trees as necessary to be plumb and straight through final inspection. Remove guy wires at completion of project.

- G. Watering: During planting, thoroughly saturate the soil around each plant with water and as many times later as seasonal conditions require until the end of the guarantee period.

3.6 EDGING

- A. General: Establish a neat edge where planting areas meet grass areas, with spade or edging tools, immediately after all planting and seeding is completed. Establish good flowing curves as shown. Maintain edging until the end of the guarantee period.

3.7 GRAVELED AREAS

- A. General: Lay a weed barrier in accordance with the manufacturer's recommendations and top with a 4-inch layer of gravel. Edge graveled areas with metal edging.

END OF SECTION

SECTION 32 92 00**LAWN RESTORATION****PART 1 GENERAL****1.1 DESCRIPTION OF REQUIREMENTS**

- A. The Work in this section consists of furnishing all labor, material and equipment to replace and maintain all areas disturbed during construction by establishing a stand of grass, within the areas called for by the furnishing and placing grass sod, or seeding, or seeding and mulching.

1.2 REFERENCE DOCUMENTS

- A. The materials used in this Work shall conform to the requirements of Florida Department of Transportation Standard Specifications for Road and Bridge Construction as follows:

- 1. Sod - Section 981-2
- 2. Fertilizer - Section 982
- 3. Water - Section 983

1.3 SUBMITTALS

- A. Submit certifications and identification labels for all sodding supplied as specified in Section 01 33 00.

PART 2 PRODUCTS**2.1 SODDING**

- A. Types: Sod shall be nursery-grown Improved Centipede, Bahia Grass, or Bermuda Grass at the Contractor's option, as established prior to construction. It shall be well matted with roots. When replacing sod in areas that are already sodded, the sod shall be the same type as the existing sod.
- B. Sod shall be provided as required in accordance with Florida Department of Transportation Specifications 575 and 981. The CONTRACTOR shall furnish sod equal to and similar in type as that disturbed. Placement and watering requirements shall be in accordance with FDOT Specifications Section 575.
- C. The sod shall be taken up in commercial-size rectangles, preferably 12-inch by 24-inch or larger, except where 6-inch strip sodding is called for.

- D. The sod shall be sufficiently thick to secure a dense stand of live grass. The sod shall be live, fresh and uninjured at the time of planting. It shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. It shall be reasonably free of weeds and other grasses. It shall be planted as soon as possible after being dug and shall be shaded and kept moist from the time it is dug until it is planted.
- E. Sod should be handled in a manner to prevent breaking or other damage. Sod shall not be handled by pitch forks or by dumping from trucks or other vehicles. Care shall be taken at all times to retain the native soil on the roots of each sod roll during stripping and handling. Sod that has been damaged by handling during delivery, storage or installation will be rejected.

2.2 FERTILIZER

- A. Chemical fertilizer shall be supplied in suitable bags with the net weight certification of the shipment. Fertilizer shall be 12-8-8 and comply with Section 982 of the FDOT Standard Specification for Road and Bridge Construction.
- B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water soluble potash, contained in the fertilizer.
- C. The chemical designation of the fertilizer shall be 12-8-8, with at least 50% of the nitrogen from a nonwater-soluble organic source. The nitrogen source may be a ureaformaldehyde source provided it is not derived from a waste product of the plastic industry.

2.3 EQUIPMENT

- A. The device for spreading fertilizer shall be capable of uniformly distributing the material at the specified rate.

2.4 NETTING

- A. Netting is fabricated of material similar to Geoscope Landscape Fabric or approved equal.

2.5 GRASSING

- A. The CONTRACTOR shall grass all unpaved areas disturbed during construction which do not require sod. All grassing shall be completed in conformance with FDOT Specifications Sections 570 and 981. The grassed areas shall be mulched and fertilized in accordance with FDOT Specifications.

- A. Grass seed shall be Argentine Bahia, 60 #/acre March 1 to November 1, 50 #/acre with 20 #/acre of Ryegrass seed November 1 to March 1. Provide seed components free of noxious weed seeds and having not less than the following purity and germination:

Component	Percent Purity	Percent Germination
Bahia Grass	95	80
Bermuda Grass	95	85
Annual Type Ryegrass	95	90

Tag each sack in accordance with the agricultural seed laws of the United States and the State of Florida. Show on each tag the producer's guarantee as to the year grown, the percentage of purity, the percentage of germination and the tests by which the percentages were determined. Provide seed for this project having a test date within six (6) months of the date of sowing.

- B. Mulch material shall be free of weeds and shall be oat straw or rye, Pangola, peanut, Coastal Bermuda, or Bahia grass hay.

2.6 TOPSOIL

- A. Topsoil stockpiled during excavation may be used. If additional topsoil is required to replace topsoil removed during construction, it shall be obtained off site at no additional cost to the OWNER. Topsoil shall be fertile, natural surface soil, capable of producing all trees, plants, and grassing specified herein.

2.7 MULCH

- A. Mulch shall be fresh cypress mulch. Rate of application specified herein shall correspond to depth not less than 1-inch or more than 3-inches according to texture and moisture content of mulch material.

2.8 WATER

- A. It is the CONTRACTOR'S responsibility to supply all water to the site, as required during seeding and sodding operations and through the maintenance period and until the Work is accepted. The CONTRACTOR shall make whatever arrangements may be necessary to ensure an adequate supply of water to meet the needs for his Work. He shall also furnish all necessary hose, equipment, attachments, and accessories for the adequate irrigation of lawns and planted areas as may be required. Water shall be suitable for irrigation and free from ingredients harmful to plant life.

PART 3 EXECUTION

3.1 SOD BED PREPARATION

- A. Areas to be sodded and/or seeded shall be cleared of all rough grass, weeds, and debris, and brought to an even grade.
- B. The soil shall then be thoroughly tilled to a minimum 8-inch depth.
- C. The areas shall then be brought to proper grade, free of sticks, stones, or other foreign matter over 1-inch in diameter or dimension. The surface shall conform to finish grade, less the thickness of sod, free of water-retaining depressions, the soil friable and of uniformly firm texture.

3.2 INSPECTION

- A. Verify that soil preparation and related preceding Work has been completed.
- B. Do not start Work until conditions are satisfactory.

3.3 SOD HANDLING AND INSTALLATION

- A. During delivery, prior to planting, and during the planting of sod areas, the sod panels shall at all times be protected from excessive drying and unnecessary exposure of the roots to the sun. All sod shall be stacked during construction and planting so as not to be damaged by sweating or excessive heat and moisture.
- B. After completion of soil conditioning as specified above, sod panels shall be laid tightly together so as to make a solid sodded lawn area. On mounds and other slopes, the long dimension of the sod shall be laid perpendicular to the slope. Immediately following sod laying the lawn areas shall be rolled with a lawn roller customarily used for such purposes, and then thoroughly watered.
- C. Sod shall be placed at all areas where sod existed prior to construction, on slopes of 3 horizontal on 1 vertical (3:1) or greater, in areas where erosion of soils will occur, and as directed by the ENGINEER. On areas where the sod may slide, due to height and slope, the ENGINEER may direct that the sod be pegged, with pegs driven through the sod blocks into firm earth, at suitable intervals.

3.4 USE OF SOD ON ROADWAY PROJECTS

- A. In accordance with the FDOT District One Standard Practice, permanent green grass shall be established at the completion of roadway construction and maintenance Work. The following shall apply to all restoration involving State or County roadways:

1. Sod in lieu of seed and mulch shall be used on all roadways with urban (raised curb) typical sections.
2. 1 inch water per week shall be required for a minimum of four (4) consecutive weeks for the purpose of establishing sod. This can be waived during construction, if and only if there is a minimum of 1 inch of rain per week on all sod on the project.
3. Sod shall be placed on slopes 1:3 or greater. Staked sod shall be placed on slopes 1:2 or greater.
4. On all curves with superelevation, sod shall be placed from the edge of pavement to the toe of slope on the downhill side(s) for the entire length of the superelevated roadway. On multi-lane divided rural facilities, sod shall be placed in the median and on the inside of the curve in the superelevated areas. This does not apply to reverse crowns.
5. For all projects with less than 10,000 square yards grass area, sod shall be used.
6. On tangent sections and on outside of curves, sod shall be used between the edge of pavement and a point 4 feet beyond the shoulder break point.
7. The entire width of sod should not exceed 15 feet from the edge of pavement.
8. Sod is to be used to eliminate narrow seed and mulch areas. Areas less than 6 feet in width shall be sodded.
9. Sod shall be placed around drainage structures as per the standard Indexes and extended to the edge of pavement.

3.5 SOD MAINTENANCE

- A. The sod shall produce a dense, well established growth. The CONTRACTOR shall be responsible for the repair and re-sodding of all eroded or bare spots until project acceptance. Repair to sodding shall be accomplished as in the original Work.
- B. Sufficient watering shall be done by the CONTRACTOR to maintain adequate moisture for optimum development of the seeded and sodded areas. Sodded areas shall receive no less than 1.5 inches of water per week for at least 2 weeks. Thereafter, the CONTRACTOR shall apply water for a minimum of sixty (60) days as needed until the sod takes root and starts to grow or until final acceptance, whichever is latest.

3.6 CLEANING

- A. Remove debris and excess materials from the project site.

END OF SECTION

SECTION 33 05 01**LEAKAGE TESTS****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Testing for any signs of leakage in pipelines and structures required to be watertight.
 - 1. Test all PVC and DI pipelines with water under the specified pressures.
 - 2. Refer to Section 33 11 02 for testing requirements for HDPE pipelines.
- B. Operation of Existing Facilities: Conduct all tests in a manner to minimize as much as possible any interference with the day-to-day operations of existing facilities or other CONTRACTORS working on the site.

1.2 PERFORMANCE REQUIREMENTS

- A. Written Notification of Testing: Provide written notice when the Work is ready for testing, and make the tests as soon thereafter as possible.
 - 1. Personnel for reading meters, gauges, or other measuring devices, will be furnished.
 - 2. Furnish all other labor, equipment, air, water and materials, including meters, gauges, smoke producers, blower, pumps, compressors, fuel, water, bulkheads and accessory equipment.

1.3 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

1.4 SUBMITTALS

- A. General: Provide all submittals, including the following, as specified in Division 1.
- B. Testing Report: Prior to placing the water system in service submit for review and approval a detailed bound report summarizing the leakage test data, describing

the test procedure and showing the calculations on which the leakage test data is based.

PART 2 EXECUTION

2.1 FLUSHING

- A. All new water pipelines installed shall be flushed to remove all particulates and foreign matter. Where flushing is not viable, Pigging shall be utilized.

1. Flushing

- a. Provide written notification to the OWNER and ENGINEER a week before flushing is to commence.
- b. After approval from OWNER, CONTRACTOR may connect an OWNER approved meter and backflow preventor to the existing 30-inch watermain connection in Daniels Parkway.
- c. Flushing shall be terminated at the direction of the ENGINEER. Dispose of the flushing water without causing a nuisance or property damage.
- d. Temporary flush out connections shall be installed on all dead-end water mains at the locations shown on the Drawings and in accordance with the Lee County Utilities Standard Detail W-02.

2. Pigging or Swabbing

- a. A cleaning pig or swab designed to remove debris, sediment, and corrosion products from the pipeline shall be used.
- b. The pig shall be propelled through the pipeline by the flow of water.

2.2 LEAKAGE TESTING

- A. All new water pipelines installed shall be tested for leakage. The test used will be Hydrostatic Testing for pressure lines. Tests to be performed will be indicated by the ENGINEER and witnessed by the ENGINEER and the Lee County Utilities representatives.

1. Hydrostatic Testing

Perform hydrostatic testing of the system as set forth in the following, and conduct said tests in the presence of representatives from the COUNTY and other authorized agencies, with 48 hours advance notice provided.

Piping and appurtenances to be tested shall be within sections between valves unless alternate methods have received prior approval from the COUNTY. Testing shall not proceed until concrete thrust blocks are in place and cured, or other restraining devices installed. All piping shall be thoroughly cleaned and flushed prior to testing to clear the lines of all foreign matter. While the piping is being filled with water, care shall be exercised to permit the escape of air from extremities of the test section, with additional release cocks provided if required.

Hydrostatic testing shall be performed with a sustained pressure for a minimum of two (2) hours at 150 psi pressure or 2-1/2 times working pressure, whichever is higher, unless otherwise approved by Lee County Utilities, for a period of not less than two (2) hours. Testing shall be in accordance with the applicable provisions as set forth in the most recent edition of AWWA Standard C600. The allowable rate of leakage shall be less than the number of gallons per hour determined by the following formula:

$$L = \frac{SD (P)^{1/2}}{133,200}$$

Where,

L = Allowable leakage in gallons per hour;

S = Length of pipe tested in feet;

D = Nominal diameter of the pipe in inches;

P = Average test pressure maintained during the leakage
test in pounds per square inch

$$\text{For 150 psi, } L = (9.195 \times 10^{-5}) SD$$

The testing procedure shall include the continued application of the specified pressure to the test system, for the one hour period, by way of a pump taking supply from a container suitable for measuring water loss. The amount of loss shall be determined by measuring the volume displaced from said container.

Should the test fail, necessary repairs shall be accomplished by the CONTRACTOR and the test repeated until results are within the established limits. The CONTRACTOR shall furnish the necessary labor,

water, pumps, and gauges at specified location(s) and all other items required to conduct the required testing and perform necessary repairs.

END OF SECTION

SECTION 33 05 03**LAYING AND JOINTING BURIED PIPELINES****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Installation of all underground pipelines. Provide pipeline materials, coatings and linings as specified and pipe of the types, sizes and classes shown or specified.
1. Use proper and suitable tools and appliances for the safe and convenient cutting, handling, and laying of the pipe and fittings.
 2. Use suitable fittings where shown and at connections or where grade or alignment changes require offsets greater than those recommended and approved.
 3. Lay all underground pipelines not supported on piles or concrete cradle in select fill bedding material.
 4. Close off all lines with bulkheads when pipe laying is not in progress.
- B. Related Work Specified in Other Sections Includes:
1. Section 31 23 16 - Excavation - Earth and Rock
 2. Section 31 23 23 - Backfilling
 3. Section 33 05 01 - Leakage Tests
 4. Section 33 05 23 - Jack and Bore Installation
 5. Section 33 11 02 - High Density Polyethylene (HDPE) Pipe and Fittings
 6. Section 33 11 03 - Ductile Iron Pipe and Fittings
 7. Section 33 11 12 - Disinfection

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
1. ASTM D2774 - Practice for Underground Installation of Thermoplastic Pressure Piping
 2. AWWA C600 - Installation of Ductile-Iron Water Mains and Their Appurtenances

3. ASTM A307 - Specification for Carbon Steel Bolts and Studs, 60000 psi Tensile
4. ASME B16.1 - Cast Iron Pipe Flanges and Flanged Fittings, C25, 125, 250, 800
5. ASME B16.21 - Nonmetallic Flat Gaskets for Pipe Flanges
6. AWWA C111/A21.11 - Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings
7. AWWA C115/A21.15 - Flanged Ductile-Iron Pipe With Threaded Flanges
8. ASTM E165 - Practice for Liquid Penetrant Examination
9. ASTM E709 - Practice for Magnetic Particle Examination

1.3 DELIVERY, STORAGE AND HANDLING

- A. General: Deliver, store and handle all products and materials as specified in Division 1 and as follows:
- B. Transportation and Delivery: Take every precaution to prevent injury to the pipe during transportation and delivery to the site.
- C. Loading and Unloading: Take extreme care in loading and unloading the pipe and fittings.
 1. Work slowly with skids or suitable power equipment, and keep pipe under perfect control at all times.
 2. Under no condition is the pipe to be dropped, bumped, dragged, pushed, or moved in any way that will cause damage to the pipe or coating.
- D. Sling: When handling the pipe with a crane, use a suitable sling around the pipe.
 1. Under no condition pass the sling through the pipe.
 2. Use a nylon canvas type sling or other material designed to prevent damage to the pipe and coating.
 3. When handling reinforced concrete pipe or uncoated steel or ductile iron pipe, steel cables, chain or like slings are acceptable.

- E. Damaged Piping: If in the process of transportation, handling, or laying, any pipe or fitting is damaged, replace or repair such pipe or pipes.
- F. Blocking and Stakes: Provide suitable blocking and stakes installed to prevent pipe from rolling.
 - 1. Obtain approval for the type of blocking and stakes, and the method of installation.
- G. Storage for Gaskets: Store gaskets for pipe joints in a cool place and protect gaskets from light, sunlight, heat, oil, or grease until installed.
 - 1. Do not use any gaskets showing signs of checking, weathering or other deterioration.
 - 2. Do not use gasket material stored in excess of six months without approval.

1.4 FIELD CONDITIONS

- A. Repair of Sanitary Sewers and Services: Rebed, in compacted select fill material, sanitary sewers which cross over the new pipe or which cross under the new pipe with less than 12 inches clear vertical separation. Compact the bedding to densities required for new pipeline construction and extend bedding below the sewer to undisturbed earth. Reconstruct sewers damaged by pipeline construction.
 - 1. Furnish and install all materials and do all Work necessary for the reconstruction or repairs of sanitary sewers and services.
 - 2. Provide pipe for reconstruction of sanitary sewers and services meeting the appropriate specification requirements.
 - 3. Provide pipe of the same size as the existing sewer or when the same size is not available, use the next larger size of pipe. Obtain approval of joints made between new pipe and existing pipe.

PART 2 PRODUCTS

- A. The materials allowed for buried sewer pipes are PVC, HDPE or fiberglass. Use of ductile iron pipe is not allowed for sewer construction without specific approval of Lee County Utilities.

PART 3 EXECUTION

3.1 PREPARATION

- A. Dry Trench Bottoms: Lay pipe only in dry trenches having a stable bottom.
1. Where groundwater is encountered, make every effort to obtain a dry trench bottom.
 2. If a dry trench bottom has not been obtained due to improper or insufficient use of all known methods of trench dewatering, then the order to excavate below grade and place sufficient select fill material, crushed stone, or 2500 psi concrete over the trench bottom may be given.
 3. If all efforts fail to obtain a stable dry trench bottom and it is determined that the trench bottom is unsuitable for pipe foundation, obtain an order, in writing, for the kind of stabilization to be constructed.
 4. Perform trench excavation and backfill in accordance with Sections 31 23 16 and 31 23 23.

3.2 INSTALLATION

- A. General: Install all piping in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1. Where pipe deflections are used, do not exceed 80% of the maximum deflection limits shown in AWWA C600.
1. Arrange miscellaneous pipelines, which are shown in diagram form on the Plans, clear of other pipelines and equipment.
- B. Code Requirements: Provide pipeline installations complying with AWWA C600 for iron pipe, AWWA Manual M11 for steel pipe, ASTM D2774 for thermoplastic pressure piping, and as modified or supplemented by the Specifications.
- C. Pipe Laying - General:
1. For pipelines intended for gravity flow, begin pipeline laying at the low end of a run and proceed upgrade.
 2. Generally, lay all pipe with bells pointing ahead.
 3. Carefully place each pipe and check for alignment and grade.
 4. Make adjustments to bring pipe to line and grade by scraping away or filling in select fill material under the body of the pipe.

5. Wedging or blocking up the pipe barrel is not permitted.
6. Bring the faces of the spigot ends and the bells of pipes into fair contact and firmly and completely shove the pipe home.
7. As the Work progresses, clean the interior of pipelines of all dirt and superfluous materials of every description.
8. Keep all lines absolutely clean during construction.
9. Lay pipelines accurately to line and grade.
10. During suspension of Work for any reason at any time, a suitable stopper shall be placed in the end of the pipe last laid to prevent mud or other material from entering the pipe.

D. Pipe Laying - Trenches:

1. Lay all pipelines in trench excavations on select fill bedding, concrete cradle or other foundations as shown, specified or ordered in writing.
2. Properly secure the pipe against movement and make the pipe joints in the excavation as required.
3. Carefully grade and compact pipe bedding.
4. Bell Holes:
 - a. Cut out bell holes for each joint as required to permit the joint to be properly made and allow the barrel of the pipe to have full bearing throughout its length.
 - b. Thoroughly tamp bell holes full of select fill material following the making of each joint.

E. Other Foundations: Install pipelines laid on other types of foundations as specified for such other foundations or as ordered in writing.

F. Ductile Iron Pipe Mechanical Joints:

1. Assembly: In making up mechanical joints, center the spigot in the bell.
 - a. Thoroughly brush the surfaces with which the rubber gasket comes in contact with a wire brush just prior to assembly of the joint.

- b. Brush lubricant over the gasket just prior to installation.
 - c. Place the gasket and gland in position, bolts inserted, and the nuts tightened finger-tight.
 - d. Tighten the nuts with a torque wrench so that the gland is brought up toward the pipe evenly. Torque wrenches shall be set as specified in AWWA C111. Spanner type wrenches not longer than specified in AWWA C111 may be used with the permission of Lee County Utilities.
 - e. Prime all bolts by dipping with a bituminous coating, except the threads. Coat threads immediately prior to installation of nuts.
2. Torques: Apply the following range of bolt torques:

<u>Size Inches</u>	<u>Range of Torque - ft. lbs</u>
5/8	45 - 60
3/4	75 - 90
1	85 - 100
1-1/4	105 - 120

3. Remaking of Joints: If effective sealing is not obtained at the maximum torque listed above, disassemble and reassemble the joint after thorough cleaning.

G. Ductile Iron Pipe Rubber Gasket Joints:

1. Assembly: In making up the rubber gasket joint, brush the gasket seat in the socket thoroughly with a wire brush and wipe the gasket with a cloth.
 - a. Place the gasket in the socket with the large round end entering first so that the groove fits over the bead in the seat.
 - b. Apply a thin film of lubricant to the inside surface of the gasket that will come in contact with the entering pipe.
 - c. Brush the plain end of the pipe to be entered thoroughly with a wire brush and place it in alignment with the bell of the pipe to which it is to be joined.

- d. Exert sufficient force on the entering pipe so that its plain end is moved past the gasket until it makes contact with the base of the socket to make the joint.
 2. Positioning: Before proceeding with backfilling, feel completely around the joint using a feeler gauge to confirm that the gasket is in its proper position.
 - a. If the gasket can be felt out of position, withdraw the pipe and examine the gasket for cuts or breaks.
 - b. If the gasket has been damaged, replace it with a new one before re-installing the pipe.
 3. Optional Mechanical Joints: Use mechanical joint fittings that meet the requirements of Section 33 11 03 with the rubber gasket joint pipe when specified or when rubber gasket fittings are not available.
- H. Temporary Bulkheads: Provide temporary bulkheads at the ends of sections where adjoining pipelines have not been completed, and in connections built into pipelines where adjoining pipelines or structures have not been completed and are not ready to be connected.
 1. Remove bulkheads encountered in connecting sewers or structures included in this Contract, or in pipelines or structures previously built, when they are no longer needed or when ordered.
- I. Sleeve Type Couplings: For sleeve type couplings, equally tighten diametrically opposite bolts on the connection so that the gaskets will be brought up evenly all around the pipe.
 1. Torque Wrenches: Do the final tightening with torque wrenches set for the torque recommended by the coupling manufacturer.
- J. Concrete Encasement: Concrete encasement shall be constructed in accordance with Lee County standard details when:
 1. A waterline crosses at a depth which provides less than 18 inches clear distance from sewer lines. Encasement shall extend a minimum 10 feet on each side of the point of crossing. Encase the sewer main unless specifically approved by Lee County Utilities.
 2. A waterline running parallel to a sewer line provides less than 10 feet separation. Encase the sewer main unless specifically approved by Lee County Utilities.

3. The ENGINEER has ordered the line encased.

The points of beginning and ending of pipe encasement shall be not more than 6 inches from a pipe joint to protect the pipe from cracking due to uneven settlement of its foundation or the effects of superimposed live loads.

- K. Valve Box Setting: Install valve boxes vertical and concentric with the valve stem.

1. Satisfactorily reset any valve box which is moved from its original position, preventing the operation of the extension valve stem.
2. Replace any extension valve stem which has been damaged so that it can be operated.

- L. Identification:

1. Identification Tape: For all types of pipe to be installed, 3-inch detectable marking tape, of appropriate color, shall be placed along the entire pipe length. In all cases, marking tape shall be installed 12 inches to 18 inches below the finished grade during backfill operations. All PVC pipe, PVC fittings, and identification tape shall be color-coded per standards outlined in the Utility Location and Coordinating Council's Uniform Color Code as specified in Section 4 of the Lee County Utilities Operations Manual.
2. Locating Wire: A locating tracing wire shall also be installed with PVC, HDPE and fiberglass pipes and shall be a continuous No. 12 insulated copper tracing wire laid in the trench on top of the utility pipe and attached to the pipe at 10-foot intervals. This continuous tracing wire shall run along the entire pipe and be stubbed out at valves, pressure clean-outs and air release valves. Locating wire for HDPE shall be installed in accordance with Section 33 05 24.

3.3 FIELD QUALITY CONTROL

- A. Testing: Test pipelines in accordance with Section 33 05 01.
1. Test valves in place, as far as practicable, and correct any defects in valves or connections.
- B. Inspection: Clean, inspect, and examine each piece of pipe and each fitting and special for defects before it is installed.
1. Cut away any lumps or projections on the face of the spigot end or the shoulder.

2. Do not use any cracked, broken, or defective pieces in the Work.
3. If any defective piece should be discovered after having been installed, remove and replace this piece with a sound piece in a satisfactory manner at no increase in Contract Amount.

3.4 CLEANING

- A. General: Thoroughly clean all pipe before it is laid and keep it clean until it is accepted in the completed Work.
- B. Removal of Materials: Exercise special care to avoid leaving bits of wood, dirt, and other foreign particles in the pipe. If any particles are discovered before the final acceptance of the Work, remove and clean the pipe.

3.5 DISINFECTION

- A. General: Disinfect all pipelines that are to carry potable water in accordance with Section 33 11 12.

END OF SECTION

SECTION 33 05 23**JACK AND BORE INSTALLATION****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Pipeline installation in casing pipe beneath highways, railroads and other structures may be installed by jacking and augering or by jacking and mining.
- B. Related Work Specified in Other Sections Includes:
 - 1. Section 31 40 00 - Shoring, Sheet piling and Bracing
 - 2. Section 31 23 16 - Excavation - Earth and Rock
 - 3. Section 03 30 53 - Concrete for Non-Plant Work
 - 4. Section 33 11 03 - Ductile Iron Pipe and Fittings

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. FDOT 556 - Jack and Bore
 - 2. ASTM A139 - Specification for Electric-Fusion (Arc) -Welded Steel Pipe (NPS in 4 in. and Over)
 - 3. OSHA PL-91-596 - Occupational Safety Health Act of 1970 Public Law 91-596

1.3 SUBMITTALS

- A. Provide all submittals, including the following, as specified in Division 1.
 - 1. Working drawings of the jacking pipe, jacking frame, jacking head, reaction blocks, sheet piling, including design calculations and the complete jacking installation.
 - 2. It shall be the responsibility of the CONTRACTOR to submit the necessary permit documents and data to the appropriate authority and receive approval thereof.
 - 3. Per FDOT Section 556, Jack and Bore, submit detailed remediation plans showing how damage to any roadway facility will be remedied prior to any jack and boring activities. These details will become part of the As-Built

Plans. The remediation plans shall be approved by the FDOT and ENGINEER before any work proceeds.

1.4 DELIVERY, STORAGE AND HANDLING

- A. Deliver, store and handle all products and materials as specified in Division 1 (and as follows.

PART 2 PRODUCTS

2.1 MATERIALS

- A. All materials shall conform to FDOT Section 556.
- B. Carrier Pipe: Carrier pipe shall conform to the specifications in Section 33 11 03.
- C. Casing Pipe: New prime steel pipe, meeting the requirements of ASTM A139, Grade B. The minimum casing pipe size and wall thickness shall be as shown in the drawings.
- D. Fill Material: Use fill material consisting of 1-1/4 pounds of Bentonite per gallon of water with a minimum pH of 6.0 during jacking to fill any voids between pipe and the earth. Do not use other chemicals or polymer surfactant without written consent of the ENGINEER. Certify in writing to the ENGINEER that any chemicals added are environmentally safe and not harmful or corrosive to the facility. CONTRACTOR shall furnish water used for fill material.

PART 3 EXECUTION

3.1 INSTALLATION

- A. All installation methods shall conform to FDOT Section 556.
- B. Casing Pipe:
 - 1. Install all casing pipe in accordance with the manufacturer's recommendations and approved shop drawings and as specified in Division 1.
 - 2. The provisions of this section shall represent the minimum standards for the installation of casing pipe for water main pipeline.
 - 3. Water mains to be placed under all Lee County Department of Transportation & Engineering roadways shall be installed in a casing. The

steel casing procedures shall conform to the requirements of Lee County DOT as outlined in "Administrative Code AC-11-12" and any supplements thereto. All Work and materials shall be subject to inspection by FDOT. The Department's property and surface conditions shall be restored to the original condition in keeping with the Department's specifications and standards.

4. In general for areas identified in the Drawings for Jack and Bore installation, the underground water mains crossing existing Florida State Highways shall be installed under these traffic ways within steel casing pipe. The remediation plans shall be submitted and approved by the FDOT and ENGINEER before any work proceeds.
5. It shall be the sole responsibility of the CONTRACTOR to submit the necessary permit documents and data to the appropriate authority and receive approval thereof. The CONTRACTOR shall maintain traffic on the roadway and shall keep all workmen and equipment clear of the travel way during the Work. All safety regulations of the Department and any permit(s) shall be complied with.
6. Casing pipes crossing under County roadways shall be located at suitable approved alignments in order to eliminate possible conflict with existing or future utilities and structures with a minimum 36 inches depth of cover between the top of the casing pipe and the surface of the roadway.
7. For casing pipe crossing under roadways, railroads, or other installations not within the jurisdiction of Lee County, the CONTRACTOR shall comply with the regulations of said authority in regard to design, specifications and construction. State Highway casing installations shall be as specified in the FDOT, "Utility Accommodation Guide", and for railroads, the American Railway Engineering Association, Part 5, Section 5.2, "Specifications for Pipelines Conveying Nonflammable Substances", shall be applicable. However, in no case shall the minimum casing pipe diameter and wall thickness, for a specific carrier pipe size, be less than that specified above.
8. Any boring and jacking operations shall be done simultaneously, with continuous installation until the casing pipe is in final position. Correct line and grade shall be carefully maintained. Add-on sections of casing pipe shall be full-ring welded to the preceding length, developing water-tight total pipe strength joints. The casing installation shall produce no upheaval, settlement, cracking, movement or distortion of the existing roadbed or other facilities. Following placement of the carrier pipe within the steel casing, masonry plugs are to be installed at each open end. Said plugs shall be suitable for restraining the external earth load, while allowing internal drainage.

9. Casing pipe holes shall be mechanically bored through the soil by a cutting head on a continuous auger mounted inside the pipe. The auger shall extend a minimum distance beyond the end of the casing pipe to preclude formation of voids outside the pipe shell.
10. The casing pipe shall be adequately protected to prevent crushing or other damage under jacking pressures. Backstops shall be provided for adequately distributing the jack thrust without causing deformation of the soil or other damage. Should the casing pipe be damaged, such damaged portion, if not in the hole, shall be replaced; however, if inserted, the encasement pipe shall be abandoned in place, suitably plugged, and an alternate installation made, as directed by the OWNER.
11. Required boring or jacking pits or shafts shall be excavated and maintained to the minimum dimension. Said excavation shall be adequately barricaded, sheeted, braced and dewatered as required.

C. Casing Spacers:

1. Stainless steel carriers with PE Skids being on center and restrained shall be the preferred method for installing the carrier pipe. Skids shall be installed 7 feet or less, on center. After the carrier pipe has been tested for leakage, the casing shall have the ends blocked with end seals.
2. HDPE casing spacers (see list of approved materials) can be used for all size PVC pipes and on DIP pipe with diameters 12 inches or less. The spacers shall be of a projection type with a minimum number of projections around the circumference totaling the number of carrier pipe diameter inches. Casing spacers shall be spaced per manufacturer's recommendation with double spacers on each end of the casing. The casing spacers shall provide a minimum safety factor of 2 to 1 to support the service load.

D. Augering: Conduct augering with the proper equipment and procedure such that the carrier pipe and the casing pipe can be installed to the grades specified without disturbing the adjacent earth. Submit all equipment and procedures for prior approval.

E. Hand Mining: Conduct hand mining only in casings that are sufficiently large enough to permit such operation. Provide adequate fresh air supply within the casing pipe and conduct all operations in accordance with the requirements of the U.S. Department of Labor Safety and Health Regulations for Construction promulgated under the Occupational Safety and Health Act 7 1970 (PL-91-596).

- F. Jacking Pit: Make the jacking pit of adequate length to provide room for the jacking frame, the jacking head, the reaction blocks, the jacks, auger rig, and the jacking pipe. Make the pit sufficiently wide to allow ample working space on each side of the jacking frame. Make the depth of the pit such that the invert of the pipe, when placed on the guide frame, is at the elevation desired for the completed line. Provide excavation in conformance with Section 31 23 16.
- G. Sheet piling: Sheet the jacking pit tightly and keep it dry at all times. Conform sheet piling to Section 31 40 00. Have complete design calculation for sheet piling the jacking pit sealed and submitted by a Professional ENGINEER registered in the State of Florida.
- H. Jacking Frame: Use a jacking frame that applies a uniform pressure over the entire pipe wall area of the pipe to be jacked.
- I. Reaction Blocks: Use reaction blocks designed to carry the thrust of the jacks to the soil without excessive soil deflection and in such a manner as to avoid any disturbance of adjacent structures or utilities.
- J. Operation: Use hydraulic jacks in the jacking operation. Use extreme care to hold the pipe to exact line and grade. Advance the excavation at the heading manually or with an auger. Do not allow the advance to exceed one foot ahead of the casing pipe. Make every effort to avoid loss of earth outside the casing.
- K. Safety Railing: Provide a safety railing all around the top of the pit at all times.
- L. Property and surface conditions shall be restored to the original condition in accordance with Lee County DOT specifications and standards.
- M. Carrier Pipe:
 - 1. Water Mains installed within casing pipes shall utilize joint restraining for the entire pipe length inside the casing. Special supporting of the carrier pipe within the casing shall be required with a design approved by Lee County Utilities and FDOT. Ensure size of restrained pipes fit within carrier pipe with spacers.

END OF SECTION

SECTION 33 05 24
DIRECTIONAL DRILLING**PART 1 GENERAL****1.1 SUMMARY**

- A. Provide all necessary tools, materials and equipment to successfully complete the installation of directionally, drilled piping as specified herein and shown on the drawings. The CONTRACTOR shall be responsible for the final constructed product, and for furnishing the qualified labor and superintendence necessary for this method of construction.
- B. Furnish all items necessary to perform the horizontal directional drilling operation and construct the pipe to the lines and grade shown on the drawings.
- C. Boring must use techniques of creating or directing a borehole along a predetermined path to a specified target location. This must involve use of mechanical and hydraulic deviation equipment to change the boring course and must use instrumentation to monitor the location and orientation of the boring head assembly along a predetermined course.
- D. Drilling must be accomplished with fluid-assist mechanical cutting. Boring fluids shall be a mixture of bentonite and water or polymers and additives. Bentonite sealants and water will be used to lubricate and seal the mini-tunnel. It is mandatory that minimum pressures and flow rates be used during drilling operation as not to fracture the sub-grade material around and or above the bore.
- E. The mobile drilling system shall utilize small diameter fluid jets to fracture and mechanical cutters to cut and excavate the soil as the head advances forward.
- F. Steering shall be accomplished by the installation of an offset section of drill stem that causes the cutterhead to turn eccentrically about its centerline when it is rotating. When steering adjustments are required, the cutterhead offset section is rotated toward the desired direction of travel and the drill stem is advanced forward without rotation.
- G. The mobile drilling system must be capable of being launched from the surface at an inclined angle and drilling a 2-inch to 3-inch diameter pilot hole. The pilot hole will then be enlarged with reamers as required.

1.2 REFERENCE STANDARDS

- A. Florida Department of Transportation (FDOT) Design Standards Specification Section 555, Directional Bore.
- B. Lee County Design Manual.
- C. American Association of State Highway and Transportation Officials (AASHTO).
- D. Occupational Safety and Health Administration (OSHA).

1.3 DEFINITIONS

- A. CONTRACTOR's Construction Drawings shall be defined as drawings by which the CONTRACTOR proposes to construct, operate, build, etc., the referenced item. The submission of these drawings shall be required for the sole purpose of providing the sufficient details to verify that the CONTRACTOR's work in progress is in accordance with the intent of the design.

1.4 SUBMITTALS

- A. The ENGINEER will base the review of submitted details and data on the requirements of the completed work, safety of the work in regards to the public, potential for damage to public or private utilities and other existing structures and facilities, and the potential for unnecessary delay in the execution of the work. Such review shall not be construed to relieve the CONTRACTOR in any way of his responsibilities under the contract. CONTRACTOR shall not commence work on any items requiring CONTRACTOR's construction drawings or other submittals until the drawings and submittals are reviewed and accepted by the ENGINEER.
- B. The CONTRACTOR shall:
 - 1. Submit for review complete construction drawings and/or complete written description identifying details of the proposed method of construction and the sequence of operations to be performed during construction, as required by the method of tunnel excavation approved. The drawings and descriptions shall be sufficiently detailed to demonstrate to the ENGINEER whether the proposed materials and procedures will meet the requirements of this specification. CONTRACTOR shall submit arrangement drawings and technical specifications of the machine and trailing equipment (including any modifications), three-year experience record with this type of machine and a copy of the manufacturer's operation manual for the machine.
 - 2. CONTRACTOR's construction drawings shall be submitted on the following items.

- a. Complete details of the equipment, methods and procedures to be used, including but not limited to primary lining installation, timing of installation in relation to the excavation plan and sequence, bulkheads, etc.
 - b. Grouting techniques, including equipment, pumping procedures, pressure grout types, mixtures and plug systems.
 - c. Method of controlling line and grade of excavation.
 - d. Details of muck removal, including equipment type, number, and disposal location.
 - e. Proposed contingency plans for critical phases and areas of directional drilling.
 - f. Disposal of Spoils and Drilling Fluid Plan – Provide a plan for disposal of waste materials resulting from the pipeline construction, including drilling fluids, cuttings, waste oil, fuel, discharge water, etc. Identify the disposal site(s) and submit a letter indicating willingness and legal authority to accept the described and anticipated waste product.
 - g. Pullback Calculations – Make sure the drill rig is capable of pulling the sized reamer and pipe.
 - (1) Submit calculations for pullback loads for the conditions and operating practices anticipated.
 - (2) Consider buckling and combination loads in addition to tensile pullback loads.
 - (3) Identify parameters used and state assumptions made in calculations.
 - (4) Provide calculations that are signed and sealed by a licensed Professional Engineer in the State of Florida.
- C. Quality Control Methods. At least 10 days prior to the start of directional drilling, CONTRACTOR shall submit a description of his quality control methods he proposes to use in his operations to the ENGINEER. The submittal shall describe:
- 1. Procedures for controlling and checking line and grade.
 - 2. Field forms for establishing and checking line and grade.
- D. Safety. Procedures including, but not limited to, monitoring for gases encountered shall be submitted.
- E. Hazardous chemical list as well as all MSDS and technical data sheets.

1.5 DESIGN CRITERIA

A. Compatibility of Methods.

1. The methods of excavation, lining, and groundwater control shall be compatible.

1.6 JOB CONDITIONS

A. Safety Requirements

1. Perform work in a manner to maximize safety and reduce exposure of men and equipment to hazardous and potentially hazardous conditions, in accordance with applicable safety standards.
2. Whenever there is an emergency or stoppage of work which is likely to endanger the excavation or adjacent structures, operate a full work force for 24 hours a day, including weekends and holidays, without intermission until the emergency or hazardous conditions no longer jeopardize the stability and safety of the work.

B. Air Quality.

1. Conduct directional drilling operations by methods and with equipment, which will positively control dust, fumes, vapors, gases or other atmospheric impurities in accordance with applicable safety requirements.

1.7 PERMITS

- A. Obtain any and all other permits required for prosecution of the work.

PART 2 PRODUCTS

2.1 GENERAL

- A. Refer to Section 33 11 02 for HDPE pipe material.

PART 3 EXECUTION

3.1 GENERAL

- A. The CONTRACTOR shall be responsible for his means and methods of directional drilling construction and shall ensure the safety of the work, the CONTRACTOR's employees, the public, and adjacent property, whether public or private.

- B. Anticipate that portions of the drilled excavation will be below the groundwater table.
- C. Comply with all local, state and federal laws, rules and regulations at all times to prevent pollution of the air, ground and water.

3.2 EQUIPMENT

- A. Diesel, electrical, or air-powered equipment will be acceptable, subject to applicable federal and state regulations.
- B. Any method or equipment that the CONTRACTOR can demonstrate will produce the specified results will be considered.
- C. Employ equipment that will be capable of handling the various anticipated ground conditions. In addition, the equipment shall:
 - 1. Be capable of minimizing loss of ground ahead of and around the machine and providing satisfactory support of the excavated face at all times.
 - 2. Provide a system to indicate whether the amount of earth material removed is equivalent to that displaced by the advance of the machine such that the advance rate may be controlled accordingly.
- D. Provide adequate secondary containment for any and all portable storage tanks.

3.3 DIRECTIONAL DRILLING DATA

- A. Daily logs of construction events and observations shall be submitted on at least the following:
 - 1. Location and elevation of significant soil strata boundaries and brief soil descriptions.
 - 2. Jacking pressures and torsional forces, if applicable.

3.4 CONTROL OF THE TUNNEL LINE AND GRADE

- A. Construction Control.
 - 1. Establish and be fully responsible for the accuracy of his own control for the construction of the entire project, including structures, tunnel line and grade.
 - 2. Establish control points sufficiently far from the tunnel operation not to be affected by construction operations.

3. Maintain daily records of alignment and grade and shall submit three copies of these records to the ENGINEER. However, the CONTRACTOR remains fully responsible for the accuracy of his work and the correction of it, as required.
4. Check control for the bore alignment against an above ground undisturbed reference at least once each hour and once for each 50 feet of tunnel constructed, or more often as needed or directed by the ENGINEER.

3.5 DISPOSAL OF EXCESS MATERIAL

- A. Where such effort is necessary, cost for groundwater control during the course of the tunnel work shall be included in the unit contract price for the work.
- B. Dewatering required during the course of the project to lower water table, to remove standing water, surface drainage seepage, or to protect ongoing work against rising waters or floods shall be considered incidental to the work being performed.

END OF SECTION

SECTION 33 11 02**HIGH DENSITY POLYETHYLENE PIPE AND FITTINGS****PART 1 GENERAL****1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals required to install High Density Polyethylene (HDPE) pressure pipe, fittings, and appurtenances as shown on the Drawings and specified in the Contract Documents.
- B. High Density Polyethylene (HDPE) – Lee County Utilities has the option of approving the use of HDPE for water main crossings of roadways, ditches, canals, and environmentally sensitive lands. HDPE water mains shall have the same equivalent internal diameter and equivalent or greater pressure class rating as the corresponding DI or PVC pipe, unless otherwise approved by Lee County Utilities. For all roadway crossings, refer to the design manual for casing requirements. The Department of Transportation having jurisdiction of said road and right-of-way must grant specific approval.

1.2 REFERENCED STANDARDS

- A. All standard specifications, i.e., Federal, ANSI, ASTM, etc., made a portion of these Specifications by reference, shall be the latest edition and revision thereof.
- B. NSF International: NSF 61, NSF 372, NSF 600.

1.3 QUALIFICATIONS

- A. All HDPE pipe, fittings, and appurtenances shall be furnished by a single manufacturer who is fully experienced, reputable and qualified in the manufacture of the items to be furnished.

1.4 SUBMITTALS

- A. Submit to the ENGINEER, a list of materials to be furnished, the names of the suppliers, and the appropriate shop drawings for all HDPE pipe and fittings.
- B. Submit the pipe manufacturer's certification of compliance with the applicable sections of the Specifications.

- C. Submit shop drawings showing installation method and the proposed method and specialized equipment to be used.

1.5 INSPECTIONS AND TESTS

- A. All Work shall be inspected by an Authorized Representative of the OWNER who shall have the authority to halt construction if, in his opinion, these specifications or standard construction practices are not being followed. Whenever any portion of these specifications is violated, the ENGINEER or his authorized representative, shall, by written notice, order further construction to cease until all deficiencies are corrected.

1.6 WARRANTY AND ACCEPTANCE

- A. Warrant all Work to be free from defects in workmanship and materials for a period of one year from the date of completion of all construction. If Work meets these specifications, a letter of acceptance, subject to the one (1) year warranty period, shall be given at the time of completion. A final acceptance letter shall be given upon final inspection at the end of the one (1) year warranty period, provided the Work still complies with these specifications. In the event deficiencies are discovered during the warranty period, they shall be corrected by the CONTRACTOR without additional charge to the OWNER before final acceptance. During the warranty period, the ENGINEER shall determine if warranty repairs or replacement Work shall be performed by the CONTRACTOR. The decision of the ENGINEER shall be binding upon the CONTRACTOR.

PART 2 PRODUCTS

2.1 POLYETHYLENE PIPE AND FITTINGS

- A. Polyethylene pressure pipe shall be manufactured from PE3608 polyethylene and shall meet AWWA C906 standards; and meeting Type II, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting Manufacturer in PPI TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F per ASTM D2837. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.
- B. When specified by the ENGINEER on the construction drawings, as an alternate to PVC, HDPE, Ductile iron pipe sized (DIPS) piping can be used for buried applications. Iron pipe sized (IPS) HDPE piping can be used for above-ground applications. HDPE (IPS) SDR-11 Hydrostatic Design Basis (HDB) piping shall be

used for the riser pipes from the pump discharge and manifold as shown on the drawings.

- C. Where HDPE pipe is joined to HDPE pipe, it shall be by thermal butt fusion. Thermal fusion shall be accomplished in accordance with the pipe manufacturer and fusion equipment supplier specifications. The CONTRACTOR installing thermal butt fused HDPE pipe shall have a minimum of five (5) years experience performing this type of Work.
- D. Qualification of Manufacturer: The Manufacturer shall have manufacturing and quality control facilities capable of producing and assuring the quality of the pipe and fittings required by these specifications. The Manufacturer's production facilities shall be open for inspection by the OWNER or his authorized representative. Qualified manufacturers shall be approved by the OWNER.
- E. Approved Manufacturer: Manufacturers that are qualified and approved are listed in the LCU Approved Materials List.
- F. Materials: Materials used for the manufacture of polyethylene pipe and fittings shall be PE3608 high density polyethylene meeting cell classification 345434C per ASTM D3350; and shall be listed in the name of the pipe and fitting manufacturer in PPI (Plastics Pipe Institute) TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.
- G. Interchangeability of Pipe and Fittings: Polyethylene pipe and fittings shall be produced by the same Approved Manufacturer. Products made by Subcontractor's or Manufacturer's distributor are not acceptable. Pipe and fittings from different Approved Manufacturers shall not be interchanged.
- H. Polyethylene Pipe: Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter or ASTM D3035, Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, (from pipe) dimensions and either quick burst or ring tensile strength (equipment permitting).
- I. Color Identification: Permanent identification of piping service shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shall. The striping material shall be the same material as the pipe material except for color. The following colors shall be used to identify piping service:

J.

Black – raw water
Blue – potable water
Green – wastewater, sewage
Pantone Purple – reuse or reclaimed water

- K. Polyethylene Fittings and Custom Fabrications: Polyethylene fittings and custom fabrications shall be molded or fabricated by the pipe manufacturer. Butt fusion outlets shall be made to the same outside diameter, wall thickness, and tolerances as the mating pipe. All fittings and custom fabrications shall be fully rated for the same internal pressure as the mating pipe. Pressure de-rated fabricated fittings are prohibited.
- L. Molded Fittings: Molded fittings shall be manufactured in accordance with ASTM D3261, Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing, and shall be so marked. Each production lot of molded fittings shall be subjected to the tests required under ASTM D3261.
- M. Fabricated Fittings: Fabricated fittings shall be made by heat fusion joining specially machined shapes cut from pipe, polyethylene sheet stock, or molded fittings. Fabricated fittings shall be rated for internal pressure service equivalent to the full service pressure rating of the mating pipe. Directional fittings 16-inch IPS and larger such as elbows, tees, crosses, etc., shall have a plain end inlet for butt fusion and flanged directional outlets. Part drawings shall be submitted for the approval of the ENGINEER.
- N. Polyethylene Flange Adapters: Flange adapters shall be made with sufficient through-bore length to be clamped in a butt fusion joining machine without the use of a stub-end holder. The sealing surface of the flange adapter shall be machined with a series of small v-shaped grooves to provide gasketless sealing, or to restrain the gasket against blow-out.
- O. Back-up Rings and Flange Bolts: Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. The lap joint flange bore shall be chamfered or radiused to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

2.2 MANUFACTURER'S QUALITY CONTROL

- A. The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rate, and

contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control. Incoming materials shall be approved by Quality Control before processing into finished goods. Outgoing materials shall be checked for:

- Outside diameter, wall thickness, and eccentricity as per ASTM D2122 at a frequency of at least once/hour or once/coil, whichever is less frequent.
- Out of Roundness at frequency of at least once/hour or once/coil, whichever is less frequent.
- Straightness, inside and outside surface finish, markings and end cuts shall be visually inspected as per ASTM F714 on every length of pipe.

2.3 COMPLIANCE TESTS

- A. In case of conflict with Manufacturer's certifications, the CONTRACTOR, ENGINEER, or OWNER may request re-testing by the manufacturer or have re-tests performed by an outside testing service. All re-testing shall be at the requestor's expense and shall be performed in accordance with the Specifications.
- B. Installation shall be in accordance with Manufacturer's recommendations and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with the applicable codes and standards.

PART 3 EXECUTION

3.1 INSTALLATION OF HIGH DENSITY POLYETHYLENE PRESSURE PIPE AND FITTINGS

- A. All high density polyethylene (HDPE) pressure pipe shall be installed by direct bury, directional bore, or a method approved by the OWNER/ENGINEER prior to construction. If directional bore is used, or if directed by the OWNER/ENGINEER, the entire area of construction shall be surrounded by silt barriers during construction.

Installation shall be in accordance with Manufacturer's recommendations, and this specification. All necessary precautions shall be taken to ensure a safe working environment in accordance with the applicable codes and standards.

3.2 HEAT FUSION JOINING

- A. Joints between plain end pipes and fittings shall be made by butt fusion, and joints between the main and saddle branch fittings shall be made using saddle fusion using only procedures that are recommended by the pipe and fitting Manufacturer.

Ensure that persons making heat fusion joints have received training and certification for heat fusion in the Manufacturer's recommended procedure. Maintain records of trained personnel, and shall certify that training was received not more than twelve (12) months before commencing construction. External and internal beads shall not be removed.

3.3 MECHANICAL JOINING

- A. Polyethylene pipe and fittings may be joined together or to other materials by means of flanged connections (flange adapters and back-up rings) or mechanical couplings designed for joining polyethylene pipe or for joining polyethylene pipe to another material. Mechanical couplings shall be fully pressure rated and fully thrust restrained such that when installed in accordance with manufacturer's recommendations, a longitudinal load applied to the mechanical coupling will cause the pipe to yield before the mechanical coupling disjoins. External joint restraints shall not be used in lieu of fully restrained mechanical couplings.

3.4 BRANCH CONNECTIONS

- A. Branch connections to the main shall be made with saddle fittings or tees.

3.5 EXCAVATION

- A. Trench excavations shall conform to this specification, Section 31 23 16, the plans and drawings, as otherwise authorized in writing by the ENGINEER or his approved representative, and in accordance with all applicable codes. Excess groundwater shall be removed by the CONTRACTOR. Where necessary, trench walls shall be shored or reinforced.

3.6 LARGE DIAMETER FABRICATED FITTINGS

- A. Fabricated directional fittings 16-inch IPS and larger shall be butt fused to the end of a pipe. The flanged directional outlet connections shall be made up in the trench.

3.7 MECHANICAL JOINT AND FLANGE INSTALLATION

- A. Mechanical joints and flange connections shall be installed in accordance with the Manufacturer's recommended procedure. Flange faces shall be centered and aligned to each other before assembling and tightening bolts. In no case shall the flange bolts be used to draw the flanges into alignment. Bolt threads shall be lubricated, and flat washers shall be fitted under the flange nuts. Bolts shall be evenly tightened according to the tightening pattern and torque step recommendations of the Manufacturer. At least one hour after initial assembly, flange connections shall be re-tightened following the tightening pattern and

torque step recommendations of the Manufacturer. The final tightening torque shall be 100 ft-lbs or less as recommended by the Manufacturer.

3.8 FOUNDATION AND BEDDING

- A. Pipe shall be laid on grade and on a stable foundation in accordance with Section 31 23 23.

3.9 PIPE HANDLING

- A. When lifting with slings, only wide fabric choker slings shall be used to lift, move, or lower pipe and fittings. Wire rope or chain shall not be used. Slings shall be of sufficient capacity for the load, and shall be inspected before use. Worn or defective equipment shall not be used.

3.10 TESTING

- A. Low Pressure Air Testing: A single test of the entire fused section that includes a low-pressure air test at 5 psi for 15 minutes shall be required in the presence of the ENGINEER or their representative.

Perform all butt fusion joints in the presence of the ENGINEER or his representative. Record the temperature and corresponding time for each fusion joint.

- B. Hydrostatic Pressure Testing: HDPE pipes shall be pressure tested in accordance with Section 33 05 01.

END OF SECTION

SECTION 33 11 03**DUCTILE IRON PIPE AND FITTINGS****PART 1 GENERAL****1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals required, and install ductile iron pipe, fittings and appurtenances as shown on the Drawings and as specified herein.
- B. NOTE: No buried ductile iron pipe shall be acceptable for sanitary force main construction. All water mains larger than 12 inches shall be constructed of Ductile Iron Pipe and shall be used for all vertical deflections ditch crossings, subaqueous crossings, and all paved surfaces unless otherwise approved by Lee County Utilities.

1.2 RELATED WORK SPECIFIED ELSEWHERE

- A. Section 33 05 03 - Laying and Jointing Buried Pipe

1.3 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

- A. Commercial Standards: (Latest Revision)
 - 1. ANSI/AWWA C104/A21.4 Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.
 - 2. ANSI/AWWA C110/A21.10 Ductile-Iron Fittings, 3 in. Through 48 Inches, for Water and Other Liquids. (C110 2-48 inches).
 - 3. ANSI/AWWA C111/A21.11 Rubber Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - 4. ANSI/AWWA C115/A21.15 Flanged Ductile-Iron Pipe with Threaded Flanges.
 - 5. ANSI/AWWA C150/A21.50 Thickness Design of Ductile-Iron Pipe.
 - 6. ANSI/AWWA C151/A21.51 Ductile-Iron Pipe, Centrifugally Cast for Water or Other Liquids.
 - 7. ANSI/AWWA C153/A21.53 Ductile-Iron Compact Fittings, 3 inches through 64 inches, for Water and Other Liquids.

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|-----|------------------|---|
| 8. | AWWA C600 | Installation of Ductile Iron Water Mains and Their Appurtenances. |
| 9. | AWWA C602 | Cement-Mortar Lining of Water Pipelines in Place – 4 In. (100 mm) and Larger |
| 10. | ASTM G62 | Standard Test Methods for Holiday Detection in Pipeline Coatings ¹ |
| 11. | ASTM F477 | Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Material |
| 12. | NSF/ANSI 61 | Drinking Water System Components |
| 13. | NSF/ANSI/CAN 372 | Technical Requirements |
| 14. | NSF/ANSI/CAN 600 | Health Effects Solvent Criteria |

1.4 CONTRACTOR SUBMITTALS

- A. Shop Drawings: Submit shop drawings of pipe and fittings in accordance with the requirements in the General Conditions, the requirements of the referenced standards and the following supplemental requirements as applicable:
1. Certified dimensional drawings of all valves, fittings, and appurtenances.
 2. For pipe 48 inches in diameter and larger, a line layout and marking diagram shall indicate the specific number and location (station) of each fitting.
 3. In all cases, a line layout to indicate the limits of each reach of restrained joints, or of concrete encasement shall be supplied.
- B. Certifications: Furnish a certified affidavit of compliance for all pipe and other products or materials furnished under this Section of the Specifications, which indicates that all tests have been made and that all results comply with the requirements of AWWA C151, including but not necessarily limited to the following:
1. Acceptance Tests.
 2. Hydrostatic Tests.
 3. Low Temperature Impact Tests.
- C. Additional Documentation: Foundry records shall be furnished in the form of written transcripts upon request.
- D. All expenses incurred for certification, testing, and data submittal shall be borne by the CONTRACTOR or the Supplier.

1.5 QUALITY ASSURANCE

- A. Inspection: All pipe shall be available for inspection at the place of manufacture prior to shipping in accordance with the provisions of the referenced standards. Notify the ENGINEER in writing not less than ten (10) calendar days prior to the shipping of the pipe.
- B. The ENGINEER shall be given access to all areas where manufacturing and testing is performed and shall be permitted to make all inspections necessary to confirm manufacturer compliance with these Specifications.
- C. Tests: Except as modified herein, all materials used in the manufacture of the pipe shall be tested in accordance with the requirements of the referenced standards as applicable.
- D. Provide data on material tests at no additional cost to the OWNER.
- E. In addition to those tests specifically required, the ENGINEER may request additional samples of any material including lining and coating samples for testing by the OWNER. The additional samples shall be furnished at no additional cost to the OWNER.

1.6 CORROSION PROTECTION

- A. If specifically approved by Lee County Utilities for use, exterior protection shall be provided for underground ductile iron pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement through the area of concern. The soil test evaluation to determine the necessity for extra protection in suspect areas shall be those set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, ductile iron pipe crossing said utility shall be protected for a distance of 20 feet to each side. If ductile iron pipe is to be installed parallel to and within 10 feet of cathodically protected pipe, then protection shall be provided for the entire length. Steel pipe shall not be installed in severe corrosion areas.

PART 2 PRODUCTS

2.1 GENERAL

- A. Cement mortar lined ductile iron pipe shall conform to ANSI/AWWA C151 and C104, subject to the following supplemental requirements. The pipe shall be of the diameter and class shown, shall be furnished complete with rubber gaskets as indicated in the Contract Documents, and all specials and fittings shall be provided as required under the Contract Documents.

- B. Markings: Legibly mark specials 48 inches in diameter and larger in accordance with the laying schedule and marking diagram. All fittings shall be marked at each end with top field centerline.
- C. Handling and Storage: The pipe shall be handled by wide slings, padded cradles, or other devices designed and constructed to prevent damage to the pipe and its lining. The use of equipment or handling, which might injure the pipe and its lining, will not be permitted. Stockpiled pipe shall be suitably supported and shall be secured to prevent accidental rolling. All other pipe handling equipment and methods shall be acceptable to the ENGINEER.
- D. Laying lengths: Maximum pipe laying lengths shall be 20 feet.
- E. Finish: The pipe shall have smooth dense interior surfaces and shall be free from fractures, excessive interior surface crazing and roughness, in accordance with ANSI/AWWA C104.
- F. Closures and Correction Pieces: Closures and correction pieces shall be provided as required so that closures may be made due to different headings in the pipe laying operation and so that correction may be made to adjust the pipe laying to conform to pipe stationing shown on the Drawings or line layouts where applicable.

2.2 PIPE DESIGN CRITERIA

- A. General: Ductile Iron pipe shall be designed in accordance with the requirements of ANSI/AWWA C150 as applicable and as modified in this Section.
- B. Pipe Wall Thickness for Internal Pressure: The pipe shall be designed with a net thickness to withstand the design internal pressure in accordance with the hoop stress formula. In addition to the requirements of the Section, the minimum wall thickness shall be in accordance with the minimum thickness wall depicted in table 50.5 of ANSI/AWWA C150.
- C. Ductile Iron Pipe shall be a minimum of Class 50 or pressure Class 250 and will be accepted in any diameter for use within the water distribution system.
- D. All aboveground water main pipe shall be painted blue. The pipe wall thickness shall not be less than that required by a working pressure of 250 psi in laying condition Type 4 "B" with 5-foot cover in conformance with ANSI Standard A21.50.

2.3 MATERIALS

- A. Ductile Iron Pipe: Pipe materials shall conform to the requirements of ANSI/AWWA C151.

- B. Cement: Cement for mortar lining shall conform to the requirements of ANSI/AWWA C104; provided that cement for mortar lining shall be Type II or V. A fly ash or pozzolan shall not be used.
- C. Adapters to connect ductile iron pipe or fittings to pipe or fittings of dissimilar materials shall be supplied by the CONTRACTOR in accordance with the pipe manufacturer recommendations, and as approved by the ENGINEER.

2.4 SPECIALS AND FITTINGS

- A. Fittings for ductile iron pipe shall conform to the requirements of ANSI/AWWA C153/A21.53 or ANSI/AWWA C110/A21.10 for diameters 3 inches through 48 inches and shall have a minimum pressure rating of 250 psi. Ductile iron fittings shall be cement lined, seal coated and outside coated as specified. Ductile Iron fittings larger than 48 inches shall conform to the above referenced standard with the necessary modifications for the larger size manufacturer's standard.
- B. All above-ground fittings in direct contact with wastewater shall be HDPE or ductile iron flanged joints with a minimum pressure rating of 250 psi conforming to ANSI A21.10. If above-ground ductile iron fitting is used, the fitting shall be lined with an approved liner (see LCU Approved Materials List) applied in strict accordance with the manufacturer's specifications to a dry film thickness of 40 mils. All above-ground fittings shall have a factory applied exterior epoxy coating in accordance with AWWA C550.

2.5 DESIGN OF PIPE

- A. General: The pipe furnished shall be ductile iron pipe, mortar-lined, with rubber gasketed joints.
- B. The pipe shall be designed, manufactured, tested, inspected, and marked according to applicable requirements previously stated and except as hereinafter modified, shall conform to ANSI/AWWA C151.
- C. Pipe Dimensions: The pipe shall be of the diameter and class shown. The minimum wall thickness for each pipe size shall be as specified herein or shown on the Drawings.
- D. Fitting Dimensions: The fittings shall be of the diameter shown and class specified.
- E. Joint Design: Ductile Iron pipe and fittings shall be furnished with mechanical joints, push-on joints and flanged joints as follows:

1. For buried pipe applications, unless otherwise indicated, mechanical and push-on joints shall conform to ANSI/AWWA C111/A21.11, with the minimum pressure rating of 250 psi.
 2. For above-ground or buried vault applications, unless otherwise indicated, flanged joints shall conform to ANSI/AWWA C115/A21.15, with the minimum pressure rating of 250 psi. All above-ground fittings shall be painted blue.
- F. Restraining Devices: Restraining joints shall be placed at all bends, tees, plugs, reducers, and other fittings to provide lateral support, and shall conform to the notes and details shown on the Drawings. Concrete thrust blocks may be utilized as additional restraint if approved by Lee County Utilities. Closed valves are considered dead ends and should be restrained according to the Restrained Length Table on the Drawings.
1. See LCU Approved Materials List for Joint restraint devices for ductile iron mechanical joint pipe and ductile iron mechanical joint fittings to ductile iron pipe.
 2. See LCU Approved Materials List for Bell joint restraint devices for ductile iron push joint pipe.
- G. For bell-and-spigot ends with rubber gaskets, the clearance between the bells and spigots shall be such that when combined with the gasket groove configuration and the gasket itself will provide watertight joints under all operating conditions when properly installed. Require the pipe manufacturer to submit details complete with significant dimensions and tolerances and also to submit performance data indicating that the proposed joint has performed satisfactorily under similar conditions. In the absence of a history of field performance, the results of a test program shall be submitted.
- H. Gaskets shall be a Buna N, Neoprene, or a Nitril-based rubber product approved by the County. Gaskets shall have clean tips unless otherwise specified. Elastomeric gaskets conforming to ASTM F477 shall also be acceptable.
- I. Shop-applied interior linings and exterior coatings shall be applied evenly to the nominal thickness specified. Holiday free cement is not possible to manufacture. Exterior coatings: asphalt coating for buried pipe or primed pipe cannot be furnished holiday free.

2.6 CEMENT-MORTAR LINING

- A. Cement-Mortar Lining For Shop Application: Except as otherwise provided herein, interior surfaces of all ductile iron pipe shall be cleaned and lined in the shop with cement-mortar lining applied centrifugally in conformity with ANSI/AWWA C104. Ductile-Iron pipe fittings need not have the cement-mortar lining applied centrifugally. The lining machines shall be of a type that has been used successfully for similar Work. Every precaution shall be taken to prevent damage

to the lining. If lining is damaged or found faulty at delivery site, the damaged or unsatisfactory portions shall be repaired in the field in accordance with ANSI/AWWA C104.

- B. The nominal wet lining thickness shall be as follows:

Nominal Factory Nominal Replacement		
Nominal Pipe Diameter (in.)	Applied Lining Thickness (in.)	Lining Thickness (in.)
3-12	1/8	1/8
14-24	3/16	3/16
30-64	1/4	1/4

- C. Protection of Pipe Lining/Interior: All shop-applied cement mortar lining shall be given a seal coat of asphaltic material in conformance with ANSI/AWWA C104.

2.7 EXTERIOR COATING OF PIPE

- A. Exterior Coating of Exposed Piping: The exterior surfaces of pipe which will be exposed to the atmosphere inside structures or above ground shall be thoroughly cleaned and then given a shop coat of rust-inhibitive primer. All above-ground pipe shall be painted blue.
- B. Exterior Coating of Buried Piping: The exterior coating shall be an asphaltic coating approximately 1-mil thick, conforming to ANSI/AWWA C151.

2.8 CORROSION PROTECTION

- A. If specifically approved by Lee County Utilities for use, exterior protection shall be provided for underground ductile iron pipe and fittings within areas of severe corrosive conditions. This shall be accomplished by the installation of polyethylene encasement through the area of concern. The soil test evaluation to determine the necessity for extra protection in suspect areas shall be those set forth in ANSI Standard A21.5. Additionally, where other existing utilities are known to be cathodically protected, ductile iron pipe crossing said utility shall be protected for a distance of 20 feet to each side. If ductile iron pipe is to be installed parallel to and within 10 feet of cathodically protected pipe, then protection shall be provided for the entire length. Steel pipe shall not be installed in severe corrosion areas.

PART 3 EXECUTION

3.1 INSTALLATION OF PIPE

- A. Handling and Storage: All pipe, fittings, etc., shall be carefully handled and protected against damage, impact shocks, and free fall and in accordance with

ANSI/AWWA C600. Pipe shall not be placed directly on rough rocky ground but in such instances shall be supported in a manner which will protect the pipe against injury whenever stored at such trench site or elsewhere. No pipe shall be installed where the lining or coating show defects that may be harmful as determined by the ENGINEER. Such damaged lining or coating shall be repaired, or a new undamaged pipe shall be furnished and installed.

- B. All pipe damaged prior to Substantial Completion or during warrantee period shall be repaired or replaced by the CONTRACTOR.
- C. Inspect each pipe and fitting prior to installation to ensure that no damaged portions of the pipe get installed.
- D. Before placement of pipe in the trench, each pipe or fitting shall be thoroughly cleaned of any foreign substance, which may have collected therein and shall be kept clean at all times thereafter. For this purpose, the openings of all pipes and fittings in the trench shall be closed during any interruption to the Work.
- E. Pipe Laying: The pipe shall be installed in accordance with ANSI/AWWA C600.
- F. Pipe shall be laid directly on the bedding material. No blocking will be permitted, and the bedding shall be such that it forms a continuous, solid bearing for the full length of the pipe. Excavations shall be made as needed to facilitate removal of handling devices after the pipe is laid. Bell holes shall be formed at the ends of the pipe to prevent point loading at the bells or couplings. Excavation shall be made as needed outside the normal trench section at field joints to permit adequate access to the joints for field connection operations and for application of coating on field joints.
- G. Where necessary to raise or lower the pipe due to unforeseen obstructions or other causes, the ENGINEER may change the alignment and/or the grades. Such change shall be made by the deflection of joints, by the use of bevel adapters, or by the use of additional fittings. However, in no case shall the deflection in the joint exceed 70% of the maximum deflection recommended by the pipe manufacturer. No joint shall be misfit any amount which will be detrimental to the strength and water tightness of the finished joint.
- H. Pipe and Specials Protection: The openings of all pipe and specials shall be protected with suitable bulkheads to prevent unauthorized access by persons, animals, water, or any undesirable substance. At all times, means shall be provided to prevent the pipe from floating.
- I. Pipe Cleanup: As pipe laying progresses, keep the pipe interior free of all debris. Completely clean the interior of the pipe of all sand, dirt, mortar splatter and any other debris following completion of pipe laying, pointing of joints, and any necessary interior repairs per ANSI/AWWA C600 and C602 prior to testing and

disinfecting the completed pipeline. Pipe larger than 12-inch diameter will utilize a polyurethane foam plug "Poly Pig" to remove all debris from main.

3.2 RUBBER GASKETED JOINTS

- A. Rubber Gasketed Joints: Immediately before jointing pipe, the bell end of the pipe shall be thoroughly cleaned, and a clean rubber gasket shall be placed in the bell groove. The bell and spigot end of push-on joint pipe shall be carefully cleaned and lubricated with a vegetable-based lubricant or per manufacturer's recommendation. The spigot end of the pipe section shall then be inserted into the bell of the previously laid joint and telescoped into its proper position. Tilting of the pipe to insert the spigot into the bell will not be permitted.

3.3 INSTALLATION OF PIPE APPURTENANCES

- A. Installation of Valves: All valves shall be handled in a manner to prevent any injury or damage to any part of the valve. All joints shall be thoroughly cleaned and prepared prior to installation. Adjust all stem packing and operate each valve prior to installation to insure proper operation.
- B. All valves shall be installed so that the valve stems are plumb and in the location shown on the Drawings.
- C. Mechanical joints consisting of bell, socket, gland, gasket, bolts, and nuts shall conform to ANSI Standard A21.11. Bolts and nuts shall be high strength, low alloy, Cor-Ten, T-Head Type having hexagonal nuts. Bolts and nuts shall be machined through and nuts shall be tapped at right angles to a smooth bearing surface. Single sealed gasket push-on type joints shall conform to the requirements of ANSI A21.11 (see LCU Approved Materials List).
- D. Mechanical joint retainer glands may be used to restrain mechanical joint pipe and fittings to the plain end of ductile iron pipe and fittings when used in conjunction with thrust blocks of reduced size. The Utilities ENGINEER must approve thrust block size. Joint flexibility shall be maintained.

3.4 TESTING AND DISINFECTION

- A. Test completed water pipeline in accordance with Section 33 05 01. Disinfect completed water pipeline in accordance with Section 33 11 12.

END OF SECTION

SECTION 33 11 12**DISINFECTION****PART 1 GENERAL****1.1 SUMMARY**

- A. Section Includes: Disinfection of all pipelines, conduits and equipment which are to store, handle or carry potable water. Furnish all labor, water, chemicals and equipment, including taps, corporation stops, backflow preventers, temporary pumps and other items necessary to perform the Work, except as otherwise specified.

1.2 REFERENCES

- A. Codes and standards referred to in this Section are:
 - 1. AWWA C651 - Disinfecting Water Mains
 - 2. AWWA C652 - Disinfection of Water-Storage Facilities
 - 3. AWWA C655 - Field Dechlorination

1.3 QUALITY ASSURANCE

- A. Disinfection Standards: Disinfect in accordance with AWWA C651 for water mains and AWWA C652 for water storage facilities and equipment.
- B. Chlorinated Water Disposal: Dispose of old highly chlorinated water in accordance with AWWA C655 - Field Dechlorination.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION**3.1 WATER MAIN DISINFECTION**

- A. Following acceptable flushing and pressure testing, disinfect all sections of the water distribution system and receive approval thereof from the appropriate agencies, prior to placing in service. Advance notice of 24 hours shall be provided to the County before disinfecting procedures start. The disinfection shall be

accomplished in accordance with the applicable provisions of AWWA Standard C651, "Disinfecting Water Main" and all appropriate approval agencies.

- B. The disinfecting agent shall be free chlorine in aqueous solution with sustained concentration for 12 hours or more of not less than 50 parts per million. Chlorine may be derived from Chlorine gas, or 70% (high test) calcium hypochlorite (HTH or Perchloron, or equal). Administration may be by any of the several methods described in AWWA C651 as proposed by the CONTRACTOR and approved by the ENGINEER. Proposals as to method must be made prior to commencement of the disinfection process.
- C. Following contact with chlorine solution, the system shall be thoroughly flushed out. Samples shall then be taken using sterile containers obtained from the County Health Department. Samples shall be taken by the CONTRACTOR and delivered by him to the County Health Department or approved laboratory for analysis.
- D. If samples do not demonstrate satisfactory results, the disinfection procedure shall be repeated until two (2) series of satisfactory samples are obtained, the period between such series of samples to be a minimum of 24 hours.

3.2 WATER MAIN DECHLORINATION

- A. Develop and submit Dechlorination Plan and procedures. The Dechlorination Plan shall include dechlorination requirements, site characterization, dechlorination method, and necessary equipment.
- B. Identify dechlorination features, requirements, and a site inspection assessment that identifies safety, dechlorination method, equipment, traffic control, water handling, testing, and disposal.
- C. Water released into the environment shall meet the federal, state and local regulatory agency's residual chlorine limit before the point of discharge.

END OF SECTION

SECTION 33 12 16**WATER VALVES AND APPURTENANCES****PART 1 GENERAL****1.1 SCOPE OF WORK**

- A. Furnish all labor, materials, equipment, and incidentals required and install complete and ready for operation all valves and appurtenances as shown on the Drawings and as specified herein.

1.2 REFERENCES

- A. Codes, specifications, and standards referred to by number or title form a part of this Section to the extent required by the references to codes, specifications, and standards. Latest revisions, as of the date of bid opening, apply, unless otherwise noted on the Drawings or specified in this Section.
- B. Standards

<u>Designation</u>	<u>Title</u>
ANSI/AWWA C111/A21.11	Rubber-Gasket Joints for Ductile-Iron and Gray-Iron Pressure Pipe and Fittings
ANSI/AWWA C500	Gate Valves
ANSI/AWWA C509	Resilient-Seated Gate Valves 3 through 12 NPS, for Water Systems
ANSI/AWWA C510	Double Check Valve Backflow Prevention Assembly
ANSI/AWWA C511	Reduced-Pressure Principle Backflow Prevention Assembly
AWWA C550	Protection Interior Coatings for Valves and Hydrants
ANSI/B16.1	Gray Iron Pipe Flanges and Flanged Fittings, Class 25, 125, and 250
ANSI/B16.3	Malleable Iron Threaded Fittings, Class 150 and 300

ANSI/B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys
ASTM A48	Standard Specification for Gray Iron Castings
ASTM A126	Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings
ASTM A276	Specification for Stainless and Steel Bars and Shapes
ASTM A231	Standard Specification for Chromium-Vanadium Alloy Steel Spring Wire
ASTM D429	Standard Test Methods for Rubber Property – Adhesion to Rigid Substrates
ASTM A536	Standard Specification for Ductile Iron Castings
ASTM A743	Specification for Castings, Iron-Chromium, Iron-Chromium-Nickel, and Nickel-Base Corrosion-Resistant for General Application
ASTM D2794	Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact)
MSS SP-60	Connecting Flange Joint Between Tapping Sleeves and Tapping Valves
NSF/ANSI 61	Drinking Water System Components
NSF/ANSI/CAN 372	Technical Requirements
NSF/ANSI/CAN 600	Health Effects Solvent Criteria

1.3 DEFINITIONS

- A. References to valve sizes on the Drawings and in the Specifications are intended to be nominal size, and shall be interpreted as nominal size.

1.4 SUBMITTALS

- A. General: as specified in:
1. General Conditions;
 2. Supplementary General Conditions;

1.5 QUALITY ASSURANCE

- A. Testing: Test valves as specified in this Section.

1.6 WORK EXPERIENCE AND CERTIFICATIONS

A. Line Stop

1. Tapping CONTRACTOR should have a minimum of twenty (20) years documented, uninterrupted service with completing wet taps, valve insertions or line stops on pressurized piping systems, consistent with the type and size of pipe described in the description of Work being bid.
2. Tapping CONTRACTOR should have an established training program for their Field Technicians, made available for review through the appropriate department. The Field Technician should have specific training on the equipment that is to be used and must be graduates of the training program. Copies of the Field Technician training certifications should be submitted with Bid & completed Questionnaire.
3. All on-site Field Technicians employed by Tapping CONTRACTORS should possess appropriate certification to ensure that the Work is performed safely and efficiently. The following certifications are required:
 - a. OSHA 10- or 30-Hour Safety Training Certification: All on-site Field Technicians must have completed an OSHA 10- or 30-hour safety training course. This certification ensures that the Technician is aware of potential hazards and understands how to Work safely in an industrial setting.
 - b. Confined Space Entry Certification: As part of the wet tapping process, on-site Field Technicians may be required to enter confined spaces. A confined space entry certification ensures that the Technician is trained to Work safely in these environments and is aware of potential hazards and risks.
 - c. CPR and First Aid Certification: In the event of an emergency, on-site Field Technicians must be able to provide basic first aid and CPR. A CPR and first aid certification ensure that the Technician is trained to provide these services and can respond effectively in case of an emergency.
 - d. Tapping Equipment Training Certification: On-site Field Technicians must be trained on the specific tapping equipment being used for the project. This certification ensures that the Technician is familiar with the equipment, understands how to use it safely, and can troubleshoot any issues that may arise.
 - e. Welding Certification: Some wet tapping projects may require welding. A welding certification ensures that the Technician is trained and qualified to perform welding tasks safely and efficiently.
4. Certification of Tapping CONTRACTOR's on-site Field Technicians experience:

- a. Should have a minimum of twenty-five (25) Wet Taps or line stops on 6 inch or larger cast iron, ductile iron, or PVC.
- b. Should have a minimum of ten (10) Valve Inserts 4 inch or larger cast iron, ductile iron, or PVC.
- c. Should have a minimum of ten (10) years applied experience with jobsite equipment & practices.

PART 2 PRODUCTS

2.1 GENERAL:

- A. All valves and appurtenances shall be of the size shown on the Drawings and as far as possible all equipment of the same type shall be from one manufacturer.
- B. All valves and appurtenances shall have the name of the maker and the working pressure for which they are designed cast in raised letters upon some appropriate part of the body.

2.2 MANUFACTURERS

- A. See LCU Approved Materials List.

2.3 DESIGN

- A. Resilient, Wedge or Gate Valves and Boxes
 1. Valves for pipe less than 2 inch in diameter shall conform to the requirements of AWWA C509 (latest revision) and shall be cast iron, single wedge, non-rising stem, screwed bonnet, 125 pounds S.P., 200 pounds W.O.G with stuffing box repackable under pressure and all parts renewable. Ends shall be as shown or indicated on the drawings.
 2. Resilient, wedge or gate valves 2 inch in diameter and larger shall be cast or ductile iron body, non-rising stem, bronze mounted gate valves, mechanical joint conforming to requirements of the AWWA Standard C509 and shall be provided with a 2-inch square operating nut. Valves shall be resilient, wedge, or gate type and shall turn to the left (counter clockwise) to open. The wedge or gate shall be cast iron or ductile iron per ASTM A536, minimum 65,000 psi strength and, completely encapsulated with urethane rubber, permanently bonded to the wedge or gate to meet ASTM test for rubber metal bond, ASTM D429. The valve stems for non-rising stem assemblies shall be cast bronze with integral collars in full compliance with AWWA. The NRS stem stuffing box shall be the O-ring seal type with two (2) rings located above thrust collar; the two (2) rings shall be replaceable with valve fully open and subjected to full rated working pressure.

3. There shall be two (2) low torque thrust bearings located above and below the stem collar. The stem nut shall be independent of wedge and shall be made of solid bronze. There shall be a smooth unobstructed waterway free of all pockets, cavities and depressions in the seat area. The body and bonnet shall be coated with fusion bonded epoxy both interior and exterior. The valve shall be designed and tested to be opened and closed under a differential pressure of 150 psi or greater.

B. Valves for Buried Service

1. Valves for buried service shall meet all the requirements as specified herein for interior except that buried valves shall have mechanical joint ends.
2. All buried valves shall have cast-iron three-piece valve boxes, valve boxes shall be provided with suitable heavy bonnets to extend to such elevation at the finished grade surface as directed by the ENGINEER. The barrel shall be two-piece, screw type, having 53-inch shaft. The upper section shall have a flange at the bottom having sufficient bearing area to prevent settling, shall be designed so as to prevent the transmission of surface loads directly to the valve or piping, and shall be complete with cast iron covers. Covers shall have "WATER" cast into the top. The covers shall be so constructed as to prevent tipping or rattling. Valve boxes shall be manufactured by an approved manufacturer (see LCU Approved Materials List).
3. One (1) tee-handled wrench of suitable length shall be furnished to operate each valve with a valve box.
4. Where valves are located out of pavement, the boxes shall be adjusted to finished grade and a concrete slab 2 feet square and 6 inches thick shall be poured around the box.
5. Valve boxes shall be of the heavy duty, traffic bearing cast iron, adjustable screw type with a drop cover. The valve box assembly shall consist of a bottom section, top section and cover which is cast from gray iron, formulated to ASTM A48 latest revision, class 30 minimum and shall be free from blowholes, shrinkage or other imperfections not true to pattern. The shaft size shall be 5-1/4 inch and the adjustable length shall be from 18 inch to 24 inch. The wall thickness shall be 3/16 inch \pm 1/16 inch. The weight of the assembly shall be 61 pounds \pm 2 pounds, with the cover weight being a minimum of 12 pounds.
6. The name of the manufacturer and foundry of origin shall be cast into each of the components of the assembly in legible form. The assembly shall be suitable for highway traffic wheel loads of 16,000 pounds and shall withstand

a proof load test of 25,000 pounds without failure or permanent deflection, as per Federal Specification RR-F-621-C, latest revision. The valve box shall be cast, machined, assembled, and packaged within the United States and shall fully comply with the Buy American provisions of Public Law 102-240, enacted 12/18/91.

C. Gate Valves Greater Than 20 Inches

1. Valves larger than 20 inch in diameter and larger shall be approved by the County and shall be epoxy-coated, cast or ductile iron body mechanical joint type conforming to requirements of the AWWA Standards and shall be provided with a 2-inch square operating nut.
2. 20" or larger resilient gate valve must have a 4-inch bypass line and 4-inch gate valve. If an approved equal resilient gate valve (see LCU Approved Materials List) is used, the 4-inch bypass line and 4-inch gate valve is not required. Butterfly valves may be used for valves greater than 24 inches without the 4-inch bypass line and 4-inch gate valve.

D. Check Valves

1. Check valves smaller than 4 inch shall have a bronze body with a bronze disk. Check valves shall absolutely prevent the return of water back through the valve when the inlet pressure decreases below the delivery pressure.
2. The valve must be full opening, tight seating and its seat right shall be renewable and must be securely held in place by a threaded joint; the valve disc shall be bronze and shall be suspended from a non-corrosive shaft which will pass through a stuffing box.
3. The check valve 4 inch and larger shall be a rubber flapper type swing check valve and the body and cover shall be cast iron construction meeting ASTM A126 Class B or Ductile Iron construction. The flapper shall be Buna-N having an "O" ring seating edge and be internally reinforced with steel.
4. Flapper to be captured between the body and the body cover in a manner to permit the flapper to flex from closed to full open position during flow through the valve. Flapper shall be easily removed without need to remove valve from line. Check Valves to have full pipe size flow area. Seating surface to be on a 45° angle requiring the flapper to travel only 35° from closed to full open position, for minimum head loss and non-slam closure.
5. Non-slam closing characteristic shall be provided through a short 35° disc stroke and a memory flex disc return action.

6. When essential to create backflow thru the check valve, i.e.; to prime or backflush a clogged pump, an external backflow device shall be included.
7. Valve exterior to be painted Phenolic Primer Red Oxide for high resistance to corrosion.
8. Materials of construction shall be certified in writing to conform to A.S.T.M. specified above.
9. Valve shall be of an approved make and model (see LCU Approved Materials List).

E. Backflow Prevention Devices

1. Backflow prevention devices for fire protection systems which do not utilize chemical additives or an auxiliary water supply shall be double detector check valve assemblies, shall be USC approved, painted red, and meet all requirements of ANSI/AWWA C510. For all other applications, backflow prevention devices shall be reduced pressure principle assemblies and shall be USC approved, and shall meet all requirements of ANSI/AWWA C511 and the Southern Standard Plumbing Code. Refer to Section 2 of the Lee County Utilities Design Manual.

F. Air Release Valves

1. Air release valves shall be of the short body, automatic type as shown on the Lee County Standard Detail No. 9.27 in the Operations Manual. The valve body shall be cast iron construction, ASTM A126, Class B, and all internal working parts shall be 300 Series stainless steel, and BUNA-N orifice button. The inlet openings shall be 1-inch NPT screwed connection. The venting orifice shall be 3/16-inch in diameter and shall be installed to vent a minimum of 1 foot above the flood elevation. Air release valves shall be of an approved make and model (see LCU Approved Materials List).

G. Tapping Valves and Sleeves

1. Tapping valves shall be of non-rising stem type of O-Ring seals and conform to the applicable requirement as specified above for valves and shall have one flange joint end and mechanical joint end.
2. Valve end connecting to tapping sleeve shall have a flange for bolting to the sleeve. The flange shall have a tongue which fits a recess in sleeve. Tongues shall meet the requirements of MSS SP-60. Resilient-seated gate valves having a port diameter equal to or exceeding ¼-inch over nominal diameter shall not require a tongue. Flange dimensions and drilling shall meet the requirements of ANSI B16.1. Mechanical joints shall meet the

requirements of ANSI/AWWA C111/A21.11. A full nominal diameter cutter shall be used for tapping.

3. Tapping valves 16 inch and smaller, shall be installed vertically. Tapping valves larger than 16 inches shall be installed horizontally and shall have bypass valves. Tapping valves installed horizontally shall have rollers and tracks. Valves 16 inch and larger, shall have gear operators with enclosed gear cases suitable for buried service. Gear cases shall be extended type or totally enclosed type. Extended type gear cases shall have bolted side plates to cover stem and stuffing box.

H. Line Stops

1. For ductile iron pipe from 4 inch and larger: JCM 440, 442 or equal, meeting AWWA C223, fabricated from carbon steel or stainless-steel. Carbon Steel Fittings should be/contain: Carbon steel body and flange with fusion applied Epoxy Coating, Electro Coated push pin style Completion plug, Epoxy Coated Blind Flange and Stainless Steel 18-8 Type 304 Bolts, nuts and washers.
2. Stainless Steel Fittings should be/contain: Stainless Steel body and Flange, Electro Coated push pin style completion plug, Electro Coated Blind Flange and Stainless Steel 18-8 Type 304 Bolts, nuts and washers. Line Stopping on Concrete Pressure pipe from 16 inch and larger: JCM 445 or equal installed by Rangeline Tapping Services, Inc. or ENGINEER Approved Equal.
3. For purge and equalization saddles, Line Stop CONTRACTOR should use the JCM F406-0000 X 2LS service saddle with completion plug from 4-inch thru 42-inch Line Stops installed by Rangeline Tapping Services, Inc. or ENGINEER Approved Equal. For Line Stops on pipes greater than 24-inch the JCM 440 will be used for venting and equalization. "No Valve should be left attached when fittings are sealed and completed with a cap or blind flange."
4. Line stops shall be in place on the water main for no more than three (3) days.

I. Meter Boxes

1. Meters shall be installed in an approved meter box (see LCU Approved Materials List).
2. Meters larger than 2-inch shall be installed above ground and approved by Lee County Utilities. Refer to Lee County standard details.

Meter boxes, which need to be replaced, shall be of an approved make and model (see LCU Approved Materials List).

PART 3 EXECUTION

3.1 INSTALLATION

- A. All valves and appurtenances shall be installed in the locations shown, true to alignment and rigidly supported. Any damage to the above items shall be repaired to the satisfaction of the ENGINEER before they are installed.
- B. After installation, all valves and appurtenances shall be tested at least one hour at the working pressure corresponding to the class of pipe, unless a different test pressure is specified. If any joint proves to be defective, it shall be repaired to the satisfaction of the ENGINEER.
- C. Install all floor boxes, brackets, extension rods, guides, the various types of operators and appurtenances as shown on the Drawings that are in masonry floors or walls, and install concrete inserts for hangers and supports as soon as forms are erected and before concrete is poured. Before setting these items, the CONTRACTOR shall check all plans and figures which have a direct bearing on their location and he shall be responsible for the proper location of these valves and appurtenances during the construction of the structures.
- D. Flanged joints shall be made with Series 300, stainless steel bolts. All exposed bolts shall be made with Series 300 stainless steel bolts.
- E. Prior to assembly of split couplings, the grooves as well as other parts shall be thoroughly cleaned. The ends of the pipes and outside of the gaskets shall be moderately coated with petroleum jelly, cup grease, soft soap or graphite paste, and the gasket shall be slipped over one pipe end. After the other pipe has been brought to the correct position, the gasket shall be centered properly over the pipe ends with the lips against the pipes. The housing sections then shall be placed. After the bolts have been inserted, the nuts shall be tightened until the housing sections are firmly in contact, metal-to-metal, without excessive bolt tension.
- F. Prior to the installation of sleeve-type couplings, the pipe ends shall be cleaned thoroughly for a distance of 8 inches. Soapy water may be used as a gasket lubricant. A follower and gasket, in that order, shall be slipped over each pipe to a distance of about 6 inches from the end, and the middle ring shall be placed on the already laid pipe end until it is properly centered over the joint. The other pipe end shall be inserted into the middle ring and brought to proper position in relation to the pipe already laid. The gaskets and followers shall then be pressed evenly and firmly into the middle ring flanges. After the bolts have been inserted and all nuts have been made up finger-tight, diametrically opposite nuts shall be progressively and uniformly tightened all around the joint, preferably by use of a torque wrench of the appropriate size and torque for the bolts.

- G. Valves shall be carefully inspected, opened wide and then tightly closed and the various nuts and bolts shall be tested for tightness. Special care shall be taken to prevent any foreign matter from becoming lodged in the valve seat. Gate valves, unless shown otherwise, shall be set with their stems vertically above the center line of the pipe. Any valve that does not operate correctly shall be removed and replaced.
- H. Valve boxes shall be carefully centered over the operating nuts of the valves so as to permit a valve wrench or key to be fitted easily to the operating nut. Valve boxes shall be set to conform to the level of the finished surface and held in position by a ring of concrete placed under the support flange as shown on the details in Section 9 of the Lee County Utilities Operations Manual. The valve box shall not transmit surface loads to the pipe or valve. Care shall be taken to prevent earth and other material from entering the valve box.

Any valve box which is out of alignment or whose top does not conform to the finished ground surface shall be dug and reset. Before final acceptance of the Work, all valve boxes shall be adjusted to finish grade. Valve operating risers shall be installed with any valves required to ensure that the operating nut is 30 inches or less from the ground surface.

3.2 SHOP PAINTING

- A. Ferrous surfaces of valves and appurtenances shall receive a coating of epoxy in accordance with AWWA Standard C550 and meets or exceeds all test requirements including the Food and Drug Administration Document Title 21 of the Federal Regulations on Food Additives, Section 175.000 entitled "Resinous and Polymeric Coating"; Impact Test Requirement in accordance with the ASTM D2794.

END OF SECTION

TIERRA

June 21, 2024

Kimley-Horn and Associates, Inc.
1514 Broadway Street, Suite 301
Fort Myers, FL 33901

Attn: Ms. Heather Ripley, P.E.

**RE: Report of Geotechnical Engineering Services
I-75 (SR 93) at CR 876/Daniels Parkway Water Main Relocation
Lee County, Florida
Kimley-Horn Project No.: 148220029
Tierra Project No.: 6511-24-115**

Ms. Ripley:

Tierra, Inc. (Tierra) has completed geotechnical engineering services for the above-referenced project. The results of our limited study are presented herein.

The project consists of providing geotechnical services to support the design of the relocation of the 30-inch water main located north of Daniels Parkway in Lee County, Florida. The new water main is proposed to traverse beneath and across the SR 93 (I-75) roadway. Horizontal Directional Drilling (HDD) is associated with design and construction for the project.

SUBSURFACE EXPLORATION

To support the design of the HDD operation, Tierra performed seven (7) Standard Penetration Test (SPT) borings to depths ranging from approximately 10 to 50 feet below existing grades. Prior to commencing our subsurface exploration, a boring location plan was developed based on the pipe alignment provided by Kimley-Horn.

The borings were located in the field by a representative of Tierra using Garmin eTrex® hand-held, non-survey grade Global Positioning System (GPS) equipment with a manufacturer's reported accuracy of ± 10 feet. The approximate boring locations are shown on the attached **Boring Location Plan**. Utility clearances were coordinated by Tierra via Sunshine State One Call as required prior to performing the soil borings.

The SPT borings were performed with a drill rig using Bentonite Mud drilling procedures. The soil sampling was performed in general accordance with American Society for Testing and Materials (ASTM) Test Designation D-1586. Within some of the SPT borings, the initial 4 to 6 feet were manually augered to verify utility clearance. Within SPT boring B-WM-4 the resistance N-values were recorded and soil samples were collected continuously to a depth of 20 feet and at intervals of 5 feet thereafter to the boring termination depths. Representative portions of the soil samples were sealed in glass jars, labeled and transferred to our laboratory for classification and analysis.

SUBSURFACE CONDITIONS

Soil data published by the USDA/NRCS Soil Survey of Lee County, Florida was reviewed as part of the subsurface investigation. The **USDA Soil Survey Map** depicting the soil-mapping units as indicated by the USDA/NRCS along the pipe alignment is provided in the **Attachments** of this report. In addition, the USDA units reported along the pipe alignment are summarized on the attached **Summary of USDA Soil Survey** table.

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

Stratum Number	Soil Description	USCS Symbol
1	Light Gray to Gray to Light Brown to Brown Sand to Sand with Silt	SP/SP-SM
2	Light Gray to Gray to Brown Silty Sand	SM
3	Light Gray to Gray to Brown Clayey Sand	SC
4	Light Gray to Gray Silt	ML/MH
5	Weathered Limestone/Caprock	--- ⁽¹⁾
⁽¹⁾ USCS does not include nomenclature for Limestone		

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 boring profiles represent the condition at the particular boring location and variations did occur among the borings.

GROUNDWATER INFORMATION

The groundwater table was measured at depths ranging from approximately 2½ to 4 feet below the existing ground surface. The encountered groundwater levels are presented adjacent to the soil profiles on the attached **Soil Profiles** sheet.

Groundwater conditions will vary with environmental variations and seasonal conditions, such as the frequency and magnitude of rainfall patterns, as well as man-made influences (i.e. existing swales, drainage drainages, underdrains and areas of covered soils, such as paved parking lots). It should be noted that groundwater levels tend to fluctuate during periods of prolonged drought and extended rainfall and may be affected by man-made influences. In addition, a seasonal effect will also occur in which higher groundwater levels are normally recorded in rainy seasons.

TEST DESIGNATION

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

- Fines Content Analyses - The fines content tests were conducted in general accordance with the FDOT test designation FM 1-T011 (AASHTO test designation T-088).
- 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).
- Environmental Corrosion - The 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.

The results of the laboratory testing are presented on the attached **Soil Profiles** sheets in the **Attachments**.

EVALUATION AND RECOMMENDATIONS

The soils encountered within the borings performed for the project appear to be suitable for the anticipated HDD operation based on the limited geotechnical exploration performed.

Weathered limestone/Caprock was encountered within some of the borings performed along the project alignment at depths ranging from approximately 6 to 23½ feet below existing grades. This material is rock. If the horizontal directional drilling operations extend into this stratum, the Contractor should anticipate that drilling and reaming through and within this material may be difficult and may require non-conventional construction techniques and specialized equipment. In addition, limestone/caprock is porous and will be difficult to de-water. The depth and consistency of this material may vary.

Loose to medium dense sandy soils with shell fragments were encountered within some of the borings. Due to the loose sand with shell encountered and typically high permeability rates for sand with shell soil mixtures and the variable limestone/caprock stratum, the Contractor should anticipate higher than normal circulation losses of drilling fluid during the HDD operation in these areas.

The groundwater table was measured at depths ranging from approximately 2½ to 4 feet below existing grades. The groundwater levels presented in this report are the levels that were measured at the time of our field activities and fluctuation should be anticipated. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on construction procedures. Care should be given to open excavations and site grading to minimize ponding of surface water.

Based on a review of the USGS Quadrangle Map titled "Fort Myers SE, Florida", it appears that the project site natural elevations range from approximately +20 feet to +25 feet National Geodetic Vertical Datum of 1929 (NGVD 29) as illustrated on the **USGS Quadrangle Map** provided in the **Attachments**.

Temporary side slopes and excavations 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. Excavated materials should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth.

REPORT LIMITATIONS

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

If there is a substantial lapse in time between the submittal of this report and the start of work at the site, or if conditions or project layout are changed due to natural causes or construction operations at or adjacent to the site, we recommend that this report be reviewed to determine the applicability of conclusions and recommendations considering the changed conditions and time lapse.

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

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

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

Respectfully Submitted,

TIERRA, INC.



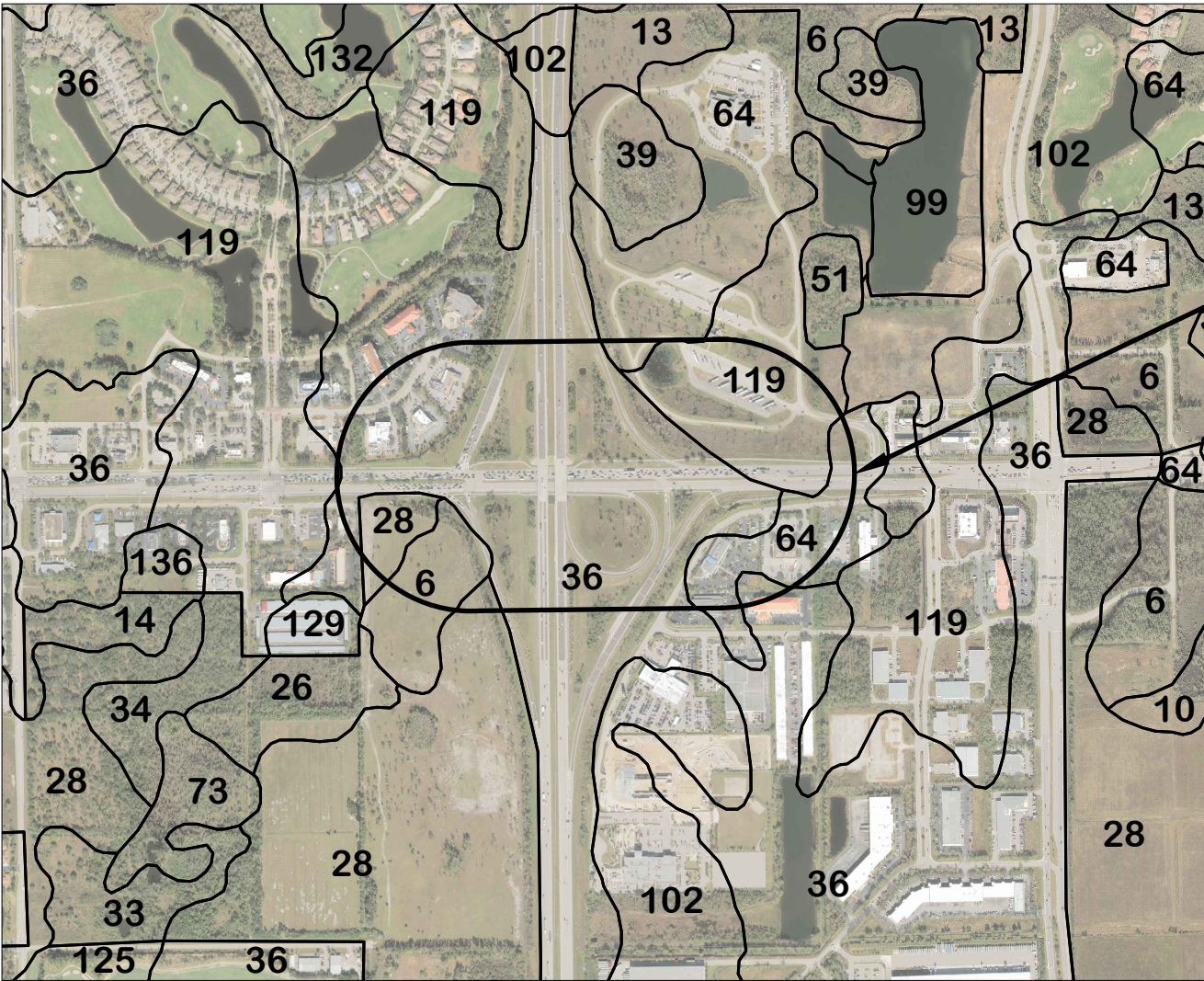
Trevor J. Bianco, E.I.
Geotechnical Engineer Intern



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

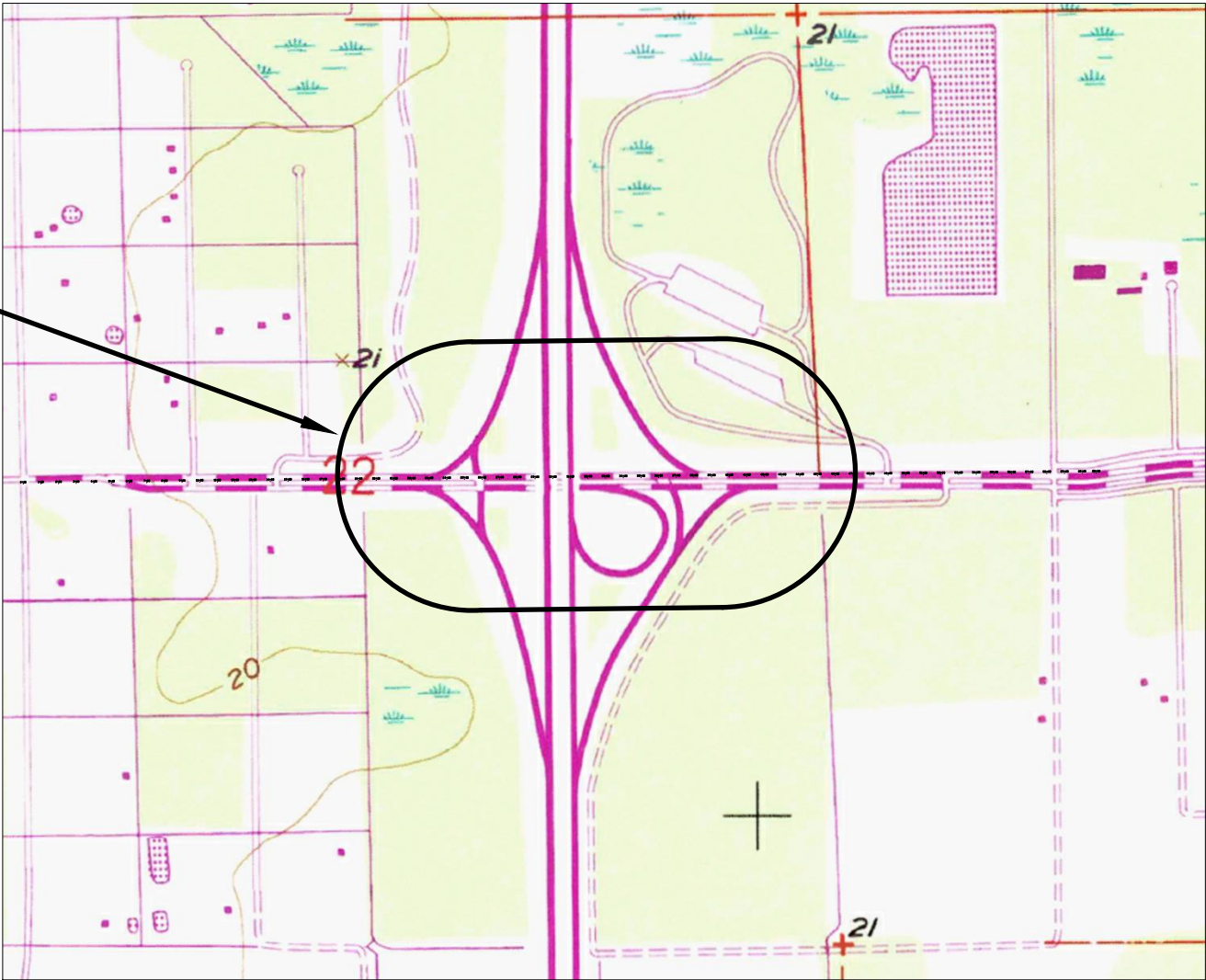
Attachments: USDA Soil Survey Map
Summary of USDA Soil Survey
Boring Location Plan
Soil Profiles

USDA SOIL SURVEY MAP



REFERENCE: USDA SOIL SURVEY OF LEE COUNTY, FLORIDA

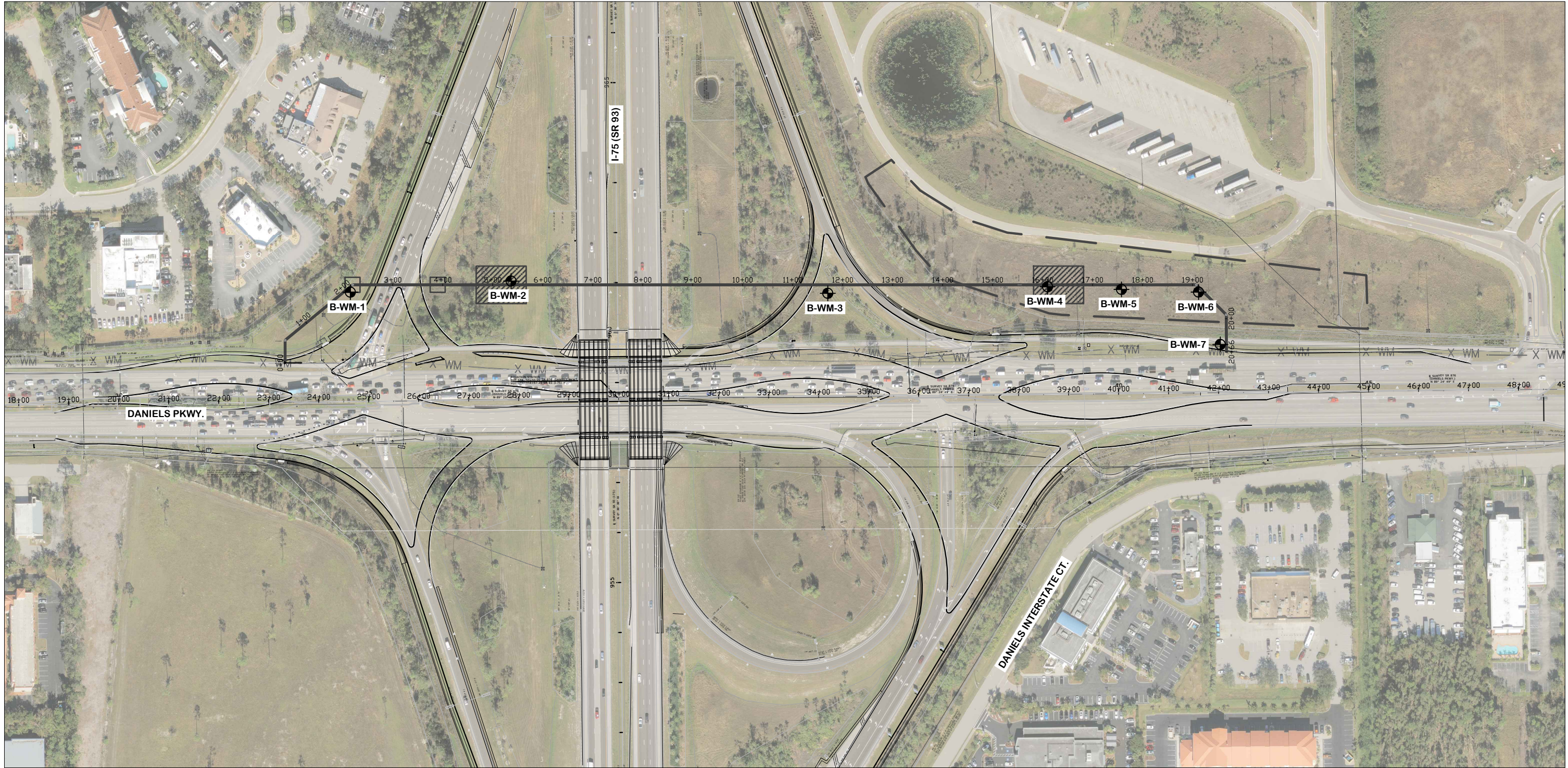
USGS QUADRANGLE MAP



REFERENCE: "FORT MYERS SE, FLORIDA" USGS QUADRANGLE MAP

TOWNSHIP: 45 S
RANGE: 25 E
SECTION: 22

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
(36) Immokalee, Urban land	0-9	SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-6.0	0.5-1.5	Jun-Nov
	9-36	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-6.0		
	36-55	SP-SM, SM	A-3, A-2-4	0.6 - 2.0	3.5-6.0		
	55-80	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	3.5-6.0		
	The USDA Soil Survey does not contain information for the Urban Land component.						
(119) Malabar, Urban land	0-5	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-7.0	0.3-1.5	July-Oct
	5-17	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-8.0		
	17-42	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-8.0		
	42-59	CL, SC-SM, SC	A-2-4, A-4, A-6	2.0 - 6.0	3.3-8.0		
	59-80	SM	A-2-4, A-4	6.0 - 20.0	5.1-8.0	The USDA Soil Survey does not contain information for the Urban Land component.	



NOTE: BASE MAP PROVIDED BY KIMLEY-HORN

BORING LOCATION PLAN



LEGEND

 APPROXIMATE LOCATION OF SPT BORING

DRAWN BY:
SW
CHECKED BY:
TB

APPROVED BY:
TEM
DATE:
JUN 2024

ENGINEER OF RECORD:
THOMAS E. MUSGRAVE, JR., P.E.
FLORIDA LICENSE NO.:
81669



TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355

SCALE:
NOTED

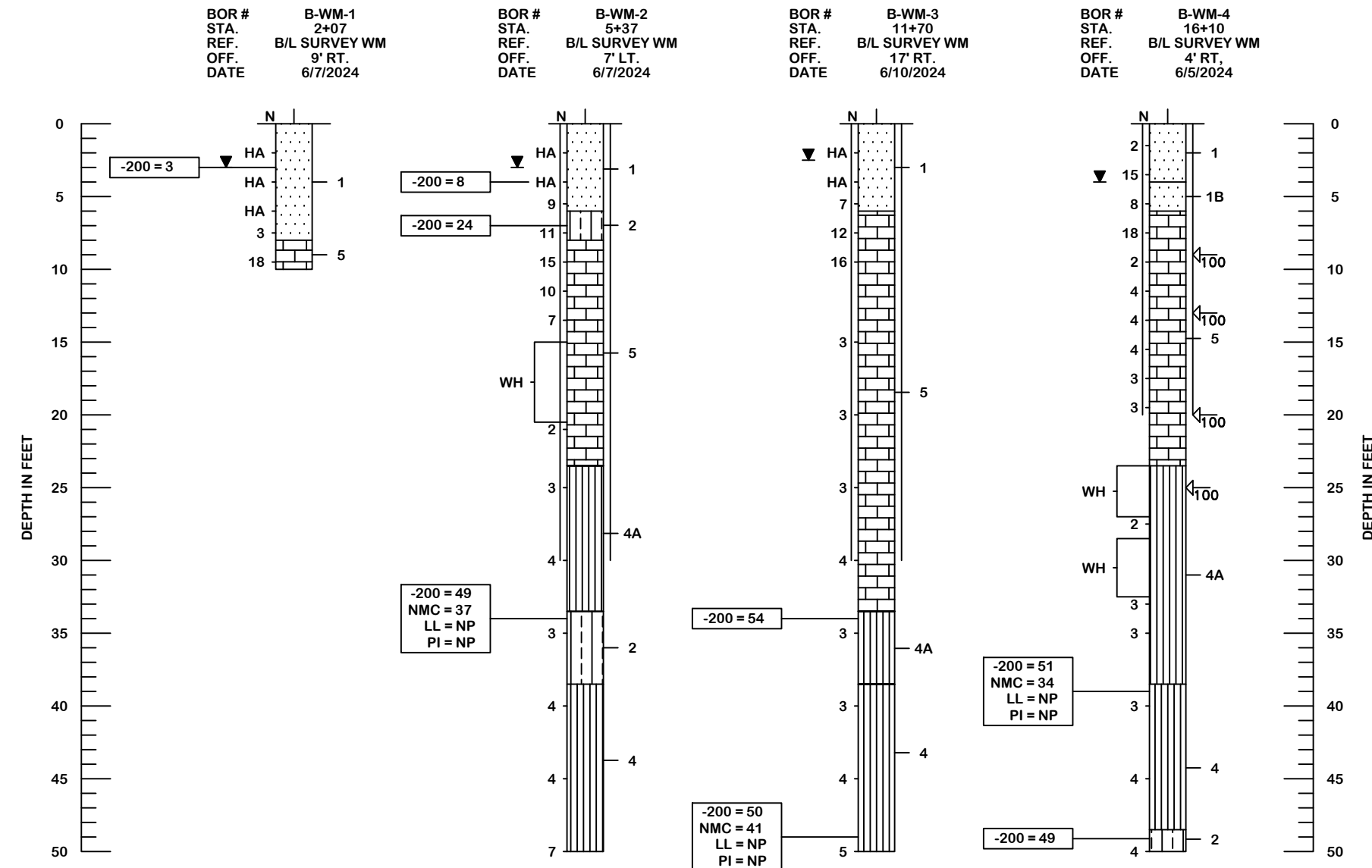
PROJECT NUMBER:
6511-24-115

GEOTECHNICAL ENGINEERING SERVICES
DANIELS PARKWAY WATER MAIN RELOCATION
LEE COUNTY, FLORIDA

SHEET 2

SOIL PROFILES

LEGEND



- 1 LIGHT GRAY TO GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
- 2 LIGHT GRAY TO GRAY TO BROWN SILTY SAND (SM)
- 3 LIGHT GRAY TO GRAY TO BROWN CLAYEY SAND (SC)
- 4 LIGHT GRAY TO GRAY SILT (ML/MH)
- 5 WEATHERED LIMESTONE/CAPROCK
- A - WITH CALCAREOUS CLAY AND/OR WEATHERED LIMESTONE FRAGMENTS
- B - WITH SHELL
- ▽ GROUNDWATER LEVEL ENCOUNTERED DURING INVESTIGATION
- N SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
- SP UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
- HA HAND AUGERED TO VERIFY UTILITY CLEARANCES
- WH FELL UNDER WEIGHT OF ROD AND HAMMER
- || CASING
- 100 LOSS OF CIRCULATION OF DRILLING FLUID (100%)
- B/L SURVEY WM BASELINE SURVEY OF THE WATER MAIN EXTENSION
- 200 PERCENT PASSING #200 SIEVE
- NMC NATURAL MOISTURE CONTENT (%)
- LL LIQUID LIMIT (%)
- PI PLASTICITY INDEX (%)
- NP NON PLASTIC
- NOTE: WEATHERED LIMESTONE/CAPROCK WAS ENCOUNTERED WITHIN THE BORINGS PERFORMED. EXCAVATIONS INTO AND/OR THROUGH THESE MATERIALS WILL BE DIFFICULT AND MAY REQUIRE NON-CONVENTIONAL CONSTRUCTION TECHNIQUES AND SPECIALIZED EQUIPMENT. VARIATIONS IN THE DEPTH AND STRENGTH OF THIS MATERIAL SHOULD BE ANTICIPATED.

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE CONCRETE SLIGHTLY AGGRESSIVE
SUBSTRUCTURE STEEL SLIGHTLY AGGRESSIVE

SOIL TEST RESULTS

RESISTIVITY 6,000 to 13,000 OHM-CM
CHLORIDES 15 PPM
SULFATES 21 to 63 PPM
pH 8.1 TO 8.4

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

DRAWN BY:
SW

CHECKED BY:
TB

APPROVED BY:
TEM

DATE:
JUN 2024

ENGINEER OF RECORD:
THOMAS E. MUSGRAVE, JR., P.E.
FLORIDA LICENSE NO.:
81669



SCALE:
NOTED

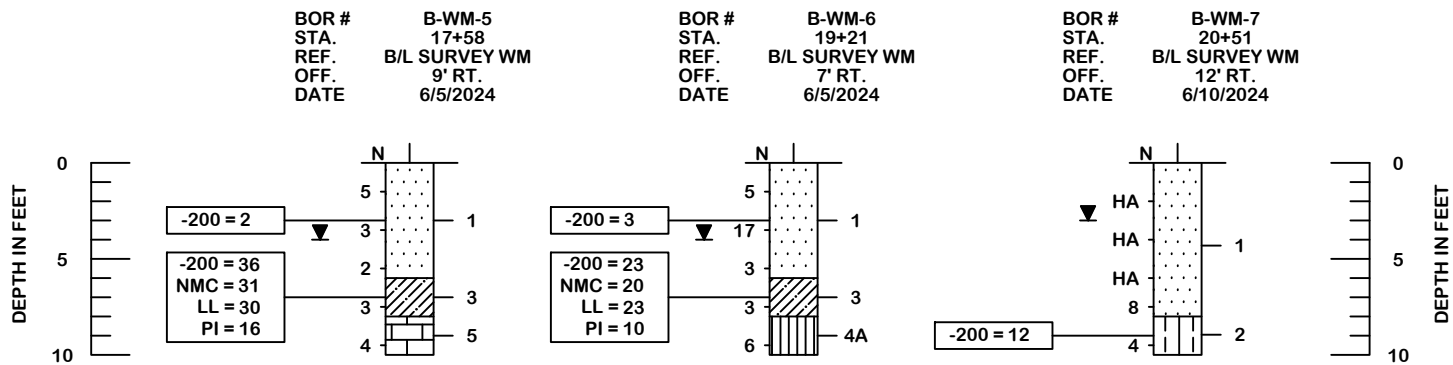
PROJECT NUMBER:
6511-24-115

GEOTECHNICAL ENGINEERING SERVICES
DANIELS PARKWAY WATER MAIN RELOCATION
LEE COUNTY, FLORIDA

SHEET 3

SOIL PROFILES

LEGEND



- 1 LIGHT GRAY TO GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
- 2 LIGHT GRAY TO GRAY TO BROWN SILTY SAND (SM)
- 3 LIGHT GRAY TO GRAY TO BROWN CLAYEY SAND (SC)
- 4 LIGHT GRAY TO GRAY SILT (ML/MH)
- 5 WEATHERED LIMESTONE/CAPROCK
- A - WITH CALCAREOUS CLAY AND/OR WEATHERED LIMESTONE FRAGMENTS
- B - WITH SHELL
- ▽ GROUNDWATER LEVEL ENCOUNTERED DURING INVESTIGATION
- N SPT N-VALUE IN BLOWS/FOOT FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED)
- SP UNIFIED SOIL CLASSIFICATION SYSTEM (ASTM D 2488) GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW
- HA HAND AUGERED TO VERIFY UTILITY CLEARANCES
- WH FELL UNDER WEIGHT OF ROD AND HAMMER
- CASING
- 100 LOSS OF CIRCULATION OF DRILLING FLUID (100%)
- B/L SURVEY WM BASELINE SURVEY OF THE WATER MAIN EXTENSION
- 200 PERCENT PASSING #200 SIEVE
- NMC NATURAL MOISTURE CONTENT (%)
- LL LIQUID LIMIT (%)
- PI PLASTICITY INDEX (%)
- NP NON PLASTIC

NOTE: WEATHERED LIMESTONE/CAPROCK WAS ENCOUNTERED WITHIN THE BORINGS PERFORMED. EXCAVATIONS INTO AND/OR THROUGH THESE MATERIALS WILL BE DIFFICULT AND MAY REQUIRE NON-CONVENTIONAL CONSTRUCTION TECHNIQUES AND SPECIALIZED EQUIPMENT. VARIATIONS IN THE DEPTH AND STRENGTH OF THIS MATERIAL SHOULD BE ANTICIPATED.

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

ENVIRONMENTAL CLASSIFICATION

SUBSTRUCTURE CONCRETE SLIGHTLY AGGRESSIVE
SUBSTRUCTURE STEEL SLIGHTLY AGGRESSIVE

SOIL TEST RESULTS

RESISTIVITY 6,000 to 13,000 OHM-CM
CHLORIDES 15 PPM
SULFATES 21 to 63 PPM
pH 8.1 TO 8.4

DRAWN BY:
SW

CHECKED BY:
TB

APPROVED BY:
TEM

DATE:
JUN 2024

ENGINEER OF RECORD:
THOMAS E. MUSGRAVE, JR., P.E.
FLORIDA LICENSE NO.:
81669



TIERRA
7351 Temple Terrace Highway
Tampa, Florida 33637
Phone: 813-989-1354 Fax: 813-989-1355

SCALE:
NOTED

PROJECT NUMBER:
6511-24-115

GEOTECHNICAL ENGINEERING SERVICES
DANIELS PARKWAY WATER MAIN RELOCATION
LEE COUNTY, FLORIDA

SHEET 4

March 5, 2024

Kimley-Horn and Associates
2 Alhambra Plaza, Suite 500
Coral Gables, FL 33134

Attn: Mr. Artem Strunnikov, P.E.

**RE: Roadway Soil Survey Report
Phase II Roadway Plans Submittal
I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway
Lee County, Florida
FPID No.: 446296-2-52-01
Kimley-Horn Project No.: 143435001
Tierra Project No. 6511-21-320**

Mr. Strunnikov:

Tierra, Inc. (Tierra) has completed a Roadway Soil Survey Report for the above-referenced project. This report is being provided to support the Phase II Roadway Plans Submittal. The results of our field exploration program and laboratory testing performed to date and subsequent geotechnical recommendations are presented herein. As the project progresses this report will be updated based on the additional field exploration program currently being conducted and the latest project information.

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

Sincerely,

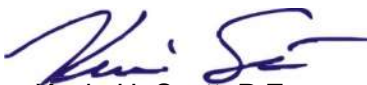
TIERRA, INC.



Trevor J. Bianco, E.I.
Geotechnical Engineering Intern



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



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

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Summary of USDA Soil Survey Information

APPENDIX B

Roadway Soil Survey Sheet
Boring Location Plan Sheets
Roadway Soil Profiles Sheets
Pond Soil Survey Sheets

APPENDIX C

Summary of Seasonal High Groundwater Table Estimates for Roadway and Ponds
Summary of Groundwater Table Measurements from Piezometers

APPENDIX D

Summary of Laboratory Test Results for Soil Classification
Summary of Laboratory Test Results for Environmental Classification

APPENDIX E

Summary of Resilient Modulus Test Results
(Provided by FDOT State Materials Office in Gainesville, Florida)

1.0 PROJECT INFORMATION

1.1 Project Authorization

Authorization to proceed with this project was issued by KHA in accordance with the Subconsultant Agreement for the referenced project.

1.2 Project Description

The project, as we understand it, consists of providing operational improvements to the I-75/Daniels Parkway Interchange in Lee County, Florida. The proposed improvements will include re-configuring the existing interchange into a new Diverging Diamond Interchange (DDI) with associated ramp alignments, drainage, signalization and signing facilities.

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 roadway and drainage improvements for the Daniels Parkway DDI project and is to be included with the Phase II Plans submittal.

1.3 General Site Conditions

Currently, the project site consists of three-lane travel-way urbanized roadway sections in both the Westbound and Eastbound directions. The existing interchange is a diamond configuration with one clover loop in the southeast quadrant that allows ingress to Northbound SR 93. Land use in the project vicinity generally consists of commercially developed property with limited residential and agricultural properties nearby.

2.0 PURPOSE AND SCOPE OF SERVICES

This geotechnical study was performed to obtain information on the existing subsurface conditions along the limits of the proposed roadway and stormwater improvements to assist in design of the construction plans for the project. 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) Natural Resources Conservation Services (NRCS). Reviewed topographic data obtained from the "Fort Myers SE, Florida" Quadrangle Map.
2. Conducted a visual reconnaissance of the project site and coordinated utility clearances via Sunshine State One Call.
3. Submitted a proposed boring location plan for the proposed roadway and pond improvements to the Florida Department of Transportation (FDOT) District Geotechnical Engineer for approval prior to commencing field work.
4. Performed a geotechnical field study to evaluate the existing subsurface conditions along the project alignments consisting of borings, subsurface sampling and field-testing.

5. Identified groundwater levels and estimated the Seasonal High Groundwater Table (SHGWT) at selected boring locations along the project alignments and within the proposed pond sites. Installed temporary piezometers at selected locations along the ramps of the project for the purpose of obtaining information regarding the existing groundwater levels.
6. Coordinated with the project surveyor to provide survey data (location and elevation) for the piezometers installed and borings performed along the project alignment and with the stormwater ponds where depth of the Seasonal High Groundwater Table (SHGWT) was estimated.
7. Visually classified and stratified recovered soil samples in the laboratory. Performed laboratory tests on selected representative samples to develop the soil legend for the project in accordance with the American Association of State Highway and Transportation Officials (AASHTO) soil classification system.
8. Collected bulk samples along the project alignments and transported the samples to the FDOT State Materials Office in Gainesville, Florida, for Resilient Modulus, M_R , testing.
9. Prepared this Roadway Soil Survey Report for the project.

3.0 REVIEW OF PUBLISHED DATA

3.1 Regional Geology

Lee County Geology was 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 with river flood plains and includes; 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 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 sand 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 USDA Soil Survey

Based on a review of the Lee County Soil Survey published by the USDA, it appears that there are fourteen (14) primary soil-mapping units noted along the project alignment and within the proposed pond sites. An illustration of the **USDA Soil Survey Map** and a summary of each soil unit 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 recent development in the project vicinity has modified soil conditions or surface/subsurface drainage.

3.3 USGS Quadrangle Maps

Based on a review of the USGS Quadrangle Map titled "Fort Myers SE, Florida", it appears that the project site natural elevations range from approximately +20 feet to +25 feet National Geodetic Vertical Datum of 1929 (NGVD 29) as illustrated on the **USGS Quadrangle Map** provided in **Appendix A**.

3.4 Potentiometric Surface Elevation

Based on a review of the "Potentiometric Surface of the Upper Floridan Aquifer" maps published by the USGS, the potentiometric surface elevation of the upper Floridan Aquifer in the project vicinity ranges up to approximately +40 to +50 feet, NGVD 1929.

As indicated in Section 3.3, the project site natural ground elevations range from approximately +20 to +25 feet NGVD 1929. Artesian conditions were not encountered at the time of our field

activities; however, the Contractor should be prepared to address artesian levels up to a head of +50 feet NGVD 1929.

4.0 SUBSURFACE EXPLORATION

4.1 Boring Location Plan and Utility Clearance

Prior to commencing our subsurface explorations, a boring location plan was produced and provided to FDOT for approval. The boring location plan was generated based on a review of the current design information and general guidance provided in the FDOT "Soils and Foundation Handbook" along with our engineering judgment. Following the FDOT approval, the test borings were located and staked in the field by a representative of Tierra using a hand-held non-survey grade Global Positioning System (GPS) device with a manufacturer's reported accuracy of ± 10 feet. Tierra then coordinated utility clearances for the test borings through Sunshine State One Call. Generally, the borings were performed at the proposed boring locations. When not possible due to access or utility constraints, the boring locations were altered, and the GPS coordinates of the offset boring locations were recorded on the boring logs.

The locations of the roadway and pond borings where the SHGWT depth was estimated for the project design were survey-located by the project surveyor. The project surveyor provided State Plane coordinates and elevations. The State Plane coordinates were then converted by Tierra to Station and offset using project design files provided by KHA. The remaining boring locations and elevations were determined using the project design files provided by KHA in conjunction with the GPS coordinates obtained by Tierra in the field. The **Boring Locations Plan** sheets depicting the locations of the borings performed to date are presented in **Appendix B**.

Utility clearances were coordinated by Tierra and updated as required prior to performing the soil borings to reduce the potential for damage to the underground utilities during the boring process.

4.2 Roadway and Pond Borings

To evaluate the subsurface conditions and groundwater table levels, over 170 hand auger borings were advanced to depths ranging from approximately 1½ to 7 feet below the existing ground surface and over 50 Standard Penetration Test (SPT) borings were performed to depths of 15 to 35 feet below the existing ground surface along the project alignments and within the proposed stormwater ponds.

The hand auger borings were performed by manually twisting and advancing a bucket auger into the ground, typically in 6-inch increments. As each soil type was revealed, representative samples were collected and returned to our office for confirmation of the field classification by a geotechnical engineer. Following completion of the borings, the auger holes were backfilled with sand and compacted.

The SPT borings were performed using mechanical drilling equipment utilizing 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. In general, the SPT borings were advanced by hand auger from the ground surface to depths of 4 to 6 feet to verify utility clearance. SPT resistance N values were then taken continuously to a depth of 10 feet and on intervals of 5 feet thereafter to the boring termination depth.

4.3 Piezometers

Tierra installed eight (8) piezometers to depths of approximately 4 to 5 feet below the existing ground surface along the ramps of the project. The purpose of the piezometers was to monitor groundwater levels to assist in estimating SHGWT levels. A summary table of the recorded water levels in the piezometers to date is included in **Appendix C**.

4.4 Bulk Sampling and LBR Testing

Bulk samples were retrieved for Resilient Modulus, M_R , testing at ten (10) locations along the roadway alignments of I-75, Daniels Parkway, and their respective ramps where asphalt pavement is planned for the project. In general, these samples were collected from depths within ½ foot to 2 feet of the existing ground surface. These samples were delivered to the State Materials Office in Gainesville for M_R testing. The results of these tests are provided in **Appendix E** along with the FDOT's recommendations on the design M_R value.

5.0 LABORATORY TESTING

5.1 General

Representative soil samples collected from the borings performed along the project alignments 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, fines content, organic content, 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.

5.2 Test Designation

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

- Fines Content Analyses - The fines content tests were conducted in general accordance with the FDOT test designation FM 1-T011 (AASHTO test designation T-088).
- 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).
- Organic Content - The organic content tests were conducted in general accordance with the FDOT test designation FM 1 T-267 (AASHTO test designation T-267).
- Natural Moisture Content - The moisture content tests were conducted in general accordance with the AASHTO test designation T-265 (ASTM test designation D-2216).
- Environmental Corrosion - The 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 alignments and pond sites is presented on the **Roadway Soil Survey** sheet in **Appendix B**. These sheets include ranges of laboratory test results for different stratum soil samples collected from borings performed along the project alignment. A detailed summary of the laboratory test results performed for this report is presented in **Appendix D**.

6.0 RESULTS OF SUBSURFACE EXPLORATION

6.1 General Soil Conditions

The soil types encountered during this exploration have been assigned a stratum number. The stratum number and soil types associated with the roadway portion of this project are provided below:

Stratum Number	Typical Soil Description	AASHTO Classification
1	Gray to Light Brown to Brown Sand to Sand with Silt, occasionally with Limestone/Caprock fragments and/or limerock, shell, and/or cemented sand/hardpan	A-3
2	Gray to Light Brown to Brown Silty Sand, occasionally with Limestone/Caprock fragments and/or limerock, and/or shell	A-2-4
3	Gray to Light Brown to Brown Silty Sand to Clayey-Silty Sand, occasionally with Limestone/Caprock fragments and/or limerock, and/or shell	A-2-4
4	Light Brown to Brown Clayey Sand to Silt to Clay, occasionally with Limestone/Caprock fragments and/or limerock, and/or shell	A-2-6/A-4/A-6
5	Dark Brown organic Sand to Organic Silty Sand to Muck	A-8
6	Calcareous Clay to Weathered Limestone/Caprock	--- ⁽¹⁾
⁽¹⁾ AASHTO does not provide classification for Limestone.		

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 within the same boring not considered pertinent to our engineering evaluation may have been abbreviated or omitted for clarity. The boring profiles represent the conditions at the particular boring location and variations do occur among the borings.

The results of the borings performed for this project along with the boring location plans are presented in **Appendix B** of this report.

6.2 Groundwater

The groundwater table was recorded at each of the boring locations during our field exploration. The depths to the groundwater table along the project alignments, when encountered, were found to range from at or above the existing ground surface to approximately 7 feet below the existing grades at the boring locations. The groundwater table measured at each of the boring locations is presented on the **Roadway Soil Profiles** sheets in **Appendix B**. Within some boring locations, the groundwater table was not encountered prior to termination of the boring. As a result, GNE (Groundwater Not Encountered) is indicated on those soil profiles. Boring WB-30L was performed within the embankment of the I-75 roadway alignment and the groundwater table was not apparent prior to the introduction of drilling fluid. Therefore, Groundwater Not Apparent (GNA) is depicted adjacent to the boring profile.

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 Estimates

Seasonal high groundwater table levels were estimated at selected boring locations along the project and within the proposed pond sites. The estimated seasonal high groundwater table (SHGWT) levels ranged from at or above the existing ground surface to approximately 2½ feet below existing grades. The estimated SHGWT levels along the project alignment and within the proposed pond sites are presented on the **Roadway Soil Profiles** and **Pond Soil Survey** sheets in **Appendix B** and summarized in the **Summary of Seasonal High Groundwater Table Estimates for Roadway and Ponds** tables in **Appendix C**.

The SHGWT levels were estimated based on a review of the soil samples, measured groundwater levels in the borings, the Lee County, Florida USDA Soil Survey information, and the surrounding topography.

7.0 ENGINEERING EVALUATIONS AND RECOMMENDATIONS

7.1 General

In general, the existing subsurface soils encountered in the borings performed along the project alignments are suitable for supporting the proposed roadway improvements after proper subgrade preparation.

All earthwork activities including the site preparation, clearing and grubbing, removal and utilization/placement of soils, compaction of subgrade soils and selection of backfill materials should be accomplished in accordance with the FDOT Standards and Specifications.

7.2 Organic Soils

Organic sandy soils (Stratum 5, A-8) were encountered within some borings performed during the subsurface exploration. Based on the results of borings SH-1212L, SH-37R, SH-69R and SH-930L, the organic soils were encountered outside the project limits, outside the roadway embankment control line and at isolated locations. Therefore, removal limits are not depicted in the plans at this time. Additional delineation of the isolated areas where organic soils were encountered within the project limits and within the control line is being performed and will be presented in subsequent submittals. However, this material if encountered should be considered as muck and should be removed in accordance with FDOT Standard Plans Index 120-002 and utilized in accordance FDOT Standard Plans Index 120-001.

7.3 Shallow Weathered Limestone/Caprock

Many of the hand auger borings performed along the roadway alignments and within proposed ponds encountered auger refusal conditions on near-surface limestone, colloquially known as "caprock" (Stratum 6). Weathered limestone/caprock (Stratum 6) was also encountered within SPT borings performed within the project limits at depths ranging from approximately 4 to 20 feet below existing grades. The presence of caprock is well known in the geographic area and is reported within 12 to 40 inches of the ground surface in the USDA Soil Survey at various locations along the project alignment.

7.4 Embankment Settlement

Embankment fill soils should be placed and compacted in accordance with the project specifications. Based on a review of the cross sections, maximum proposed embankment heights are on the order of 4 feet or less. For the anticipated embankment construction, we expect total settlements on the order of 1 inch or less, and differential settlements on the order of half the total settlements. Total and differential settlements are expected to occur predominately during construction.

7.5 Slope Stability

Based on the cross-sectional geometry information, the proposed embankment fill slopes and cuts appear to have side slopes of 2 horizontal to 1 vertical (2H:1V) or flatter. Based on soil conditions encountered along the project alignments, Tierra does not anticipate limitations to the proposed roadway performance with the proposed embankment slopes if the embankments are constructed in accordance with the FDOT Specifications.

7.6 Temporary Slopes and Trenches

Temporary side slopes and excavations 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. Excavated materials should not be stockpiled at the top of the slope within a horizontal distance equal to the excavation depth.

7.7 Groundwater Control

Groundwater was encountered above the existing ground surface during our field exploration at some boring locations. Depending upon groundwater levels at the time of construction, some form of dewatering may be required to achieve the required compaction. Due to shallow groundwater levels, seepage may enter the bottom and sides of excavated areas. Such seepage will act to loosen soil 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 the FDOT Specifications. In addition, shallow weathered limestone/caprock was encountered along the project alignments. This material is porous and will be difficult to dewater.

7.8 Pavement Design Considerations

The design of the pavement section should be in accordance with the FDOT Flexible Pavement Design Manual, FDOT Rigid Pavement Design Manual, and FDOT Specifications.

As previously mentioned, Resilient Modulus (M_R) tests were performed by the FDOT State Materials Office in Gainesville on soil samples obtained along the proposed alignment. As addressed in the FDOT result summary letter provided in **Appendix E**, a design M_R value of 10,500 psi is recommended by the FDOT for use in pavement design. It should be noted that the design M_R value is based on samples obtained of the in-situ soils from ½ foot to 2 feet of the existing ground surface and may not be representative of borrow material which may support some of the proposed roadway.

In accordance with FDOT guidelines, grades for this type of roadway should be set to provide a minimum separation 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 ditches important. The choice of base

material should consider the relationship of final roadway grades and the bottom of the base to the estimated seasonal high groundwater table levels.

7.9 On-Site Soil Suitability

The general suitability and evaluations of the soils encountered during our geotechnical exploration is presented on the **Roadway Soil Survey** sheet in **Appendix B**. FDOT Standard Plans, Indices 120-001 and 120-002 of the Design Standards should be consulted to determine the specific use/suitability of the soil types present within the project limits.

7.10 General Roadway Construction

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

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 construction, and our recommendations 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.

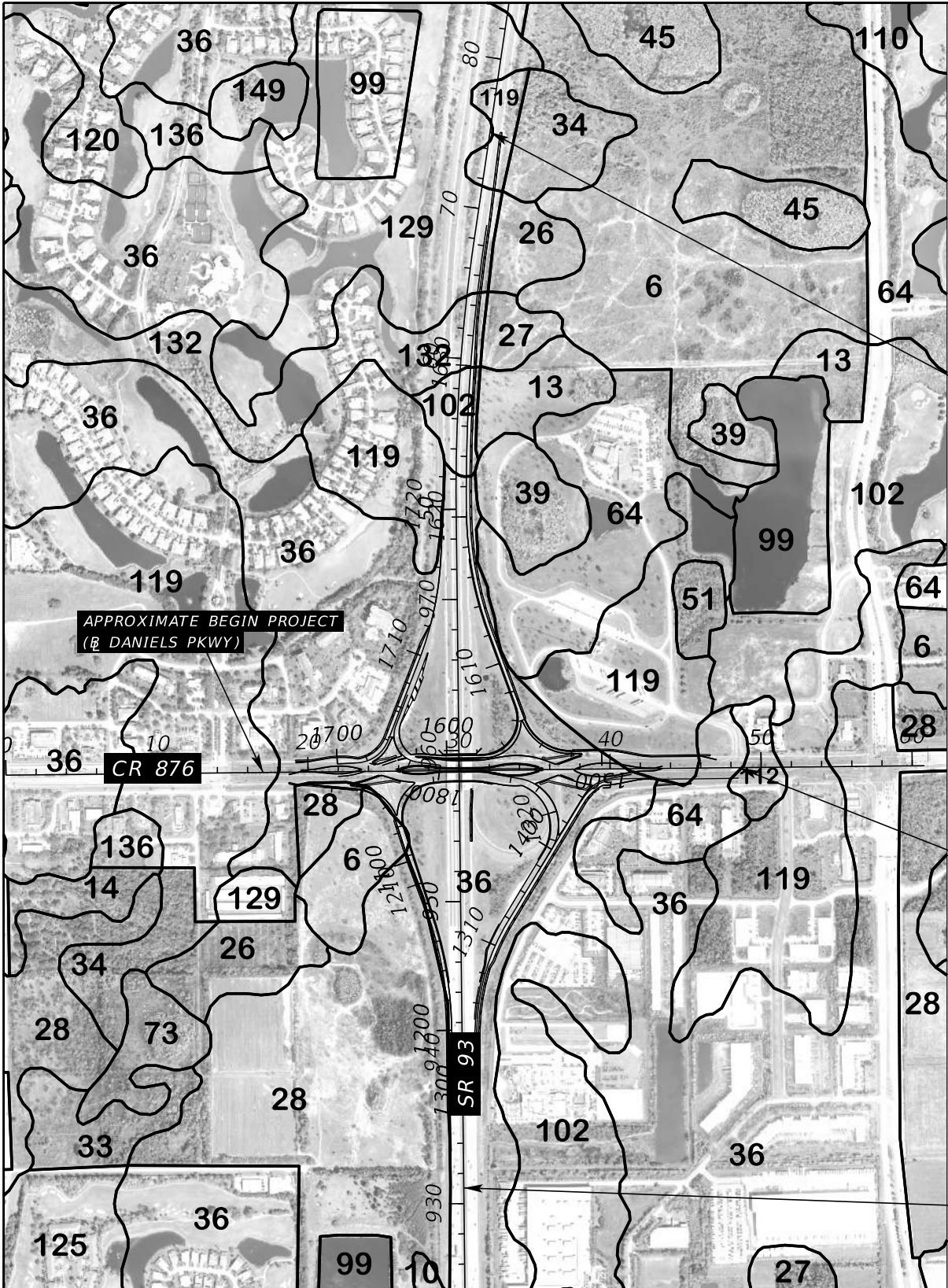
The scope of the exploration was intended to evaluate soil conditions within the influence of the proposed roadway construction. The analyses and recommendations submitted in this report are based upon the anticipated location and type of construction and data obtained from the soil borings performed 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, or 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 Kimley-Horn and Associates and FDOT.

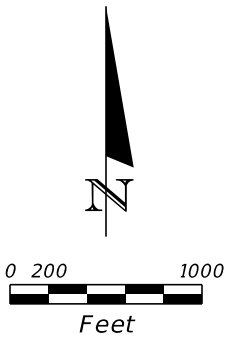
APPENDIX A

USDA Soil Survey and USGS Quadrangle Maps

Summary of USDA Soil Survey Information



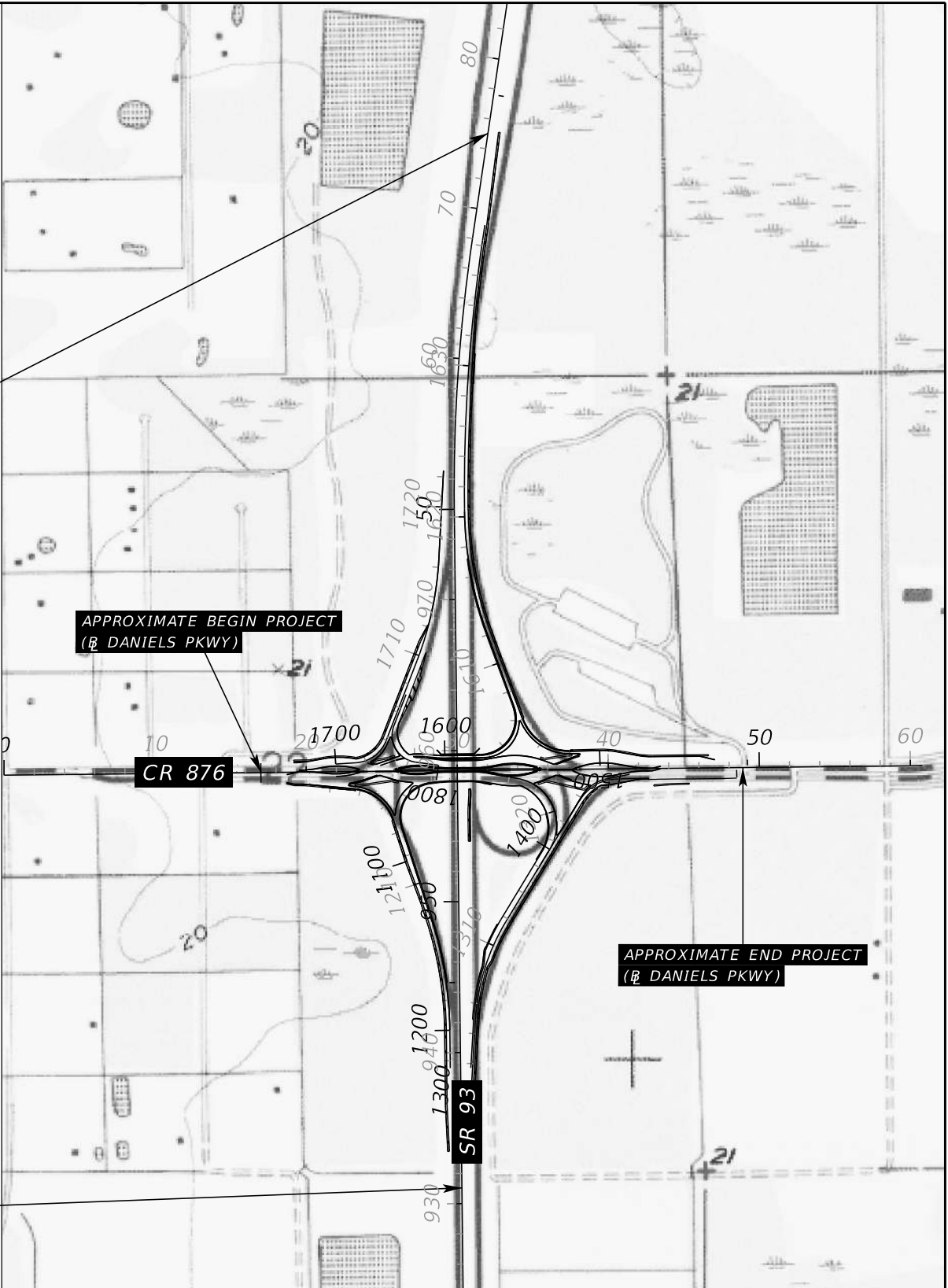
REFERENCE: USDA SOIL SURVEY OF LEE COUNTY, FLORIDA



APPROXIMATE END PROJECT
(SURVEY SR 93)

APPROXIMATE END PROJECT
(DANIELS PKWY)

APPROXIMATE BEGIN PROJECT
(SURVEY SR 93)



USGS QUADRANGLE MAP OF "FORT MYERS SE, FLORIDA"

TOWNSHIP: 45S
RANGE: 25E
SECTION: 15, 22, 23, 27

REVISIONS				ENGINEER OF RECORD		STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			USDA SOIL SURVEY & USGS QUADRANGLE MAPS	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
						SR 93	LEE	446296-2-52-01		

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

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) Brynwood	0-2	SP-SM, SM	A-2-4	6.0 - 20.0	5.1-6.5	0.3-1.5	Jun-Oct
	2-7	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	5.6-7.8		
	7-12	SM, SP-SM	A-2-4	0.6 - 6.0	5.6-7.8		
	>12-22	Limestone		2.0 - 20.0	—		
(13) Cypress Lake	0-3	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	5.1-7.8	0.3-1.5	July-Oct
	3-14	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.6-7.8		
	14-25	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	6.0-7.8		
	25-30	SC-SM, SC	A-4, A-2-4, A-6	0.6 - 2.0	7.0-8.2		
	>30-40	Limestone		2.0 - 20.0	—		
(26) Pineda Pineda, Wet	0-1	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	4.5-7.3	0.5-1.5	Jun-Nov
	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-4, A-2-4, A-6	2.0 - 6.0	4.5-7.8		
	54-80	SP-SM, SM	A-2-4, A-3	2.0 - 6.0	5.1-7.8	+2.0-0.0	July-Oct
	0-1	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	4.5-7.3		
	1-5	SP-SM, SM	A-2-4, A-3	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-4, A-2-4, A-6	2.0 - 6.0	4.5-7.8		
54-80	SP-SM, SM	A-2-4, A-3	2.0 - 6.0	5.1-7.8			
(27) Pompano	0-12	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	4.5-7.8	+2.0-0.0	Jan-Feb, June-Dec
	12-80	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	4.5-7.8		
(28) Immokalee	0-9	SP-SM	A-3, A-2-4	6.0 - 20.0	3.5-6.0	0.5-1.5	Jun-Nov
	9-36	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-6.0		
	36-55	SP-SM, SM	A-3, A-2-4	0.6 - 2.0	3.5-6.0		
	55-80	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-6.0		
(34) Malabar	0-5	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-7.0	0.3-1.5	July-Oct
	5-17	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	5.1-8.0		
	17-42	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	5.1-8.0		
	42-59	SC-SM, SC, CL	A-2-4, A-6, A-4	2.0 - 6.0	3.8-8.0		
	59-80	SM	A-4, A-2-4	6.0 - 20.0	5.1-8.0		
(36) Immokalee Urban Land	0-9	SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-6.0	0.5-1.5	Jun-Nov
	9-36	SP, SP-SM	A-2-4, A-3	6.0 - 20.0	3.5-6.0		
	36-55	SP-SM, SM	A-3, A-2-4	0.6 - 2.0	3.5-6.0		
	55-80	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	3.5-6.0		
The USDA Soil Survey does not contain information for the Urban Land component.							
(39) Isles	0-5	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	5.1-7.3	+2.0-0.0	Jun-Nov
	5-21	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	5.1-7.3		
	21-47	CL, SC	A-6, A-2-4, A-7-6	0.6 - 2.0	5.6-8.4		
	>47-57	Limestone		2.0 - 20.0	—		
(64) Brynwood Urban Land	0-2	SP-SM, SM	A-2-4	6.0 - 20.0	5.1-6.5	0.3-1.5	Jun-Oct
	2-7	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	5.6-7.8		
	7-12	SM, SP-SM	A-2-4	0.6 - 6.0	5.6-7.8		
	>12-22	Limestone		2.0 - 20.0	—		
	The USDA Soil Survey does not contain information for the Urban Land component.						
(102) Cypress Lake Urban Land	0-3	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	5.1-8.4	0.3-1.5	July-Oct
	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-6, A-4, A-2-4	0.6 - 2.0	7.0-8.6		
	>30-40	Limestone		2.0 - 20.0	—		
The USDA Soil Survey does not contain information for the Urban Land component.							

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
(112) Floridana Urban Land	0-21	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	5.6-8.4	+2.0-0.0	Jan-Mar, May-Dec
	21-25	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	5.6-8.4		
	25-60	CL, SC-SM	A-4, A-6, A-7-6	0.1 - 0.2	5.6-8.4		
	60-80	CL, SC-SM	A-4, A-6, A-7-6	0.1 - 0.2	5.6-8.4		
	The USDA Soil Survey does not contain information for the Urban Land component.						
(119) Malabar Urban Land	0-5	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-7.0	0.3-1.5	July-Oct
	5-17	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-8.0		
	17-42	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-8.0		
	42-59	CL, SC-SM, SC	A-2-4, A-4, A-6	2.0 - 6.0	3.3-8.0		
	59-80	SM	A-2-4, A-4	6.0 - 20.0	5.1-8.0		
The USDA Soil Survey does not contain information for the Urban Land component.							
(129) Pineda Urban Land	0-1	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	4.5-7.3	0.5-1.5	Jun-Nov
	1-5	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	4.5-7.3		
	5-36	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	4.5-7.3		
	36-54	CL, SC, SC-SM	A-2-4, A-6, A-4	2.0 - 6.0	4.5-7.8		
	54-80	SP-SM, SM	A-2-4, A-3	2.0 - 6.0	5.1-7.8		
The USDA Soil Survey does not contain information for the Urban Land component.							
(132) Pompano Urban Land	0-12	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	4.5-7.8	+2.0-0.0	Jan-Feb, Jun-Dec
	12-80	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	4.5-7.8		
The USDA Soil Survey does not contain information for the Urban Land component.							

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
(112) Floridana Urban Land	0-21	SP-SM, SM	A-2-4, A-3	6.0 - 20.0	5.6-8.4	+2.0-0.0	Jan-Mar, May-Dec
	21-25	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	5.6-8.4		
	25-60	CL, SC-SM	A-4, A-6, A-7-6	0.1 - 0.2	5.6-8.4		
	60-80	CL, SC-SM	A-4, A-6, A-7-6	0.1 - 0.2	5.6-8.4		
	The USDA Soil Survey does not contain information for the Urban Land component.						
(119) Malabar Urban Land	0-5	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-7.0	0.3-1.5	July-Oct
	5-17	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-8.0		
	17-42	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	5.1-8.0		
	42-59	CL, SC-SM, SC	A-2-4, A-4, A-6	2.0 - 6.0	3.3-8.0		
	59-80	SM	A-2-4, A-4	6.0 - 20.0	5.1-8.0		
The USDA Soil Survey does not contain information for the Urban Land component.							
(129) Pineda Urban Land	0-1	SM, SP-SM	A-2-4, A-3	6.0 - 20.0	4.5-7.3	0.5-1.5	Jun-Nov
	1-5	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	4.5-7.3		
	5-36	SM, SP-SM	A-3, A-2-4	6.0 - 20.0	4.5-7.3		
	36-54	CL, SC, SC-SM	A-2-4, A-6, A-4	2.0 - 6.0	4.5-7.8		
	54-80	SP-SM, SM	A-2-4, A-3	2.0 - 6.0	5.1-7.8		
The USDA Soil Survey does not contain information for the Urban Land component.							
(132) Pompano Urban Land	0-12	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	4.5-7.8	+2.0-0.0	Jan-Feb, Jun-Dec
	12-80	SP-SM, SM	A-3, A-2-4	6.0 - 20.0	4.5-7.8		
The USDA Soil Survey does not contain information for the Urban Land component.							

APPENDIX B

Roadway Soil Survey Sheet

Boring Location Plan Sheets

Roadway Soil Profiles Sheets

Pond Soil Survey Sheets

DATE OF SURVEY: FEBRUARY 2023 TO MARCH 2024

SURVEY MADE BY: TIERRA, INC.

SUBMITTED BY: THOMAS E. MUSGRAVE, JR., P.E.

STATE OF FLORIDA

DEPARTMENT OF TRANSPORTATION

MATERIALS AND RESEARCH

DISTRICT: ONE

ROAD NO.: CR 876

COUNTY: LEE

FINANCIAL PROJECT ID : 446296-2-52-01

PROJECT NAME: I-75 (SR 93) AT CR 876 / SR 876 / DANIELS PARKWAY

CROSS SECTION SOIL SURVEY FOR THE DESIGN OF ROADS

SURVEY BEGINS MP : 7.112

SURVEY ENDS MP : 7.709

REFERENCE: BASELINE SURVEY DANIELS PARKWAY

SURVEY BEGINS MP : 15.898

SURVEY ENDS MP : 17.265

REFERENCE: BASELINE SURVEY SR 93

ORGANIC CONTENT		MOISTURE CONTENT		SIEVE ANALYSIS RESULTS						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	2	2.5-3.0	6	17-33	51	78-100	74-96	62-82	30-41	1-10	4	NP	NP	A-3	GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE/CAPROCK FRAGMENTS AND/OR LIMEROCK, AND/OR SHELL, AND/OR CEMENTED SAND/HARDPAN	13	2,100-28,000	15-30	<5-57	6.4-8.9
2	--	--	--	--	9	100	94-96	78-82	39-42	11-14	1	NP	NP	A-2-4	GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE/CAPROCK FRAGMENTS AND/OR LIMEROCK AND/OR SHELL	--	--	--	--	--
3	--	--	16	17-31	20	100	98	86	51	15-26	16	NP-26	NP-9	A-2-4	GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO CLAYEY-SILTY SAND, OCCASIONALLY WITH LIMESTONE/CAPROCK FRAGMENTS AND/OR LIMEROCK AND/OR SHELL	--	--	--	--	--
4	--	--	5	35-40	5	--	--	--	--	45-83	5	NP-31	NP-18	A-2-6/A-4/A-6	LIGHT BROWN TO BROWN CLAYEY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE/CAPROCK FRAGMENTS AND/OR LIMEROCK AND/OR SHELL	--	--	--	--	--
5	4	5.9-13	4	37-57	4	--	--	--	--	7-26	--	--	--	A-8	DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK	--	--	--	--	--
6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK	--	--	--	--	--

EMBANKMENT AND SUBGRADE MATERIAL

STRATA BOUNDARIES ARE APPROXIMATE. MAKE FINAL CHECK AFTER GRADING.

NOTES:

1. THE MATERIAL FROM STRATA 1 AND 2 (A-3/A-2-4) APPEARS SATISFACTORY FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH STANDARD PLANS, INDEX 120-001.

2. THE MATERIAL FROM STRATUM 3 (A-2-4 WITH ≥15% PASSING THE #200 SIEVE) APPEARS SATISFACTORY FOR USE IN THE EMBANKMENT WHEN UTILIZED IN ACCORDANCE WITH 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 4 (A-2-6/A-4/A-6) IS PLASTIC MATERIAL AND SHALL BE REMOVED IN ACCORDANCE WITH STANDARD PLANS, INDEX 120-002 AND UTILIZED IN ACCORDANCE WITH STANDARD PLANS, INDEX 120-001.

4. THE MATERIAL FROM STRATUM 5 (A-8) IS MUCK MATERIAL. BASED ON THE RESULTS OF THE BORINGS, STRATUM 5 WAS ENCOUNTERED OUTSIDE THE CONTROL LINE AND AT ISOLATED LOCATIONS. THEREFORE, REMOVAL LIMITS ARE NOT DEPICTED IN THE PLANS. THIS MATERIAL, IF ENCOUNTERED SHALL BE CONSIDERED AS MUCK AND SHALL BE REMOVED IN ACCORDANCE WITH STANDARD PLANS, INDEX 120-002 AND UTILIZED IN ACCORDANCE WITH STANDARD PLANS, INDEX 120-001.

5. THE MATERIAL FROM STRATUM 6 IS A NATURAL LIMESTONE/CAPROCK FORMATION. THIS MATERIAL IS ROCK AND IS LOCATED AT SHALLOW DEPTHS. 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. VARIATIONS IN THE DEPTH AND STRENGTH OF THESE MATERIALS SHOULD BE ANTICIPATED.

▽ - ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

▽⁺ - ESTIMATED SEASONAL HIGH GROUNDWATER AT OR ABOVE GRADE

▼ - GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

GNA- GROUNDWATER NOT APPARENT

GNE- GROUNDWATER NOT ENCOUNTERED

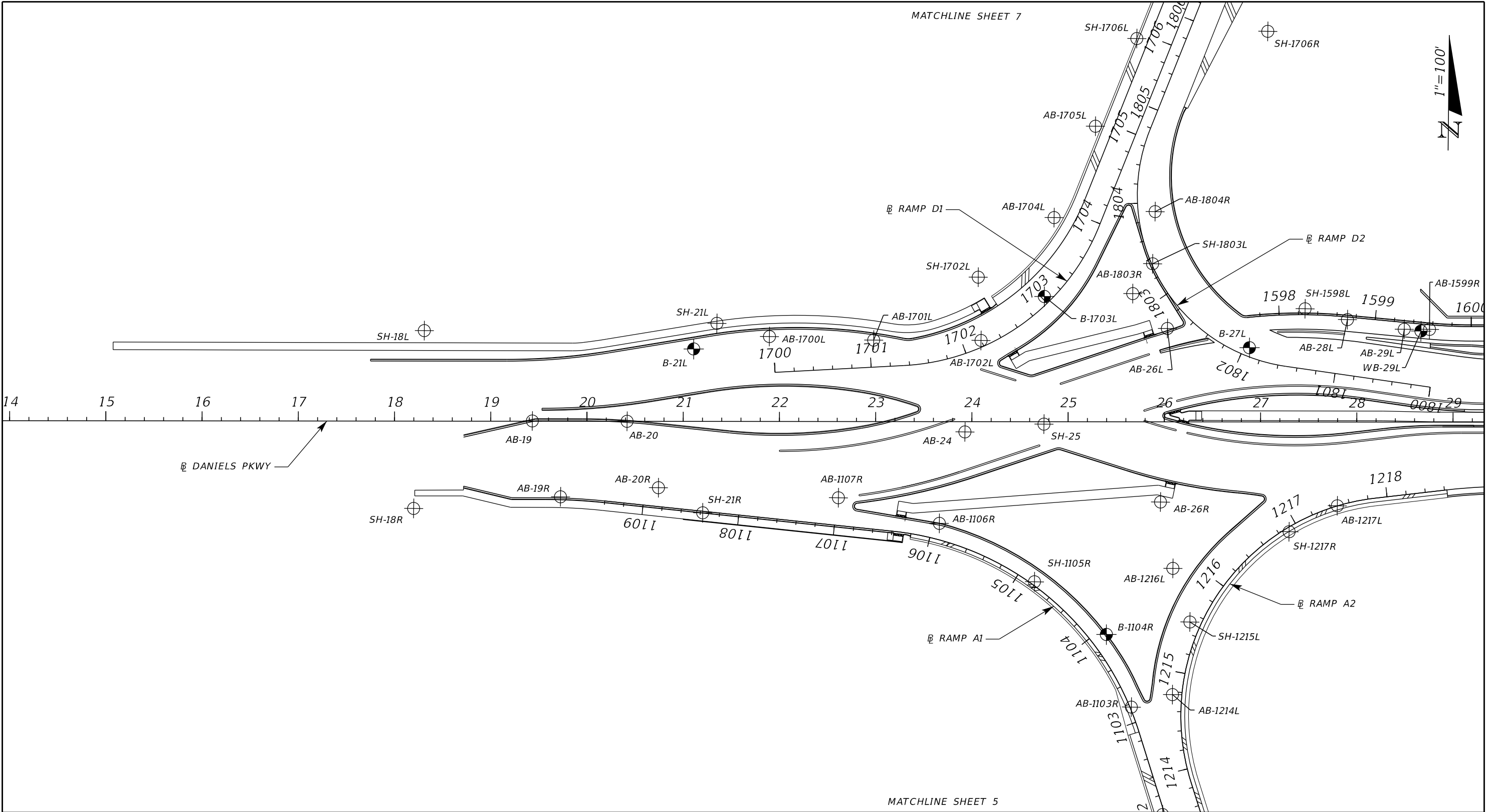
NP - NON-PLASTIC

"--" INDICATES AN UNMEASURED PARAMETER.

REVISIONS				ENGINEER OF RECORD		STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			ROADWAY SOIL SURVEY			SHEET NO.	
DATE	DESCRIPTION		DATE	DESCRIPTION		THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637	ROAD NO.	COUNTY				FINANCIAL PROJECT ID	
							SR 93	LEE				446296-2-52-01	

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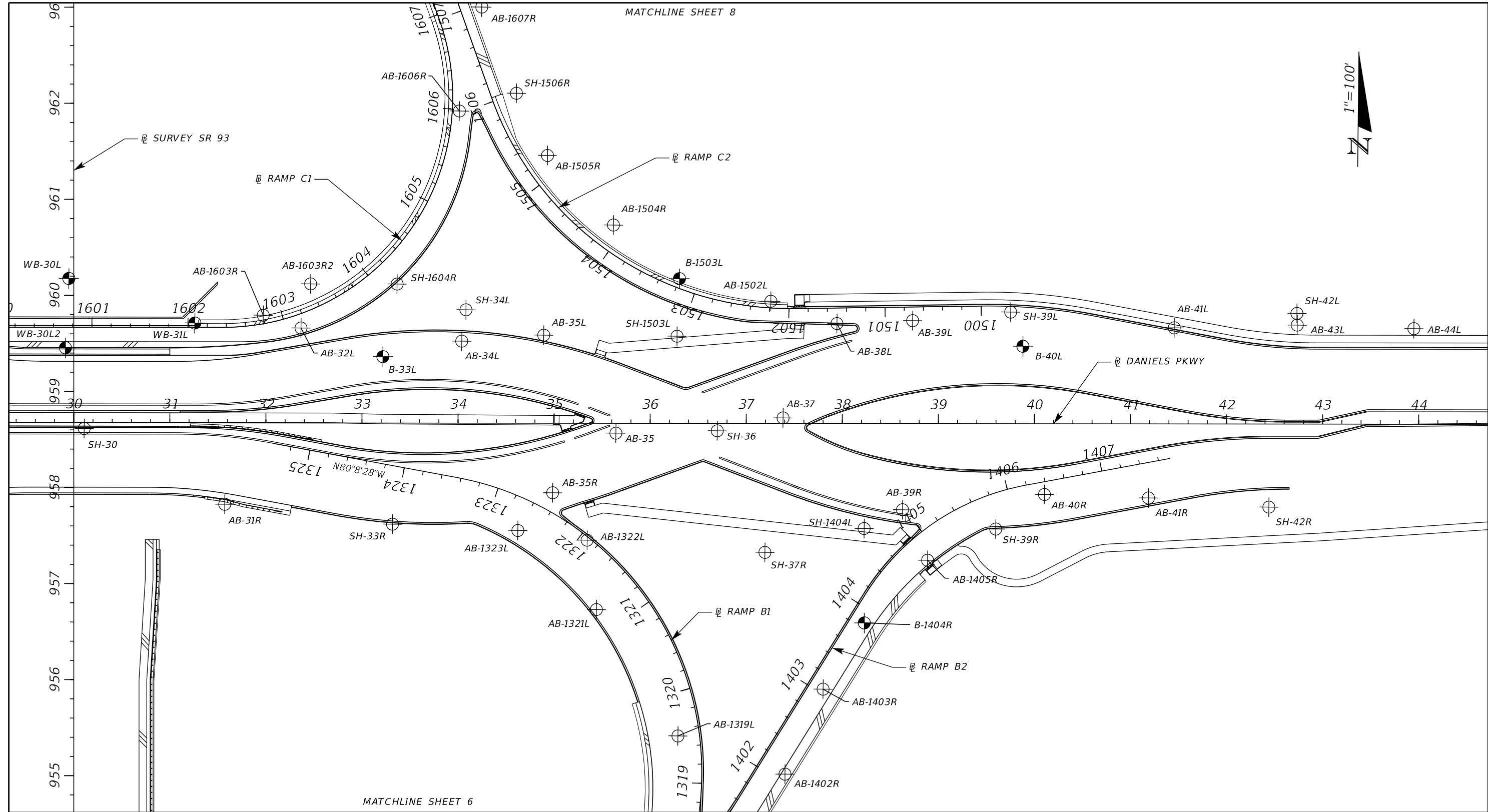
THE OFFICIAL RECORD OF THIS SHEET IS THE ELECTRONIC FILE DIGITALLY SIGNED AND SEALED UNDER RULE 61G15-23.004, F.A.C.



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- APPROXIMATE AUGER BORING LOCATION

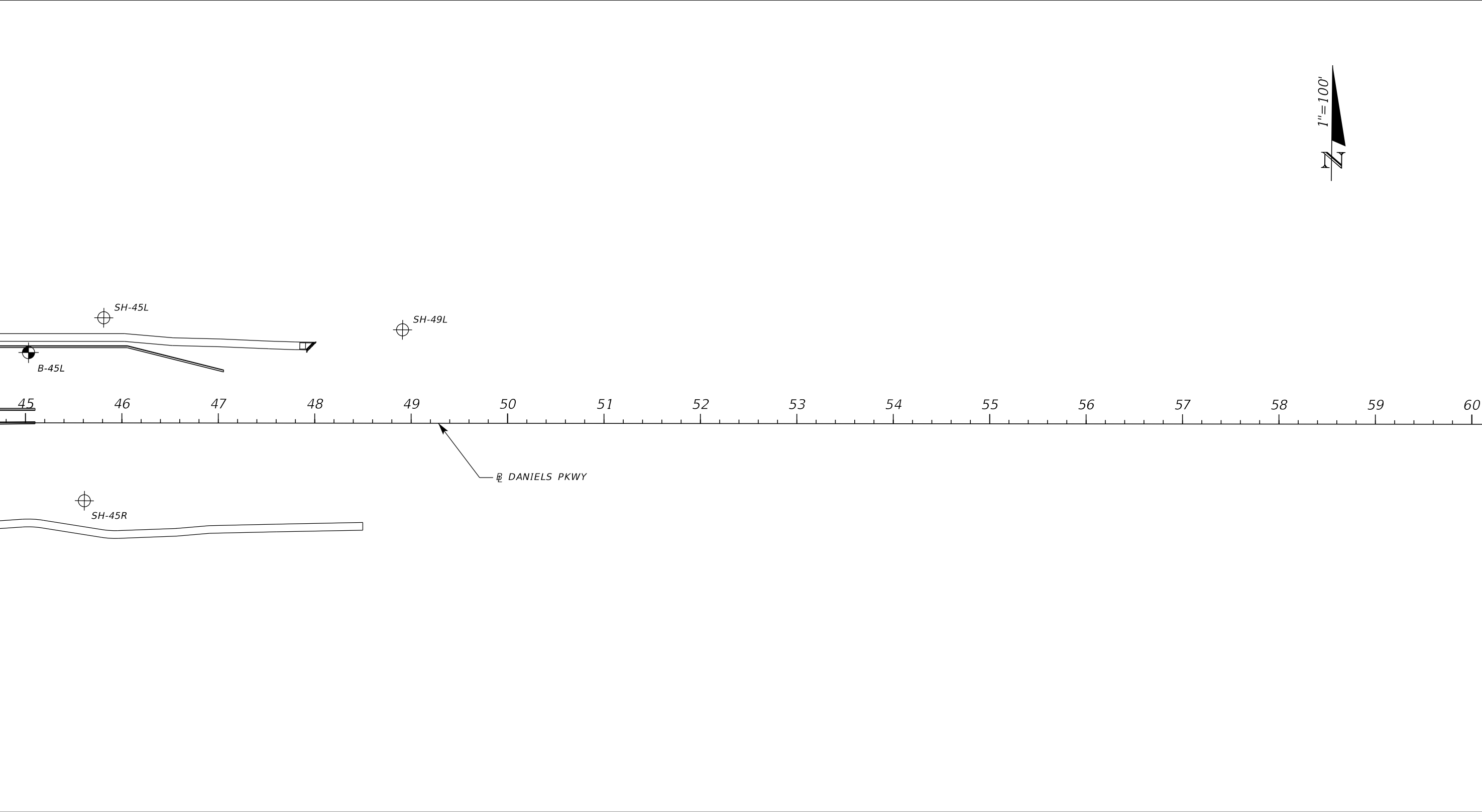
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DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
						SR 93	LEE	446296-2-52-01		



LEGEND

- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE AUGER BORING LOCATION

REVISIONS				ENGINEER OF RECORD		STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			BORING LOCATION PLAN (2)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
						SR 93	LEE	446296-2-52-01		



DATE

REVISIONS

DESCRIPTION

DATE

DESCRIPTION

ENGINEER OF RECORD

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

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.

COUNTY

FINANCIAL PROJECT ID

SR 93

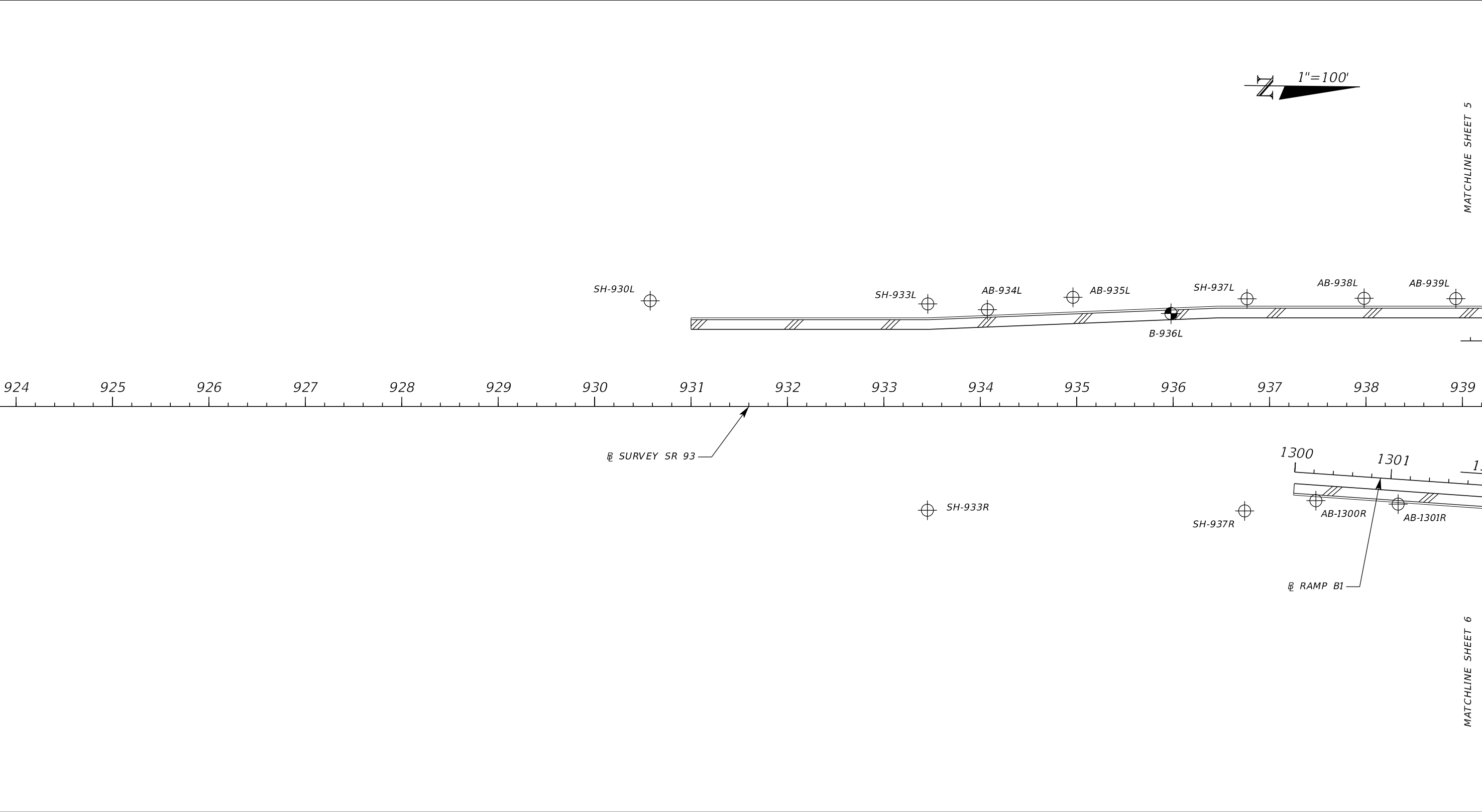
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BORING LOCATION PLAN (3)

SHEET NO.

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DATE	DESCRIPTION		DATE	DESCRIPTION			ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
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DATE

DESCRIPTION

DATE

DESCRIPTION

ENGINEER OF RECORD

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

STATE OF FLORIDA
DEPARTMENT OF TRANSPORTATION

ROAD NO.

SR 93

COUNTY

LEE

FINANCIAL PROJECT ID

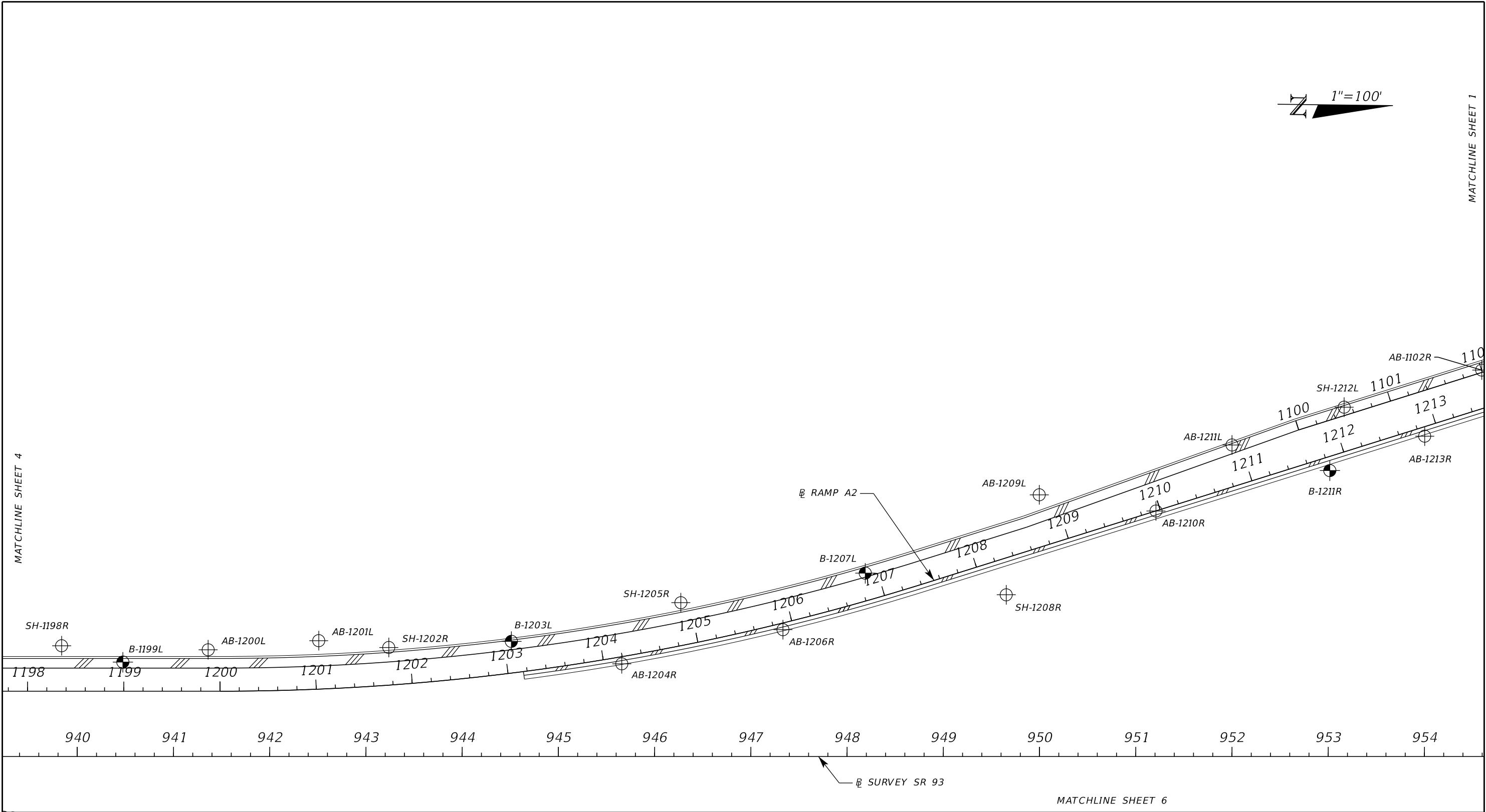
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BORING LOCATION PLAN (4)

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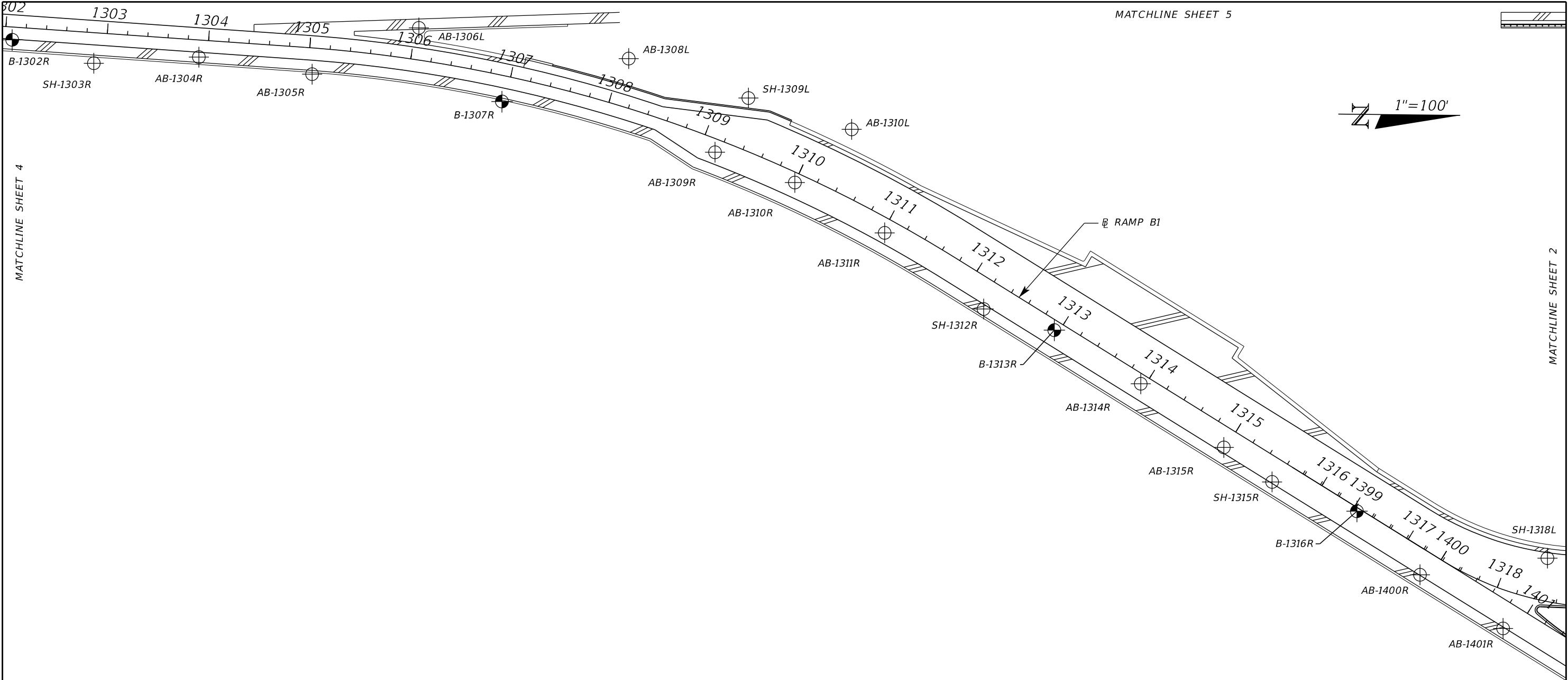
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DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		ROAD NO.	COUNTY	FINANCIAL PROJECT ID	
						SR 93	LEE	446296-2-52-01	

LEGEND



⊙ APPROXIMATE SPT BORING LOCATION

⊕ APPROXIMATE AUGER BORING LOCATION

BORING LOCATION PLAN (5)



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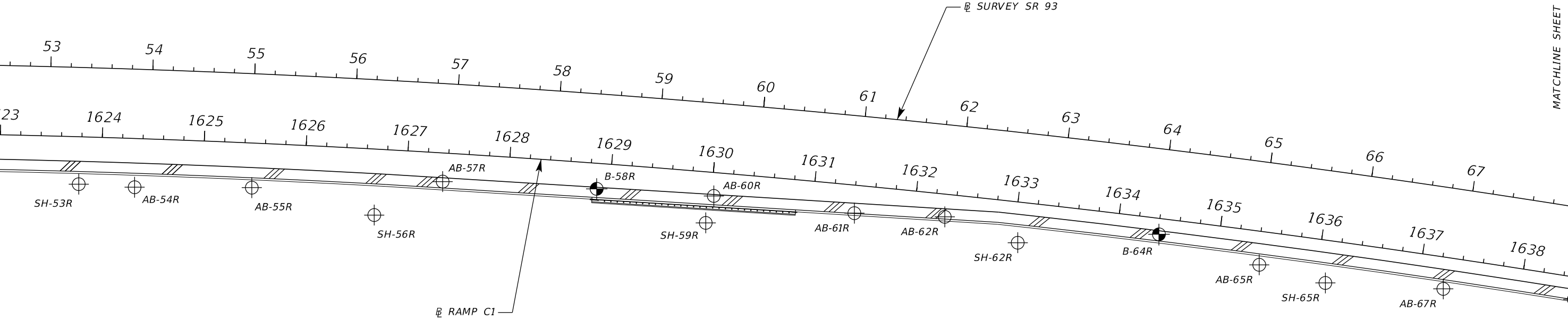
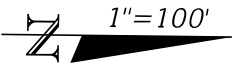
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-  APPROXIMATE AUGER BORING LOCATION

REVISIONS				ENGINEER OF RECORD		STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			BORING LOCATION PLAN (6)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
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MATCHLINE SHEET 7

MATCHLINE SHEET 8

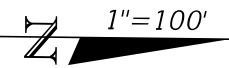
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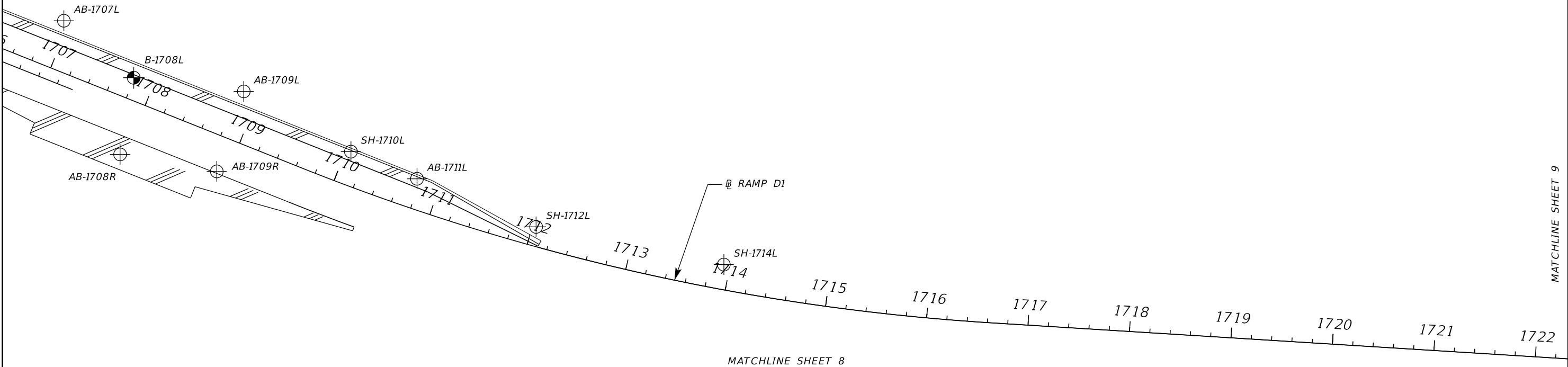
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- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE AUGER BORING LOCATION

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			BORING LOCATION PLAN (9)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 93	LEE	446296-2-52-01		



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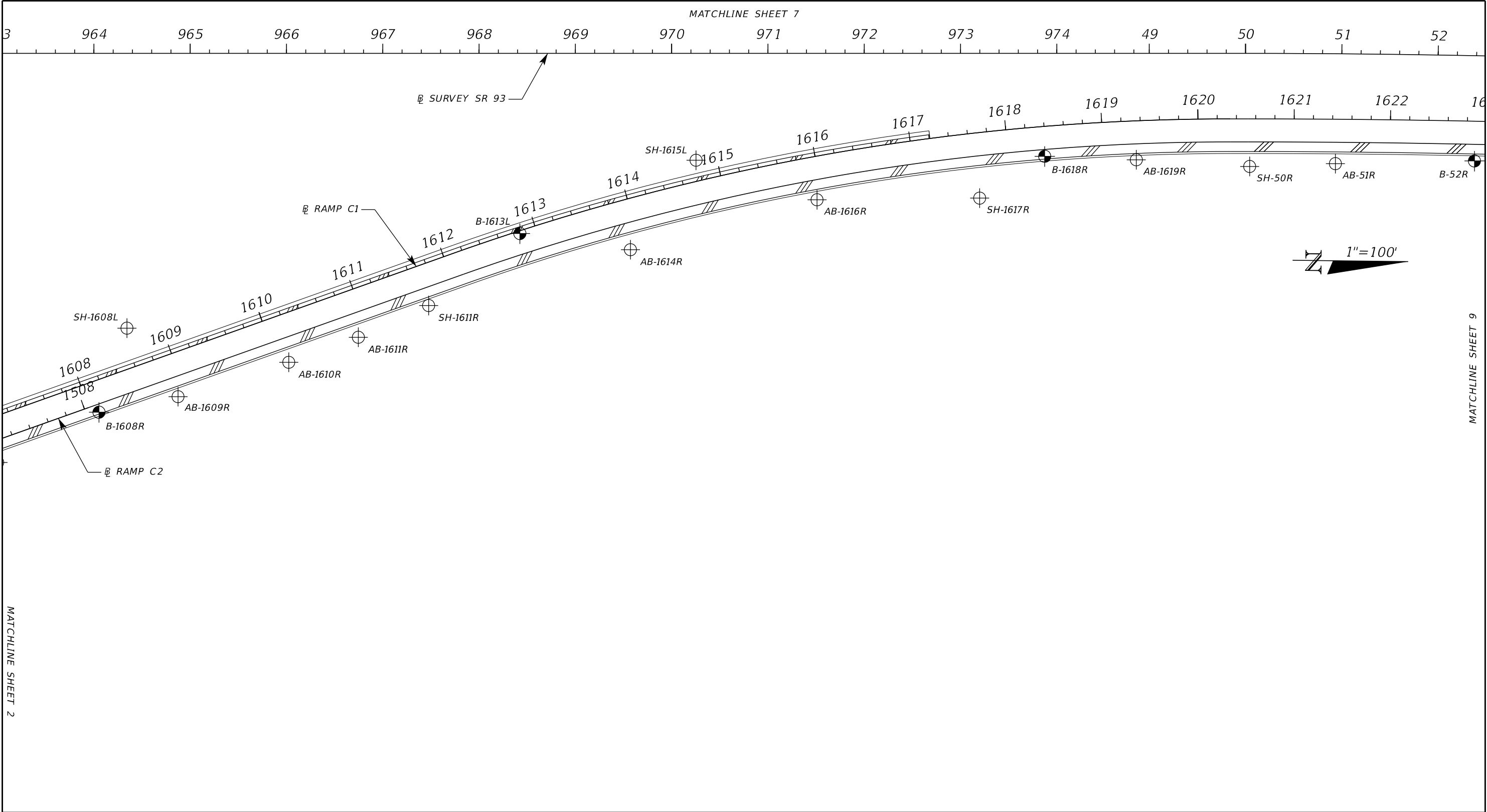


MATCHLINE SHEET 9

LEGEND

- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE AUGER BORING LOCATION

REVISIONS				ENGINEER OF RECORD		STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			BORING LOCATION PLAN (7)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
						SR 93	LEE	446296-2-52-01		



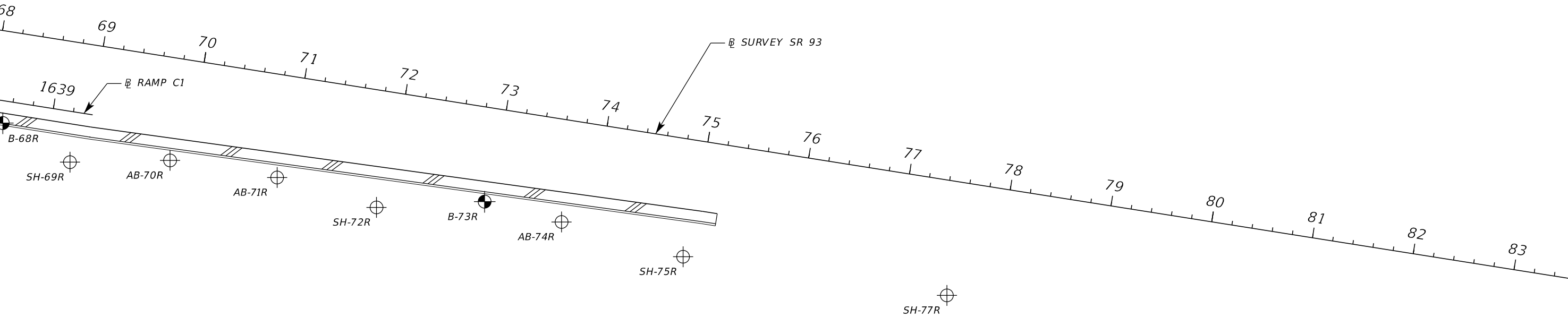
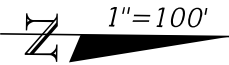
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● APPROXIMATE SPT BORING LOCATION



⊕ APPROXIMATE AUGER BORING LOCATION

REVISIONS				ENGINEER OF RECORD		STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			BORING LOCATION PLAN (8)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
						SR 93	LEE	446296-2-52-01		

MATCHLINE SHEET 9



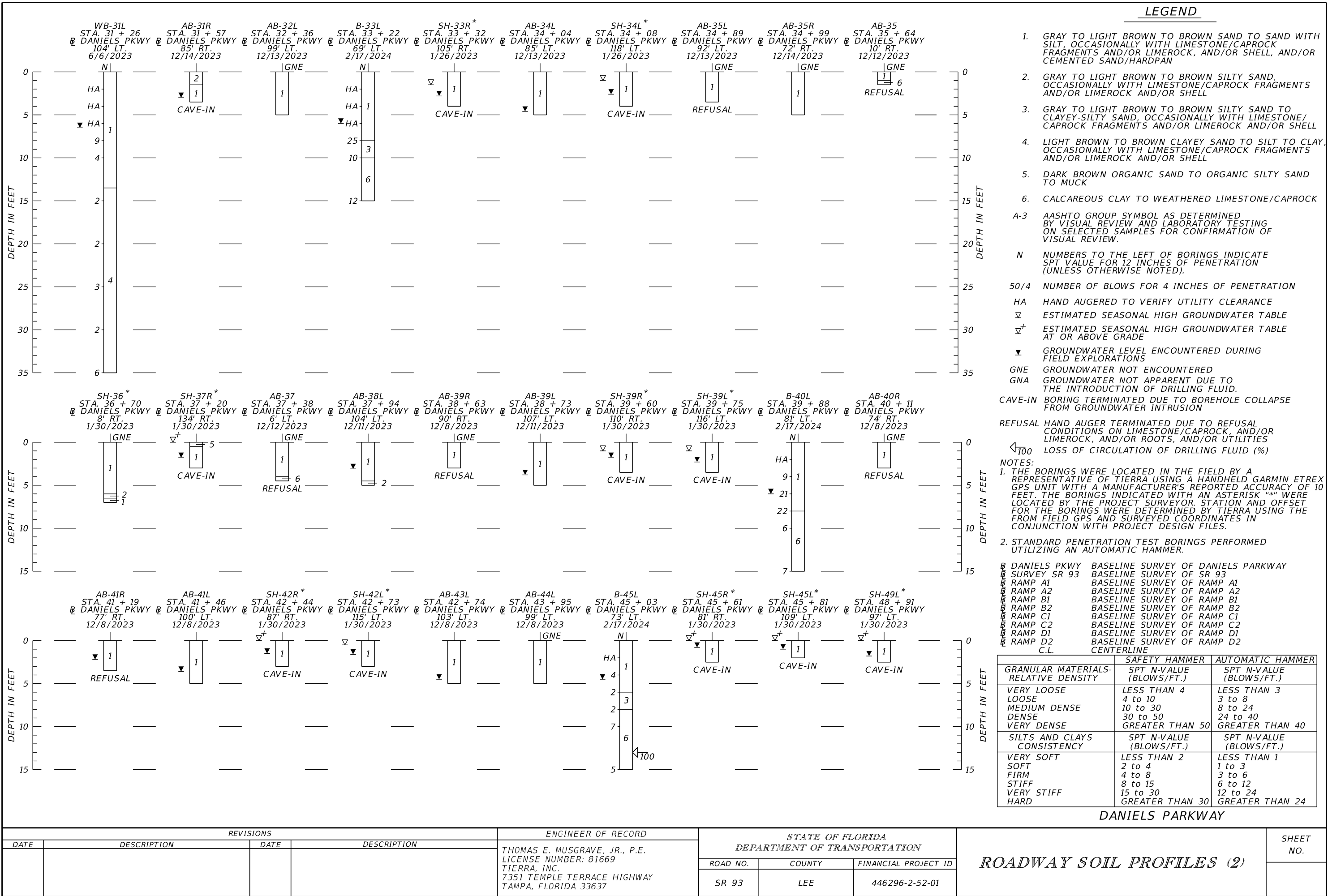
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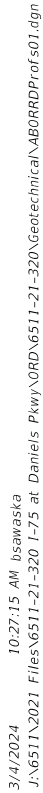
-  APPROXIMATE SPT BORING LOCATION
-  APPROXIMATE AUGER BORING LOCATION

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			BORING LOCATION PLAN (10)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 93	LEE	446296-2-52-01		

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

ROADWAY SOIL PROFILES (1)	SHEET NO.





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NOTES:

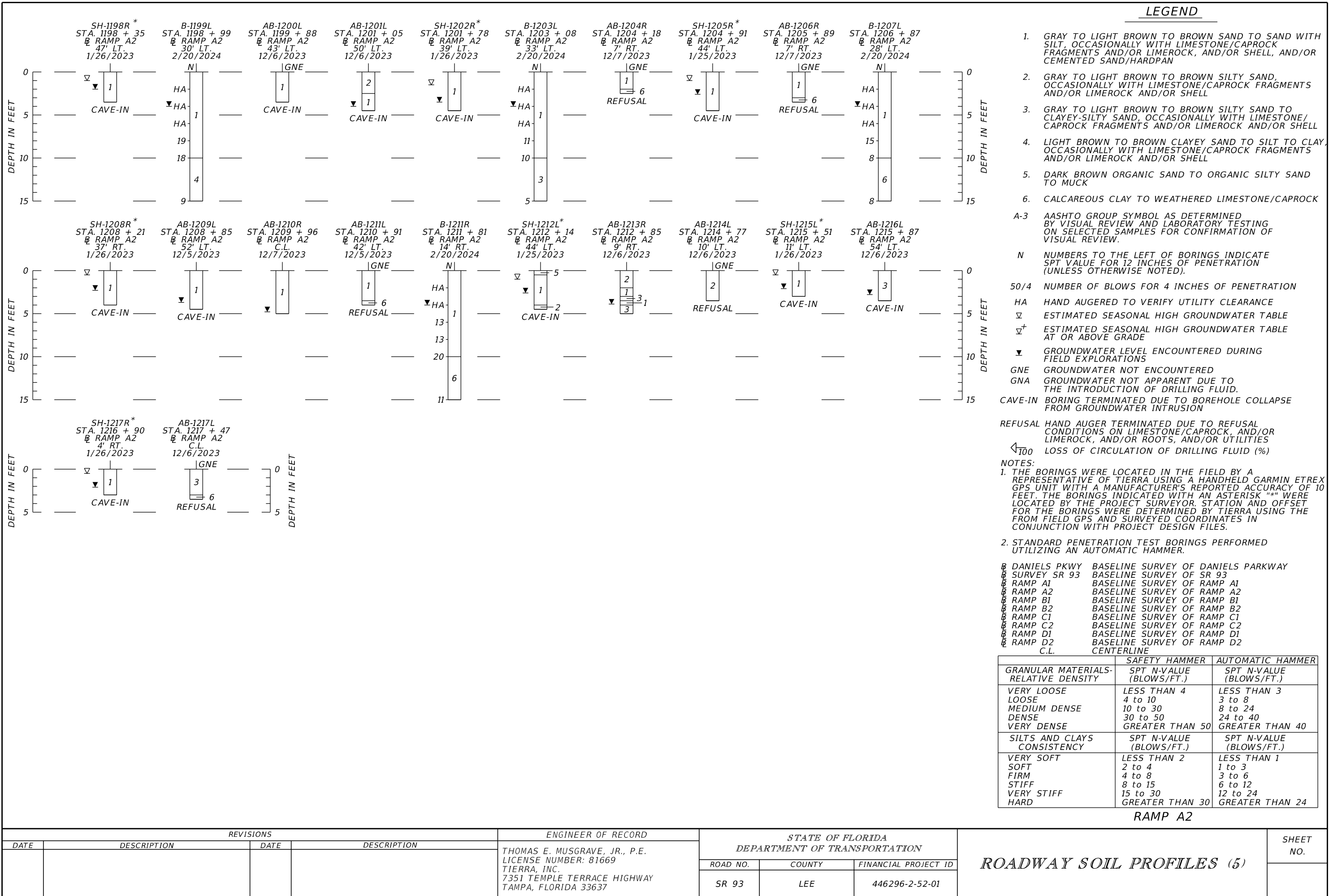
1. THE BORINGS WERE LOCATED IN THE FIELD BY A REPRESENTATIVE OF TIERRA USING A HANDHELD GARMIN ETREX GPS UNIT WITH A MANUFACTURER'S REPORTED ACCURACY OF 10 FEET. THE BORINGS INDICATED WITH AN ASTERISK "*" WERE LOCATED BY THE PROJECT SURVEYOR. STATION AND OFFSET FOR THE BORINGS WERE DETERMINED BY TIERRA USING THE FROM FIELD GPS AND SURVEYED COORDINATES IN CONJUNCTION WITH PROJECT DESIGN FILES.

2. STANDARD PENETRATION TEST BORINGS PERFORMED UTILIZING AN AUTOMATIC HAMMER.

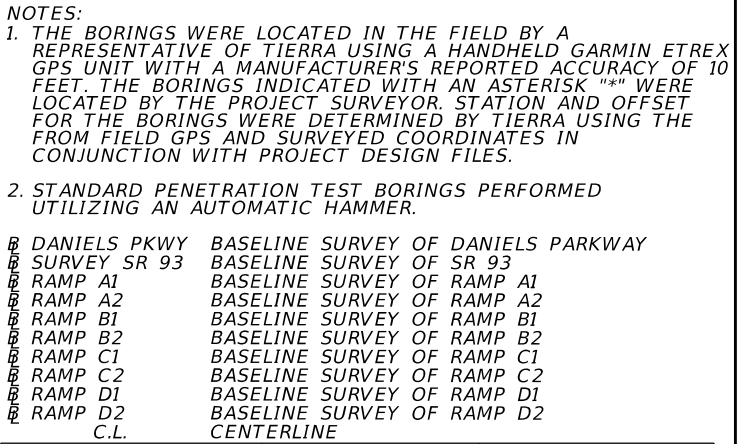
D	DANIELS PKWY	B	BASELINE SURVEY OF DANIELS PARKWAY
E	SURVEY SR 93	B	BASELINE SURVEY OF SR 93
E	RAMP A1	B	BASELINE SURVEY OF RAMP A1
E	RAMP A2	B	BASELINE SURVEY OF RAMP A2
E	RAMP B1	B	BASELINE SURVEY OF RAMP B1
E	RAMP B2	B	BASELINE SURVEY OF RAMP B2
E	RAMP C1	B	BASELINE SURVEY OF RAMP C1
E	RAMP C2	B	BASELINE SURVEY OF RAMP C2
E	RAMP D1	B	BASELINE SURVEY OF RAMP D1
E	RAMP D2	B	BASELINE SURVEY OF RAMP D2
	C.L.		CENTERLINE

RAMP A1

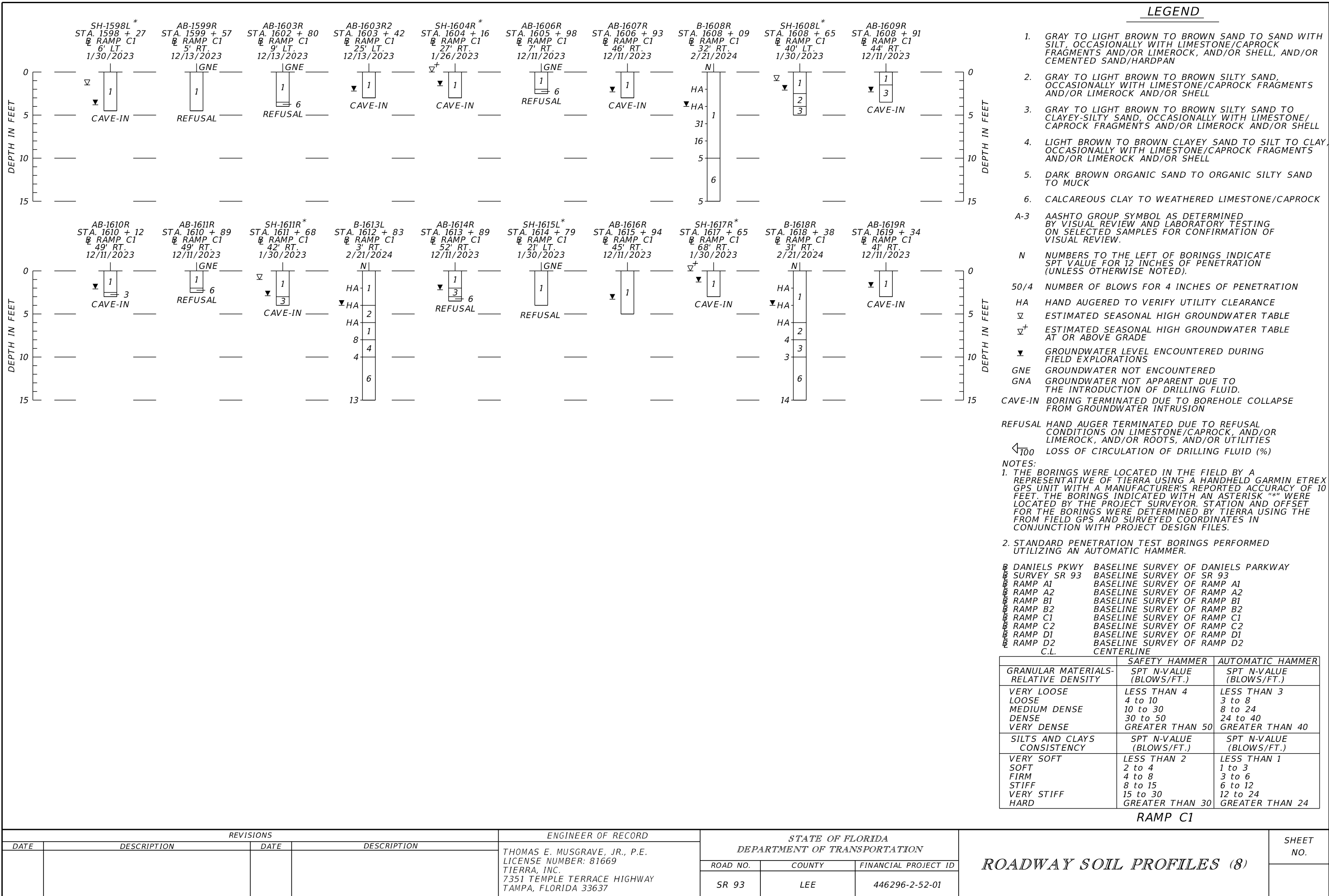
ROADWAY SOIL PROFILES (4)



ROADWAY SOIL PROFILES (6)ROADWAY SOIL PROFILES (6)



	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



NOTES:

1. THE BORINGS WERE LOCATED IN THE FIELD BY A REPRESENTATIVE OF TIERRA USING A HANDHELD GARMIN ETREX GPS UNIT WITH A MANUFACTURER'S REPORTED ACCURACY OF 10 FEET. THE BORINGS INDICATED WITH AN ASTERISK "*" WERE LOCATED BY THE PROJECT SURVEYOR. STATION AND OFFSET FOR THE BORINGS WERE DETERMINED BY TIERRA USING THE FROM FIELD GPS AND SURVEYED COORDINATES IN CONJUNCTION WITH PROJECT DESIGN FILES.

2. STANDARD PENETRATION TEST BORINGS PERFORMED UTILIZING AN AUTOMATIC HAMMER.

D DANIELS PKWY	BASELINE SURVEY OF DANIELS PARKWAY
SURVEY SR 93	BASELINE SURVEY OF SR 93
RAMP A1	BASELINE SURVEY OF RAMP A1
RAMP A2	BASELINE SURVEY OF RAMP A2
RAMP B1	BASELINE SURVEY OF RAMP B1
RAMP B2	BASELINE SURVEY OF RAMP B2
RAMP C1	BASELINE SURVEY OF RAMP C1
RAMP C2	BASELINE SURVEY OF RAMP C2
RAMP D1	BASELINE SURVEY OF RAMP D1
RAMP D2	BASELINE SURVEY OF RAMP D2
C.L.	CENTERLINE

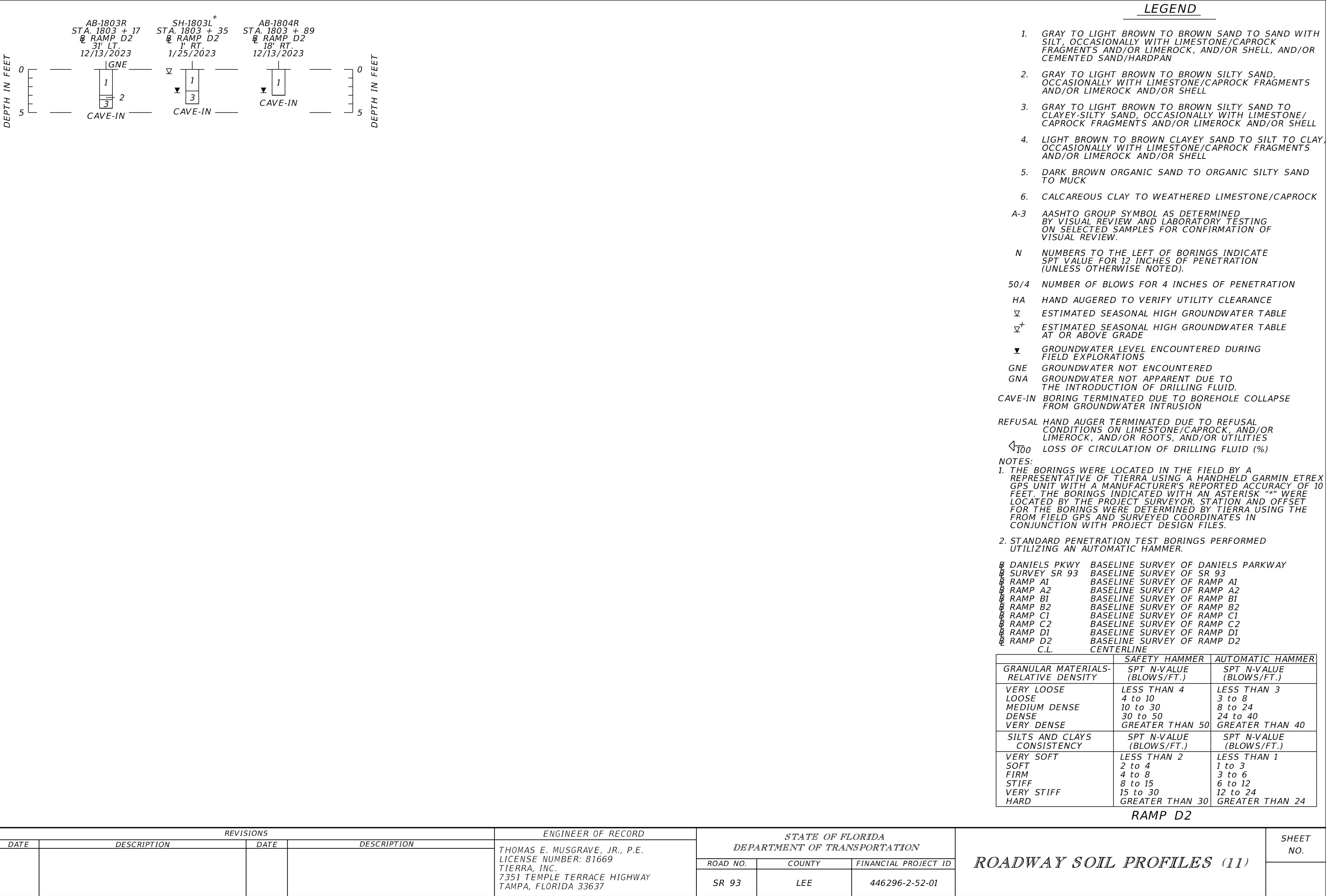
	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE	LESS THAN 4	LESS THAN 3
LOOSE	4 to 10	3 to 8
MEDIUM DENSE	10 to 30	8 to 24
DENSE	30 to 50	24 to 40
VERY DENSE	GREATER THAN 50	GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT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

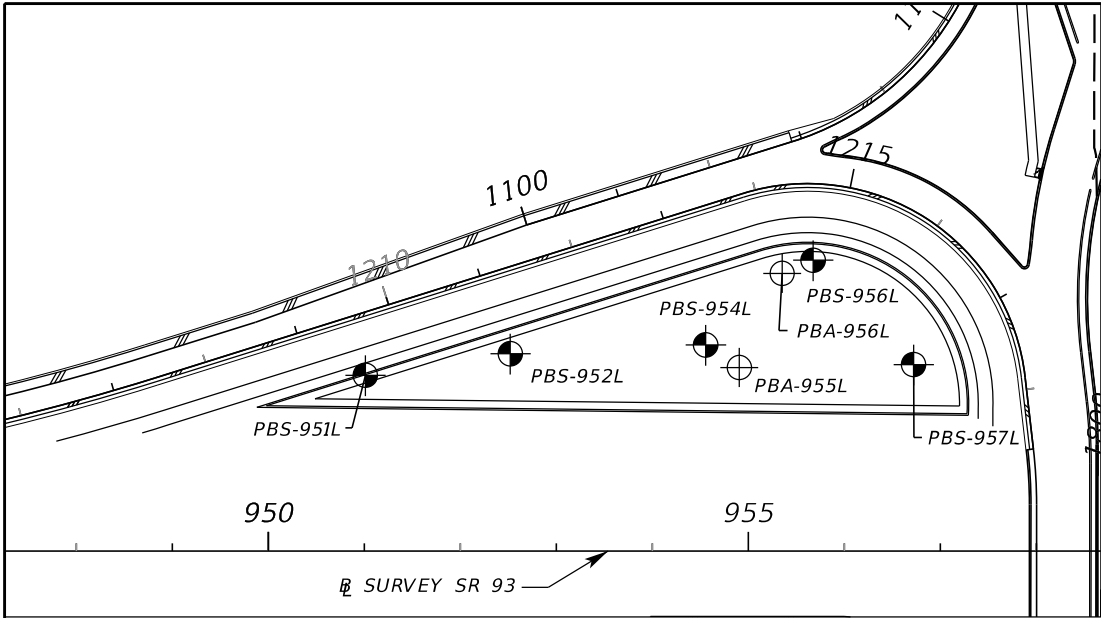
ROADWAY SOIL PROFILES (9)

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			ROADWAY SOIL PROFILES (9)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 93	LEE	446296-2-52-01		

REVISIONS				ENGINEER OF RECORD	STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			ROADWAY SOIL PROFILES (10)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637	ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
					SR 93	LEE	446296-2-52-01		

3/4/2024 10:27:21 AM bsawaska J:\6511\2021 Files\6511-21-320 1-75 at Daniels Pkwy\ORD\6511-21-320\Geotechnical\ABORRRDProf.s01.dgn





BORING LOCATION PLAN

NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

LEGEND

1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)

2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)

3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)

4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)

5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)

6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK
- A-3

N

50/4

HA

WH

-200

NMC

LL

PI

NP
- AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

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

NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HAND AUGERED TO VERIFY UTILITY CLEARANCE

SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER

PERCENT PASSING #200 SIEVE

NATURAL MOISTURE CONTENT (%)

LIQUID LIMIT (%)

PLASTICITY INDEX (%)

NON-PLASTIC

NAVD 88

NORTH AMERICAN VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION

APPROXIMATE AUGER BORING LOCATION

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS

GROUNDWATER NOT ENCOUNTERED

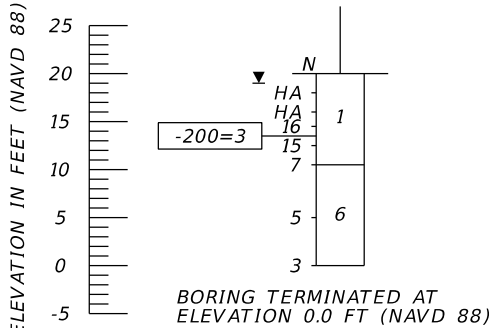
LOSS OF CIRCULATION OF DRILLING FLUID (%)

BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION

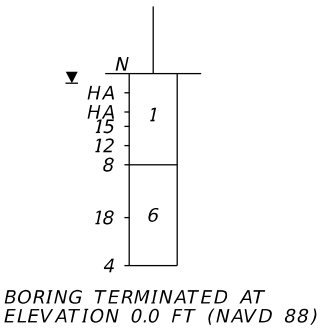
HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK

SURVEY SR 93 BASELINE SURVEY SR 93

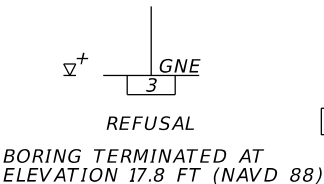
BOR # PBS-951L
STA. 951+01
REF. SURVEY SR 93
OFF. 183' LT.
ELEV. 20.0
DATE 1/11/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45



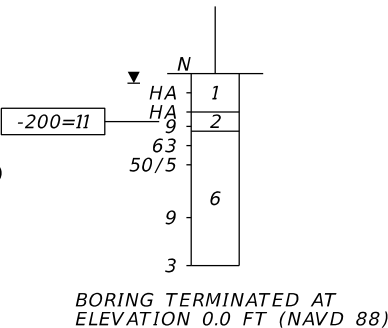
BOR # PBS-952L
STA. 952+52
REF. SURVEY SR 93
OFF. 206' LT.
ELEV. 20.0
DATE 1/12/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45



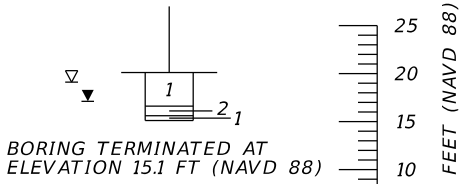
BOR # PBA-953L
STA. 953+41
REF. SURVEY SR 93
OFF. 218' LT.
ELEV. 19.8
DATE 1/2/2024



BOR # PBS-954L
STA. 954+56
REF. SURVEY SR 93
OFF. 215' LT.
ELEV. 20.0
DATE 1/12/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45



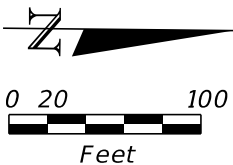
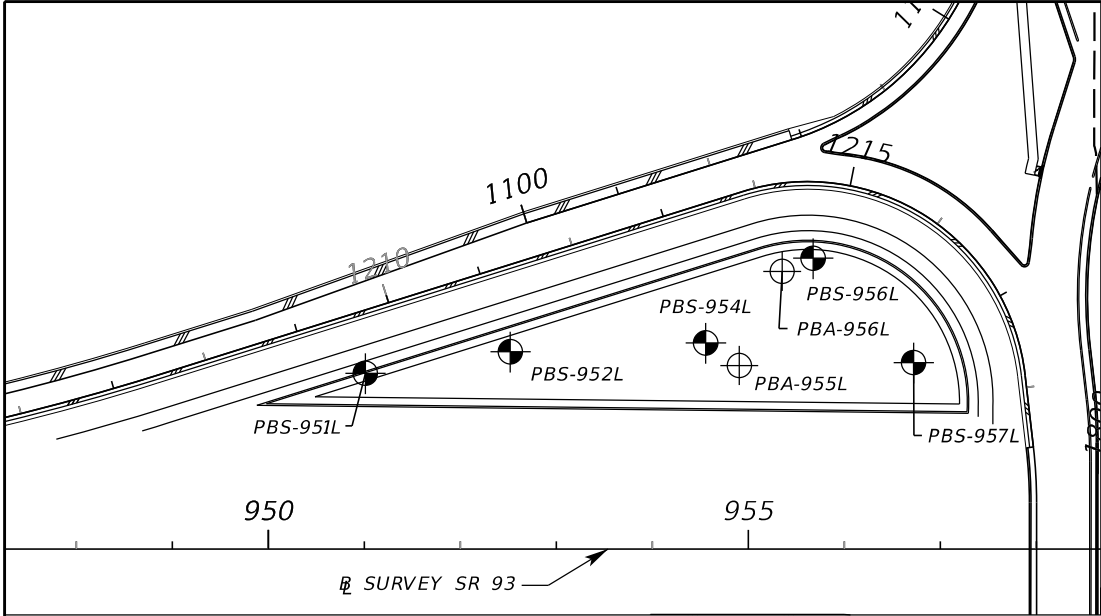
BOR # PBA-955L
STA. 954+91
REF. SURVEY SR 93
OFF. 191' LT.
ELEV. 20.1
DATE 1/26/2023



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

POND A

REVISIONS				ENGINEER OF RECORD			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POND SOIL SURVEY (1)	SHEET NO.
DATE	DESCRIPTION		DATE	DESCRIPTION			ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
						THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		LEE	446296-2-52-01		



BORING LOCATION PLAN

NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

LEGEND

1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)

2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)

3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)

4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)

5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)

6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK
- A-3

N

50/4

HA

WH

-200

NMC

LL

PI

NP
- AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

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

NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HAND AUGERED TO VERIFY UTILITY CLEARANCE

SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER

PERCENT PASSING #200 SIEVE

NATURAL MOISTURE CONTENT (%)

LIQUID LIMIT (%)

PLASTICITY INDEX (%)

NON-PLASTIC

NAVD 88 NORTH AMERICAN VERTICAL DATUM OF 1988

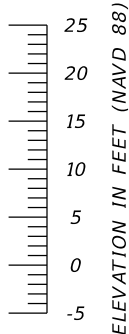
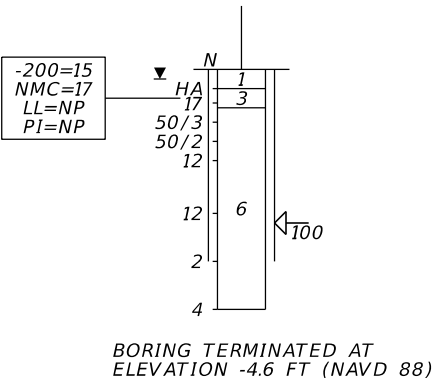
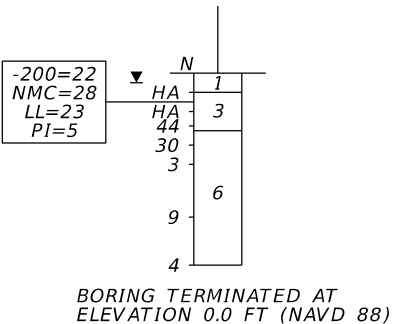
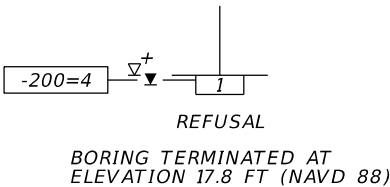
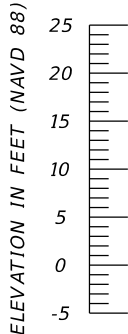
-
- APPROXIMATE SPT BORING LOCATION
-
- APPROXIMATE AUGER BORING LOCATION
-
- ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
-
- ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE
-
- GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
-
- GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS
-
- GROUNDWATER NOT ENCOUNTERED
-
- LOSS OF CIRCULATION OF DRILLING FLUID (%)
-
- BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION
-
- HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK

SURVEY SR 93 BASELINE SURVEY SR 93

BOR # PBA-956L
STA. 955+67
REF. SURVEY SR 93
OFF. 218' LT.
ELEV. 19.8
DATE 1/2/2024

BOR # PBS-956L
STA. 955+68
REF. SURVEY SR 93
OFF. 303' LT.
ELEV. 20.0
DATE 1/12/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

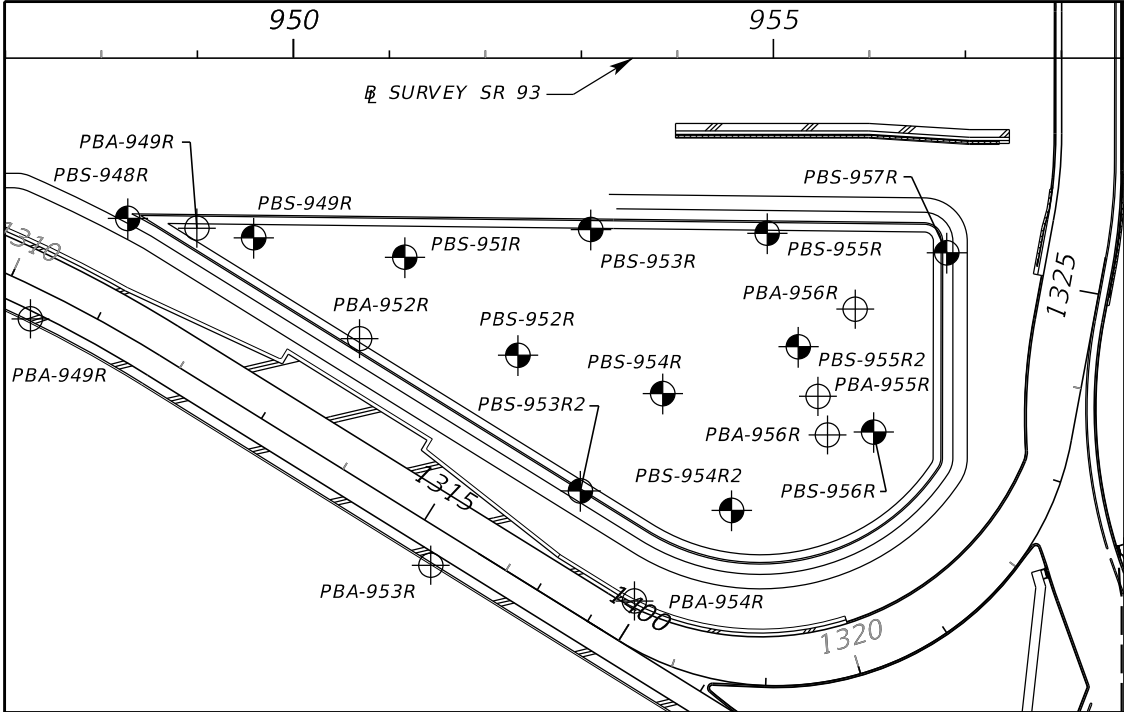
BOR # PBS-957L
STA. 956+72
REF. SURVEY SR 93
OFF. 194' LT.
ELEV. 20.4
DATE 1/12/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45



	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

POND A

REVISIONS				ENGINEER OF RECORD			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		POND SOIL SURVEY (2)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637			ROAD NO.	COUNTY		
								LEE	446296-2-52-01	



BORING LOCATION PLAN

NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)

2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)

3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)

4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)

5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)

6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK

LEGEND

- A-3

N

50/4

HA

WH

-200

NMC

LL

PI

NP

NAVD 88

GNE

CAVE-IN

REFUSAL
- AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

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

NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HAND AUGERED TO VERIFY UTILITY CLEARANCE

SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER

PERCENT PASSING #200 SIEVE

NATURAL MOISTURE CONTENT (%)

LIQUID LIMIT (%)

PLASTICITY INDEX (%)

NON-PLASTIC

NORTH AMERICAN VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION

APPROXIMATE AUGER BORING LOCATION

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS

GROUNDWATER NOT ENCOUNTERED

LOSS OF CIRCULATION OF DRILLING FLUID (%)

BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION

HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK

BASELINE SURVEY SR 93

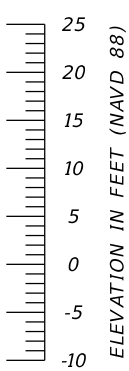
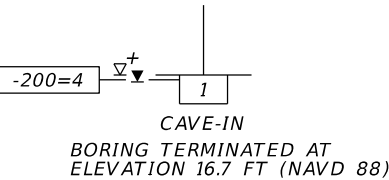
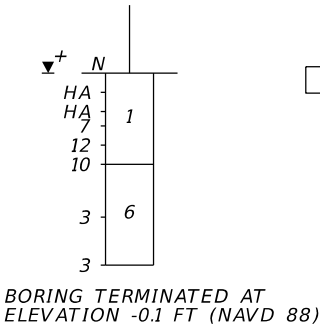
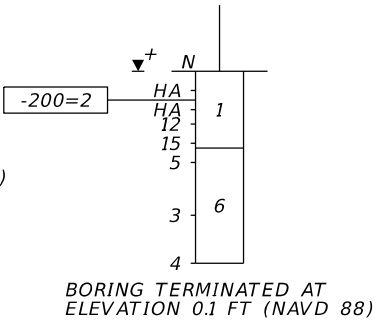
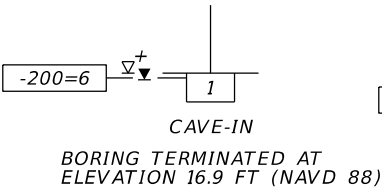
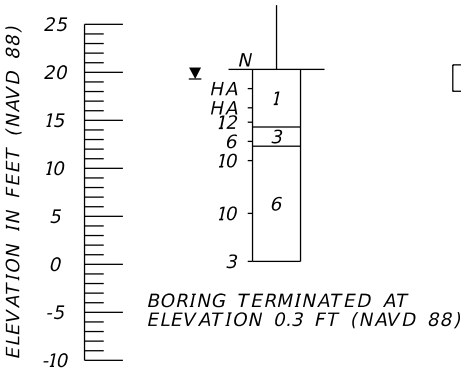
BOR # PBS-948R
STA. 948+27
REF. SURVEY SR 93
OFF. 167' RT.
ELEV. 20.3
DATE 1/10/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

BOR # PBA-949R
STA. 949+00
REF. SURVEY SR 93
OFF. 177' RT.
ELEV. 19.9
DATE 1/3/2024

BOR # PBS-949R
STA. 949+59
REF. SURVEY SR 93
OFF. 187' RT.
ELEV. 20.1
DATE 1/10/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

BOR # PBS-951R
STA. 951+16
REF. SURVEY SR 93
OFF. 207' RT.
ELEV. 19.9
DATE 1/10/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

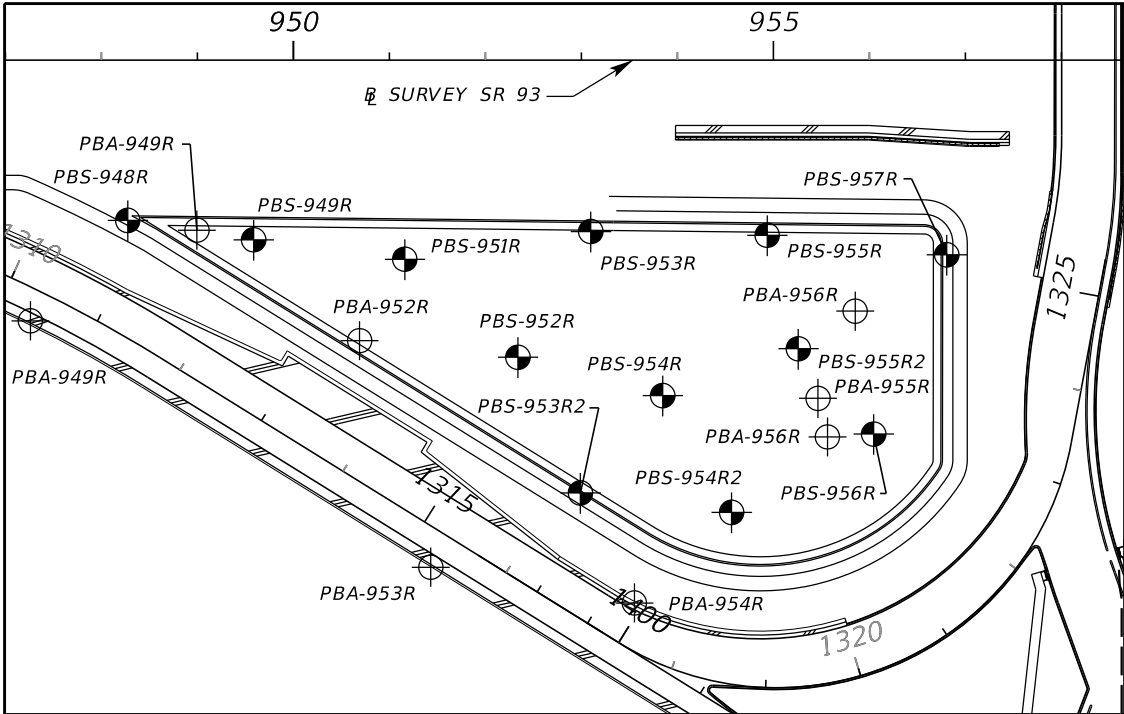
BOR # PBA-952R
STA. 951+75
REF. SURVEY SR 93
OFF. 178' RT.
ELEV. 19.7
DATE 1/3/2024



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

POND B

REVISIONS				ENGINEER OF RECORD			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POND SOIL SURVEY (3)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637			ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
								LEE	446296-2-52-01		



BORING LOCATION PLAN

NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

- 1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)
- 2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)
- 3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)
- 4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)
- 5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)
- 6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK

LEGEND

- A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
- N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
- 50/4 NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
- HA HAND AUGERED TO VERIFY UTILITY CLEARANCE
- WH SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
- 200 PERCENT PASSING #200 SIEVE
- NMC NATURAL MOISTURE CONTENT (%)
- LL LIQUID LIMIT (%)
- PI PLASTICITY INDEX (%)
- NP NON-PLASTIC
- NAVD 88 NORTH AMERICAN VERTICAL DATUM OF 1988
- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE AUGER BORING LOCATION
- ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
- ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE
- GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
- GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS
- GROUNDWATER NOT ENCOUNTERED
- LOSS OF CIRCULATION OF DRILLING FLUID (%)
- BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION
- HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK

SURVEY SR 93 BASELINE SURVEY SR 93

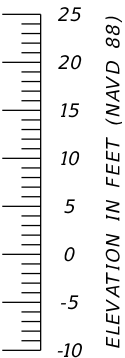
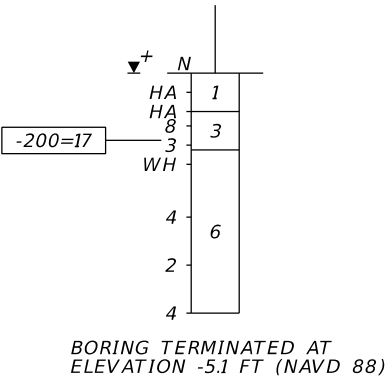
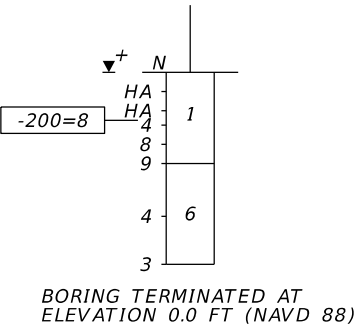
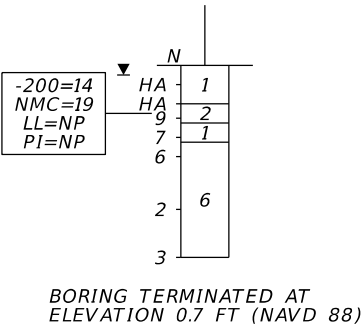
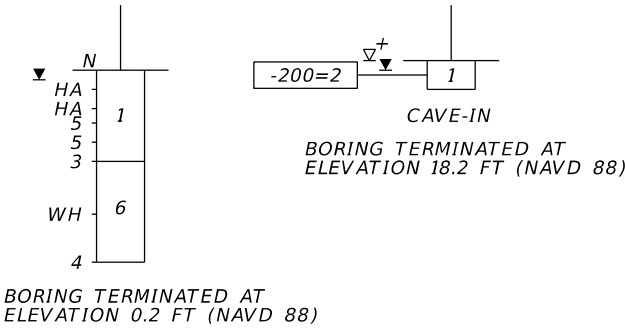
BOR # PBS-952R
STA. 952+34
REF. SURVEY SR 93
OFF. 310' RT.
ELEV. 20.2
DATE 1/11/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC RIG CME-45

BOR # PBA-953R
STA. 952+67
REF. SURVEY SR 93
OFF. 382' RT.
ELEV. 21.2
DATE 1/3/2024

BOR # PBS-953R2
STA. 952+99
REF. SURVEY SR 93
OFF. 451' RT.
ELEV. 20.7
DATE 1/11/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC RIG CME-45

BOR # PBS-953R
STA. 953+10
REF. SURVEY SR 93
OFF. 179' RT.
ELEV. 20.0
DATE 1/11/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC RIG CME-45

BOR # PBS-954R
STA. 953+85
REF. SURVEY SR 93
OFF. 349' RT.
ELEV. 19.9
DATE 1/20/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC RIG CME-45

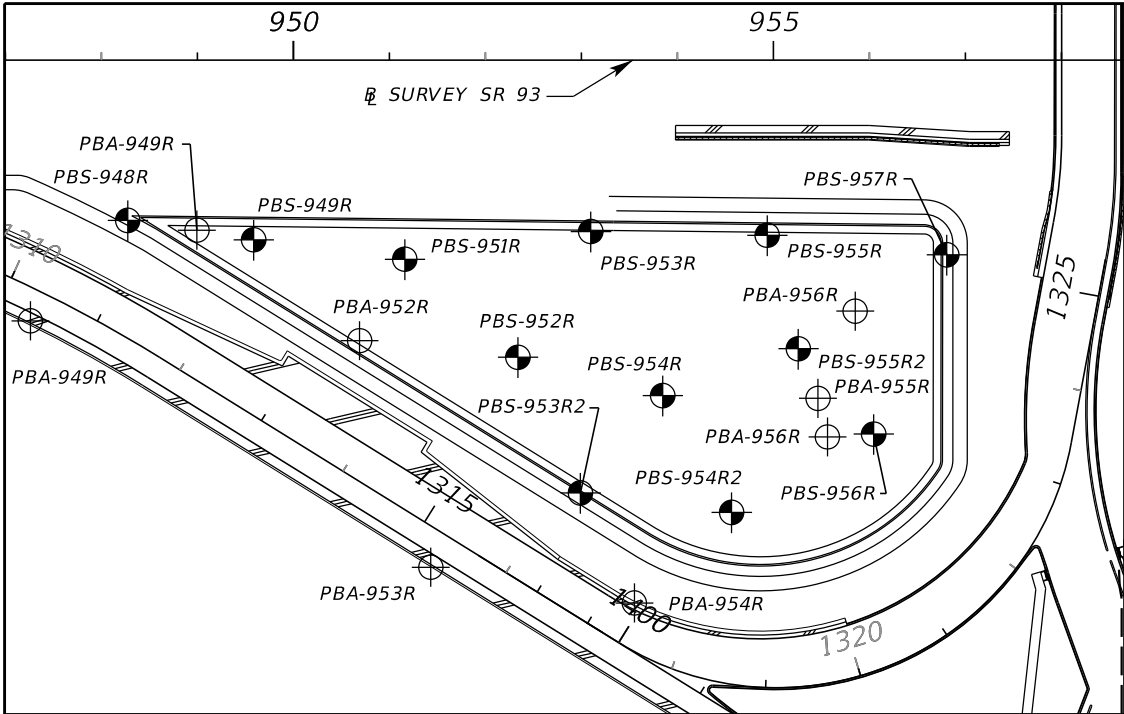


	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	LESS THAN 4 4 to 10 10 to 30 30 to 50 GREATER THAN 50	LESS THAN 3 3 to 8 8 to 24 24 to 40 GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT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

POND B

REVISIONS				ENGINEER OF RECORD			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POND SOIL SURVEY (4)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637			ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
								LEE	446296-2-52-01		

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



BORING LOCATION PLAN

NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

- GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)
- GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)
- GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)
- LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)
- DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)
- CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK

LEGEND

- A-3 AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.
- N NUMBERS TO THE LEFT OF BORINGS INDICATE SPT VALUE FOR 12 INCHES OF PENETRATION (UNLESS OTHERWISE NOTED).
- 50/4 NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
- HA HAND AUGERED TO VERIFY UTILITY CLEARANCE
- WH SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER
- 200 PERCENT PASSING #200 SIEVE
- NMC NATURAL MOISTURE CONTENT (%)
- LL LIQUID LIMIT (%)
- PI PLASTICITY INDEX (%)
- NP NON-PLASTIC
- NAVD 88 NORTH AMERICAN VERTICAL DATUM OF 1988
- APPROXIMATE SPT BORING LOCATION
- APPROXIMATE AUGER BORING LOCATION
- ESTIMATED SEASONAL HIGH GROUNDWATER TABLE
- ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE
- GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS
- GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS
- GROUNDWATER NOT ENCOUNTERED
- LOSS OF CIRCULATION OF DRILLING FLUID (%)
- BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION
- HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK

SURVEY SR 93 BASELINE SURVEY SR 93

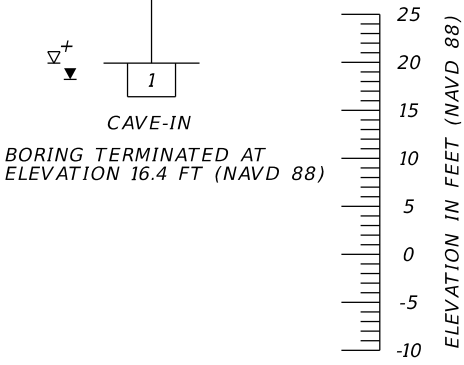
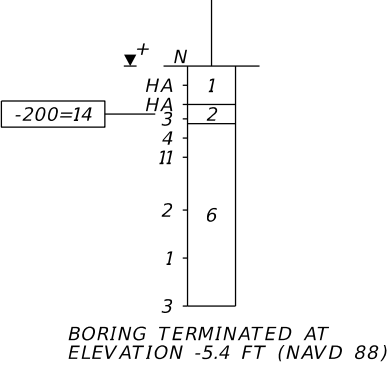
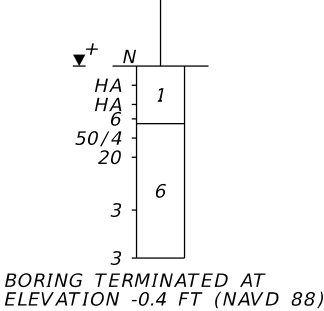
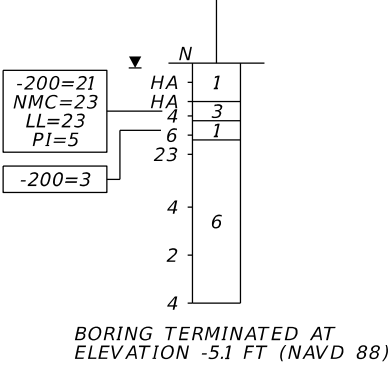
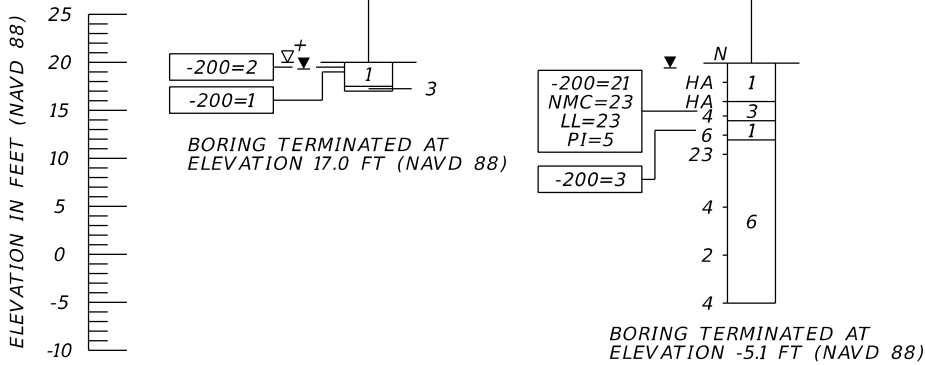
BOR # PBA-954R
STA. 954+37
REF. SURVEY SR 93
OFF. 405' RT.
ELEV. 20.0
DATE 1/2/2024

BOR # PBS-954R2
STA. 954+57
REF. SURVEY SR 93
OFF. 471' RT.
ELEV. 19.9
DATE 1/20/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

BOR # PBS-955R
STA. 954+94
REF. SURVEY SR 93
OFF. 182' RT.
ELEV. 19.6
DATE 1/20/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

BOR # PBS-955R2
STA. 955+26
REF. SURVEY SR 93
OFF. 301' RT.
ELEV. 19.6
DATE 1/20/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

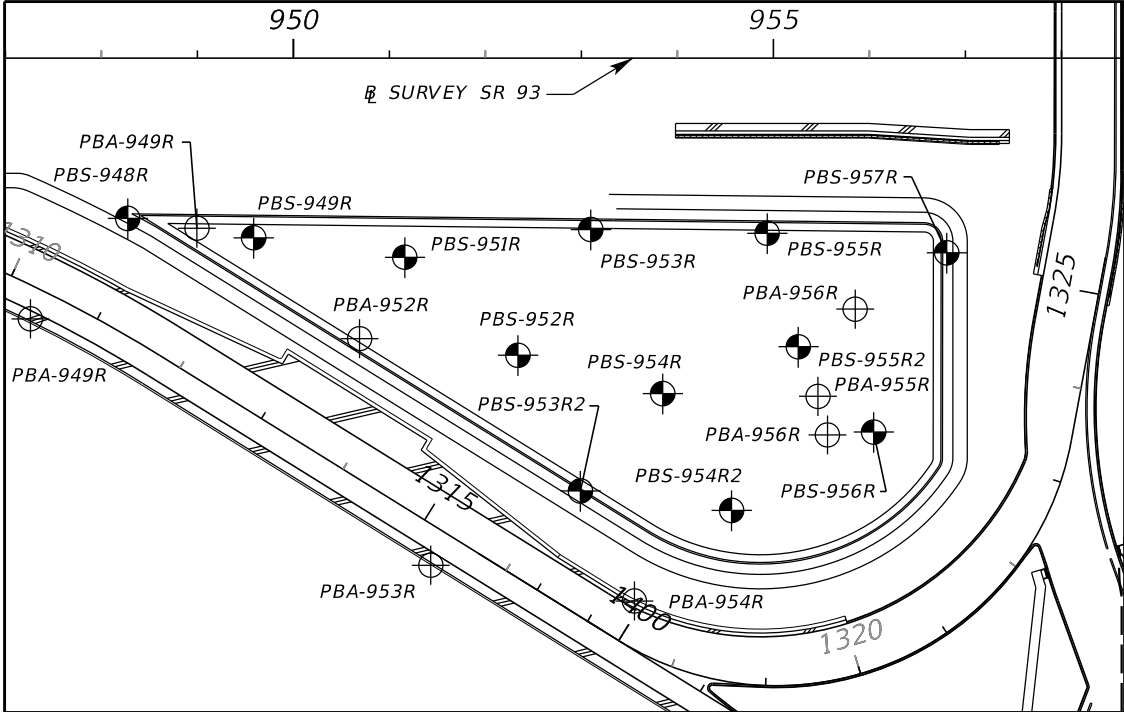
BOR # PBA-955R
STA. 955+47
REF. SURVEY SR 93
OFF. 352' RT.
ELEV. 19.9
DATE 1/26/2023



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

POND B

REVISIONS				ENGINEER OF RECORD			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POND SOIL SURVEY (5)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637			ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
								LEE	446296-2-52-01		



BORING LOCATION PLAN

NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

LEGEND

1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)

2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)

3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)

4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)

5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)

6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK
- A-3

N

50/4

HA

WH

-200

NMC

LL

PI

NP

NAVD 88

GNE

CAVE-IN

REFUSAL
- AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

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

NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HAND AUGERED TO VERIFY UTILITY CLEARANCE

SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER

PERCENT PASSING #200 SIEVE

NATURAL MOISTURE CONTENT (%)

LIQUID LIMIT (%)

PLASTICITY INDEX (%)

NON-PLASTIC

NORTH AMERICAN VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION

APPROXIMATE AUGER BORING LOCATION

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS

GROUNDWATER NOT ENCOUNTERED

LOSS OF CIRCULATION OF DRILLING FLUID (%)

BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION

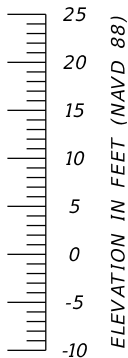
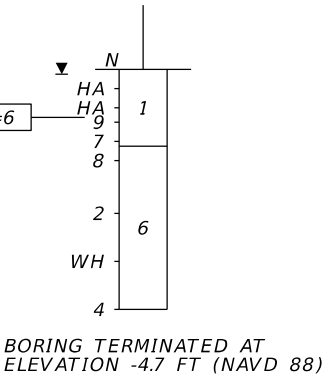
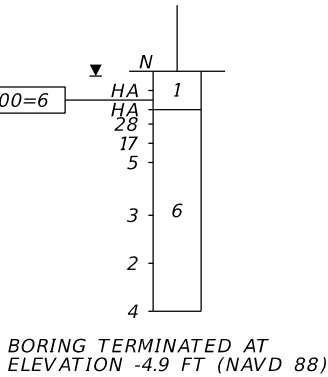
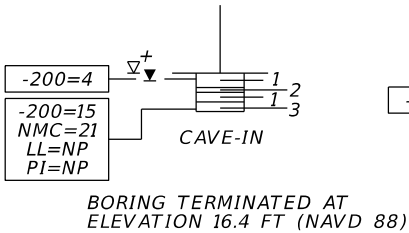
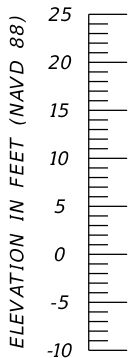
HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK

SURVEY SR 93 BASELINE SURVEY SR 93

BOR # PBA-956R
STA. 955+85
REF. SURVEY SR 93
OFF. 262' RT.
ELEV. 19.9
DATE 1/2/2024

BOR # PBS-956R
STA. 956+04
REF. SURVEY SR 93
OFF. 390' RT.
ELEV. 20.1
DATE 1/20/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

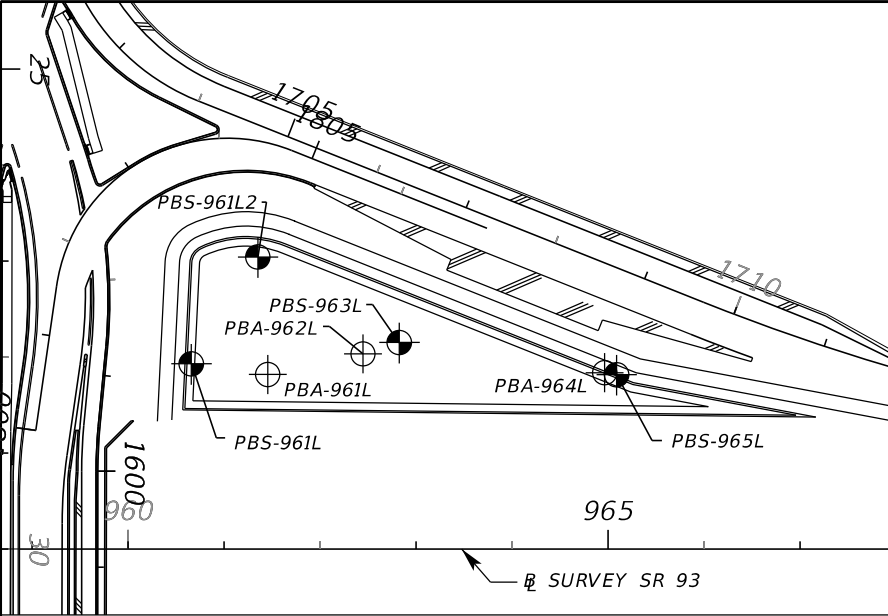
BOR # PBS-957R
STA. 956+81
REF. SURVEY SR 93
OFF. 203' RT.
ELEV. 20.3
DATE 1/20/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45



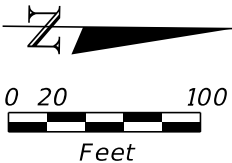
	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	LESS THAN 4 4 to 10 10 to 30 30 to 50 GREATER THAN 50	LESS THAN 3 3 to 8 8 to 24 24 to 40 GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT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

POND B

REVISIONS				ENGINEER OF RECORD			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POND SOIL SURVEY (6)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637			ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
								LEE	446296-2-52-01		



BORING LOCATION PLAN



NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

LEGEND

1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)

2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)

3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)

4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)

5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)

6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK
- A-3

N

50/4

HA

WH

-200

NMC

LL

PI

NP

NAVD 88

GNE

CAVE-IN

REFUSAL
- AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

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

NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HAND AUGERED TO VERIFY UTILITY CLEARANCE

SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER

PERCENT PASSING #200 SIEVE

NATURAL MOISTURE CONTENT (%)

LIQUID LIMIT (%)

PLASTICITY INDEX (%)

NON-PLASTIC

NORTH AMERICAN VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION

APPROXIMATE AUGER BORING LOCATION

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS

GROUNDWATER NOT ENCOUNTERED

LOSS OF CIRCULATION OF DRILLING FLUID (%)

BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION

HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK

BASELINE SURVEY SR 93

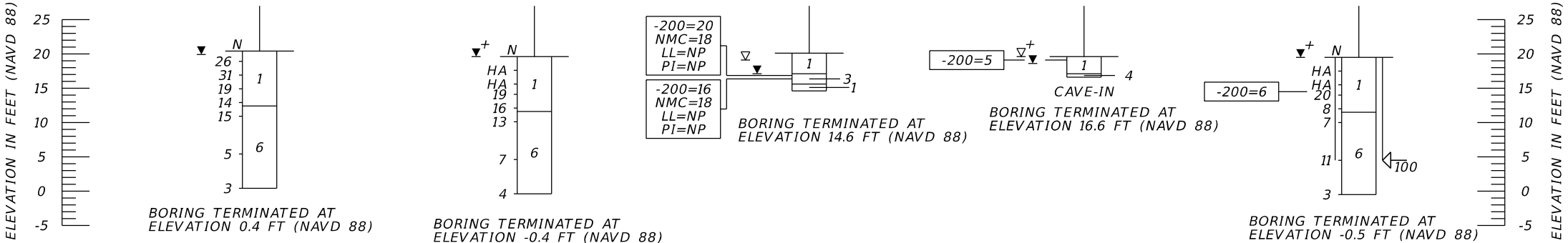
BOR # PBS-961L
STA. 960+66
REF. SURVEY SR 93
OFF. 193' LT.
ELEV. 20.4
DATE 1/8/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

BOR # PBS-961L2
STA. 961+35
REF. SURVEY SR 93
OFF. 304' LT.
ELEV. 19.6
DATE 1/8/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

BOR # PBA-961L
STA. 961+46
REF. SURVEY SR 93
OFF. 182' LT.
ELEV. 20.1
DATE 1/25/2023

BOR # PBA-962L
STA. 961+81
REF. SURVEY SR 93
OFF. 229' LT.
ELEV. 19.6
DATE 1/3/2024

BOR # PBS-963L
STA. 962+83
REF. SURVEY SR 93
OFF. 215' LT.
ELEV. 19.5
DATE 1/8/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

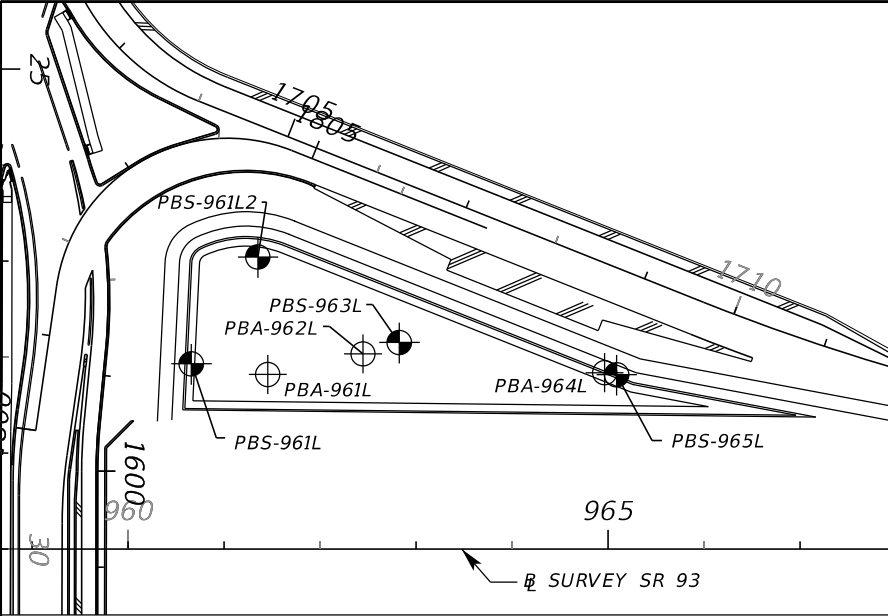


	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	LESS THAN 4 4 to 10 10 to 30 30 to 50 GREATER THAN 50	LESS THAN 3 3 to 8 8 to 24 24 to 40 GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT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

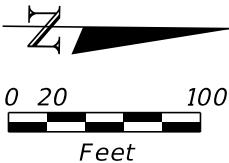
POND D

REVISIONS				ENGINEER OF RECORD			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		POND SOIL SURVEY (7)	SHEET NO.
DATE	DESCRIPTION		DATE	DESCRIPTION			ROAD NO.	COUNTY		
						THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		LEE	446296-2-52-01	

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



BORING LOCATION PLAN



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LEGEND

1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)

2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)

3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)

4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)

5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)

6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK
- A-3

N

50/4

HA

WH

-200

NMC

LL

PI

NP

NAVD 88

GNE

CAVE-IN

REFUSAL
- AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

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

NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HAND AUGERED TO VERIFY UTILITY CLEARANCE

SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER

PERCENT PASSING #200 SIEVE

NATURAL MOISTURE CONTENT (%)

LIQUID LIMIT (%)

PLASTICITY INDEX (%)

NON-PLASTIC

NORTH AMERICAN VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION

APPROXIMATE AUGER BORING LOCATION

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS

GROUNDWATER NOT ENCOUNTERED

LOSS OF CIRCULATION OF DRILLING FLUID (%)

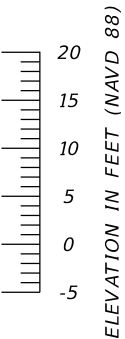
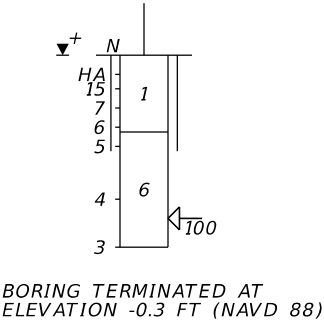
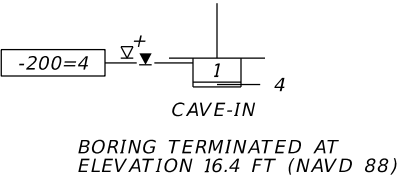
BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION

HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK

SURVEY SR 93 BASELINE SURVEY SR 93

BOR # PBA-964L
STA. 963+81
REF. SURVEY SR 93
OFF. 198' LT.
ELEV. 19.4
DATE 1/3/2024

BOR # PBS-965L
STA. 965+09
REF. SURVEY SR 93
OFF. 182' LT.
ELEV. 19.7
DATE 1/8/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC
RIG CME-45

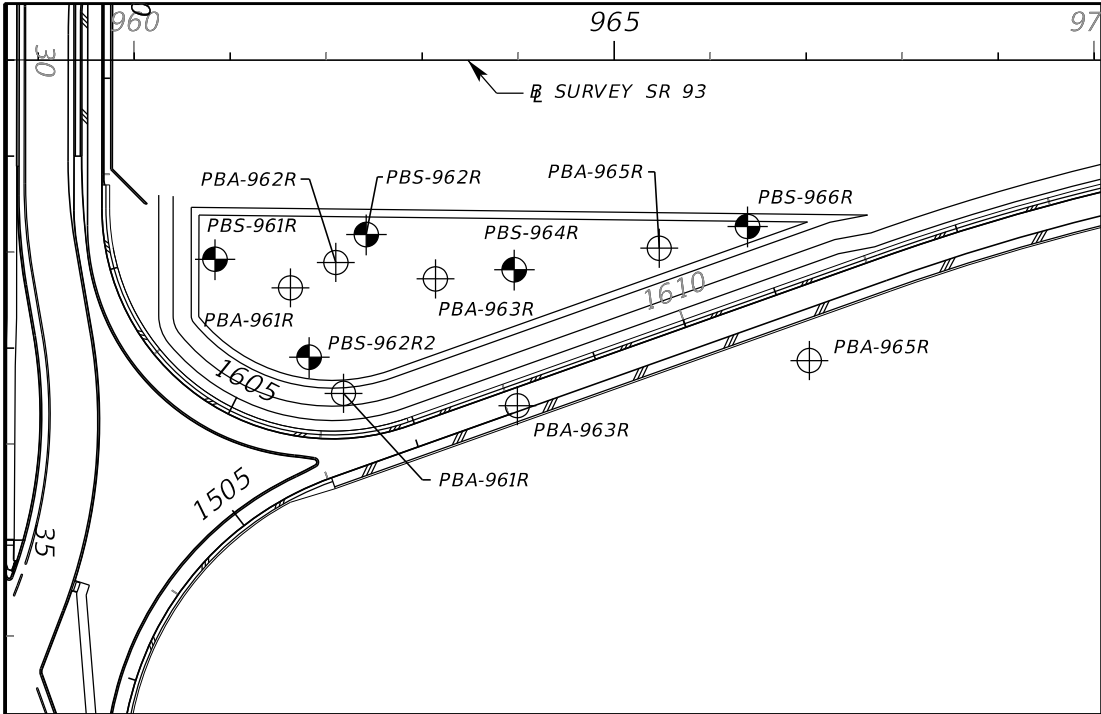


	SAFETY HAMMER	AUTOMATIC HAMMER
GRANULAR MATERIALS- RELATIVE DENSITY	SPT N-VALUE (BLOWS/FT.)	SPT N-VALUE (BLOWS/FT.)
VERY LOOSE LOOSE MEDIUM DENSE DENSE VERY DENSE	LESS THAN 4 4 to 10 10 to 30 30 to 50 GREATER THAN 50	LESS THAN 3 3 to 8 8 to 24 24 to 40 GREATER THAN 40
SILTS AND CLAYS CONSISTENCY	SPT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

POND D

REVISIONS				ENGINEER OF RECORD		STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION		POND SOIL SURVEY (8)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637		ROAD NO.	COUNTY		
							LEE	446296-2-52-01	

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



BORING LOCATION PLAN

NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)

2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)

3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)

4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)

5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)

6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK

A-3

N

50/4

HA

WH

-200

NMC

LL

PI

NP

NAVD 88

GNE

CAVE-IN

REFUSAL

AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

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

NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HAND AUGERED TO VERIFY UTILITY CLEARANCE

SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER

PERCENT PASSING #200 SIEVE

NATURAL MOISTURE CONTENT (%)

LIQUID LIMIT (%)

PLASTICITY INDEX (%)

NON-PLASTIC

NORTH AMERICAN VERTICAL DATUM OF 1988

APPROXIMATE SPT BORING LOCATION

APPROXIMATE AUGER BORING LOCATION

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS

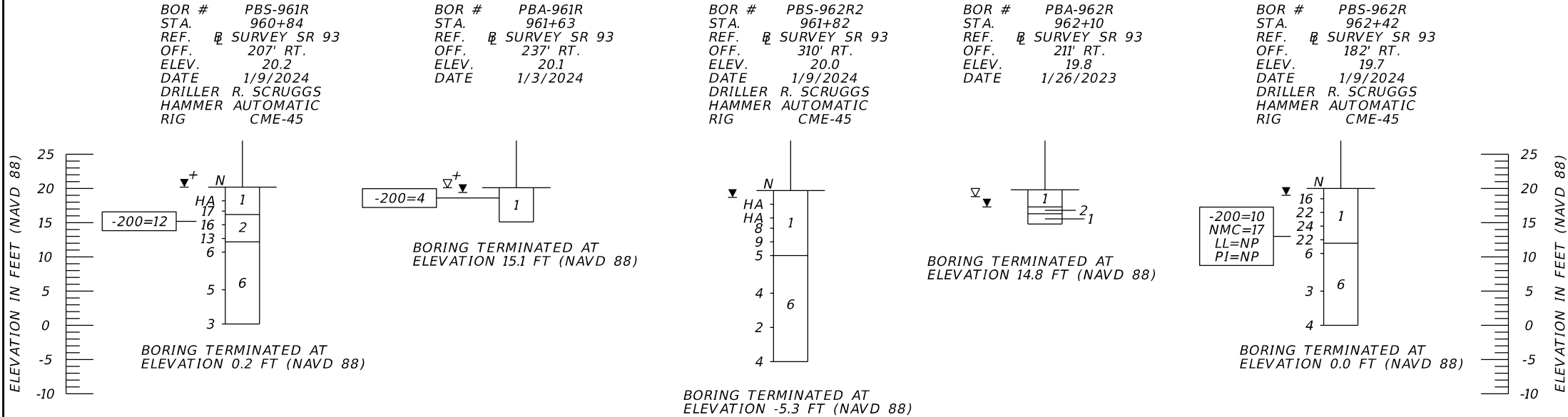
GROUNDWATER NOT ENCOUNTERED

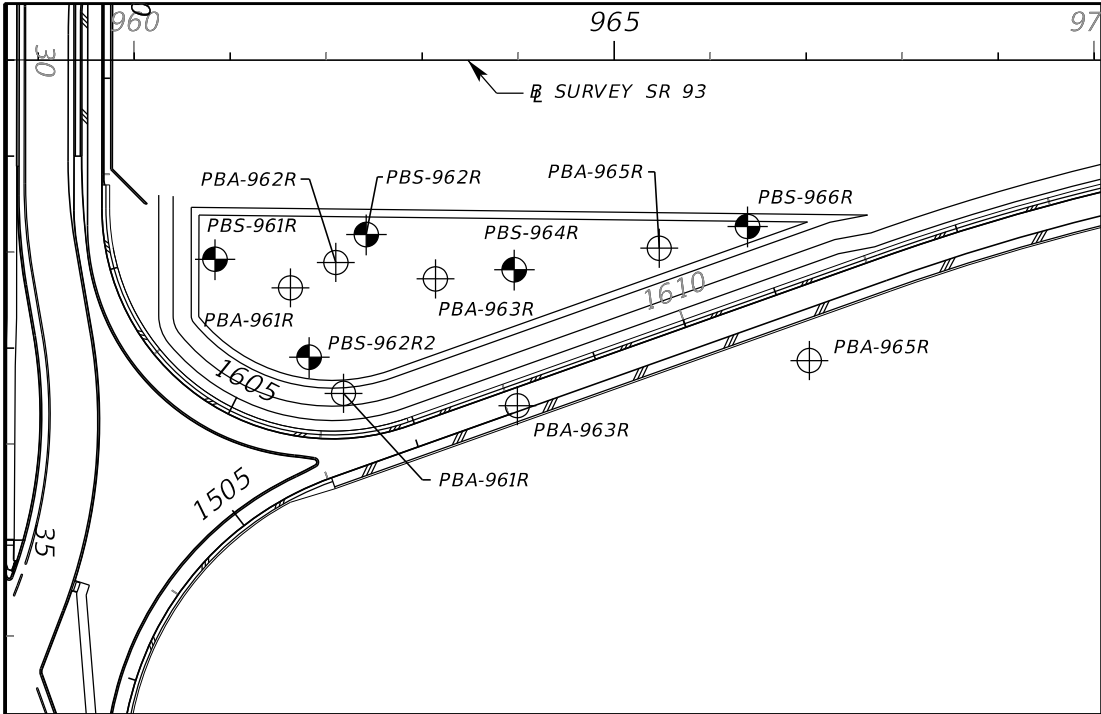
LOSS OF CIRCULATION OF DRILLING FLUID (%)

BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION

HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/ LIMEROCK
- SURVEY SR 93

BASELINE SURVEY SR 93





BORING LOCATION PLAN

NOTE: THE LOCATIONS AND ELEVATIONS OF THE BORINGS WERE PROVIDED BY THE PROJECT SURVEYOR. THE STATION AND OFFSET OF THE BORING LOCATIONS WERE DETERMINED UTILIZING THE GPS COORDINATES PROVIDED BY THE PROJECT SURVEYOR IN CONJUNCTION WITH PROJECT DESIGN FILES.

LEGEND

1. GRAY TO LIGHT BROWN TO BROWN SAND TO SAND WITH SILT, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-3)

2. GRAY TO LIGHT BROWN TO BROWN SILTY SAND, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-4)

3. GRAY TO LIGHT BROWN TO BROWN SILTY SAND TO SILTY-CLAYEY SAND, OCCASIONALLY WITH LIMESTONE OR SHELL FRAGMENTS (A-2-4)

4. LIGHT BROWN TO BROWN CLAYEY SAND TO CLAYEY-SILTY SAND TO SILT TO CLAY, OCCASIONALLY WITH LIMESTONE AND/OR SHELL FRAGMENTS (A-2-6/A-4)

5. DARK BROWN ORGANIC SAND TO ORGANIC SILTY SAND TO MUCK (A-8)

6. CALCAREOUS CLAY TO WEATHERED LIMESTONE/CAPROCK
- A-3

N

50/4

HA

WH

-200

NMC

LL

PI

NP
- AASHTO GROUP SYMBOL AS DETERMINED BY VISUAL REVIEW AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW.

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

NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION

HAND AUGERED TO VERIFY UTILITY CLEARANCE

SPLIT-SPOON SAMPLER ADVANCED UNDER WEIGHT OF ROD AND HAMMER

PERCENT PASSING #200 SIEVE

NATURAL MOISTURE CONTENT (%)

LIQUID LIMIT (%)

PLASTICITY INDEX (%)

NON-PLASTIC

APPROXIMATE SPT BORING LOCATION

APPROXIMATE AUGER BORING LOCATION

ESTIMATED SEASONAL HIGH GROUNDWATER TABLE AT OR ABOVE GRADE

GROUNDWATER LEVEL ENCOUNTERED DURING FIELD EXPLORATIONS

GROUNDWATER LEVEL ENCOUNTERED AT OR ABOVE GRADE DURING FIELD EXPLORATIONS

GROUNDWATER NOT ENCOUNTERED

LOSS OF CIRCULATION OF DRILLING FLUID (%)

BORING TERMINATED DUE TO BOREHOLE COLLAPSE FROM GROUNDWATER INTRUSION

HAND AUGER TERMINATED DUE TO REFUSAL CONDITIONS ON SHALLOW LIMESTONE/CAPROCK/LIMEROCK

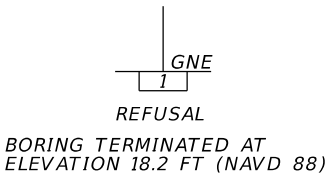
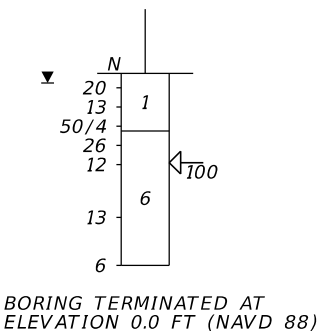
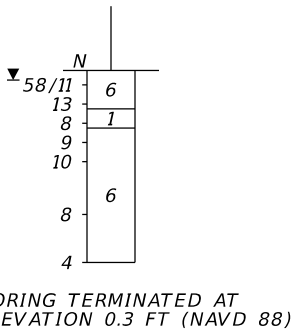
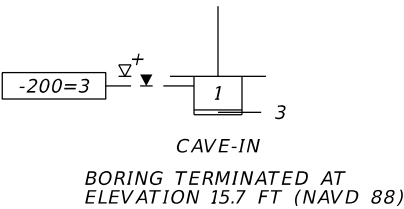
BASELINE SURVEY SR 93

BOR # PBA-963R
STA. 963+14
REF. SURVEY SR 93
OFF. 228' RT.
ELEV. 19.7
DATE 1/3/2024

BOR # PBS-964R
STA. 963+96
REF. SURVEY SR 93
OFF. 218' RT.
ELEV. 20.3
DATE 1/9/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC RIG CME-45

BOR # PBS-966R
STA. 966+39
REF. SURVEY SR 93
OFF. 173' RT.
ELEV. 20.0
DATE 1/9/2024
DRILLER R. SCRUGGS
HAMMER AUTOMATIC RIG CME-45

BOR # PBA-965R
STA. 965+47
REF. SURVEY SR 93
OFF. 196' RT.
ELEV. 20.2
DATE 1/3/2024



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

POND C

REVISIONS				ENGINEER OF RECORD			STATE OF FLORIDA DEPARTMENT OF TRANSPORTATION			POND SOIL SURVEY (10)	SHEET NO.
DATE	DESCRIPTION	DATE	DESCRIPTION	THOMAS E. MUSGRAVE, JR., P.E. LICENSE NUMBER: 81669 TIERRA, INC. 7351 TEMPLE TERRACE HIGHWAY TAMPA, FLORIDA 33637			ROAD NO.	COUNTY	FINANCIAL PROJECT ID		
								LEE	446296-2-52-01		

APPENDIX C

Summary of Seasonal High Groundwater Table Estimates for Roadway and Ponds

Summary of Groundwater Table Measurements from Piezometers

<p align="center"> Summary of Seasonal High Groundwater Table Estimates for Roadway and Ponds I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway Lee County, Florida FPID: 446296-2-52-01 Kimley-Horn Project No.: 143435001 Tierra Project No.: 6511-21-320 </p>

Boring Name	Boring Location ⁽¹⁾			Boring Depth ⁽²⁾ (feet)	Ground Elevation ⁽¹⁾ (feet, NAVD 88)	Measured Groundwater Table			USDA Soil Survey		Estimated SHGWT ⁽⁵⁾		
	Station (feet)	Offset (feet)	Alignment			Date Recorded	Depth ⁽³⁾ (feet)	Elevation (feet, NAVD 88)	Map Symbol	Estimated SHGWT ⁽⁴⁾ Depth (feet)	Depth ⁽³⁾ (feet)	Elevation (feet, NAVD 88)	
Daniels Pkwy (CR 876)													
SH-18R	18+20	91' RT.	Baseline Survey Daniels Pkwy	4.5	19.6	1/26/2023	3.0	16.6	36	0.5-1.5	1.5	18.1	
SH-18L	18+31	94' LT.	Baseline Survey Daniels Pkwy	5.5	21.3	1/25/2023	4.8	16.5	36	0.5-1.5	2.5	18.8	
SH-21R	21+22	94' RT.	Baseline Survey Daniels Pkwy	5.0	20.4	1/25/2023	3.3	17.1	28	0.5-1.5	2.0	18.4	
SH-21L	21+35	102' LT.	Baseline Survey Daniels Pkwy	4.5	21.0	1/25/2023	3.7	17.3	36	0.5-1.5	2.0	19.0	
SH-25	24+75	2' RT.	Baseline Survey Daniels Pkwy	6.5	26.3	1/30/2023	6.0	20.3	36	0.5-1.5	ND	ND	
SH-30	30+11	6' RT.	Baseline Survey Daniels Pkwy	7.0	25.5	1/30/2023	GNE	<18.5	36	0.5-1.5	ND	ND	
SH-33R	33+32	105' RT.	Baseline Survey Daniels Pkwy	4.0	20.9	1/26/2023	2.8	18.1	36	0.5-1.5	1.5	19.4	
SH-34L	34+08	118' LT.	Baseline Survey Daniels Pkwy	4.0	20.8	1/26/2023	2.6	18.2	36	0.5-1.5	1.0	19.8	
SH-36	36+70	8' RT.	Baseline Survey Daniels Pkwy	7.0	26.5	1/30/2023	GNE	<19.5	36	0.5-1.5	ND	ND	
SH-37R	37+20	134' RT.	Baseline Survey Daniels Pkwy	3.0	19.5	1/30/2023	1.8	17.7	36	0.5-1.5	ABG ⁽⁶⁾	≥19.5	
SH-39R	39+60	110' RT.	Baseline Survey Daniels Pkwy	3.5	20.4	1/30/2023	1.8	18.6	36	0.5-1.5	1.0	19.4	
SH-39L	39+75	116' LT.	Baseline Survey Daniels Pkwy	3.5	21.0	1/30/2023	2.3	18.7	119	0.3-1.5	1.0	20.0	
SH-42R	42+44	87' RT.	Baseline Survey Daniels Pkwy	3.0	20.1	1/30/2023	1.5	18.6	119	0.3-1.5	ABG ⁽⁶⁾	≥20.1	
SH-42L	42+73	115' LT.	Baseline Survey Daniels Pkwy	3.0	20.0	1/30/2023	1.6	18.4	36	0.5-1.5	0.5	19.5	
SH-45R	45+61	81' RT.	Baseline Survey Daniels Pkwy	2.5	19.8	1/30/2023	0.8	19.0	64	0.3-1.5	ABG ⁽⁶⁾	≥19.8	
SH-45L	45+81	109' LT.	Baseline Survey Daniels Pkwy	2.0	20.1	1/30/2023	1.0	19.1	64/119	0.3-1.5/0.3-1.5	ABG ⁽⁶⁾	≥20.1	
SH-49L	48+91	97' LT.	Baseline Survey Daniels Pkwy	2.5	20.5	1/30/2023	1.8	18.7	64/119	0.3-1.5/0.3-1.5	ABG ⁽⁶⁾	≥20.5	
I-75 (SR 93)													
SH-930L	930+58	110' LT.	Baseline Survey SR 93	4.5	19.8	1/26/2023	2.4	17.4	28	0.5-1.5	1.0	18.8	
SH-933R	933+45	108' RT.	Baseline Survey SR 93	4.5	20.2	1/26/2023	2.4	17.8	36	0.5-1.5	1.5	18.7	
SH-933L	933+46	106' LT.	Baseline Survey SR 93	4.0	20.5	1/26/2023	2.7	17.8	28	0.5-1.5	1.0	19.0	
SH-937R	936+74	108' RT.	Baseline Survey SR 93	4.0	20.2	1/26/2023	2.2	18.0	36	0.5-1.5	1.0	19.7	
SH-937L	936+77	112' LT.	Baseline Survey SR 93	3.5	19.9	1/26/2023	1.7	18.2	28	0.5-1.5	0.5	19.4	
SH-50R	50+04	117' RT.	Baseline Survey SR 93	5.0	19.0	1/30/2023	1.8	17.2	36	0.5-1.5	0.5	18.5	
SH-53R	53+31	114' RT.	Baseline Survey SR 93	5.0	19.0	1/30/2023	4.1	14.9	102	0.3-1.5	1.0	18.0	
SH-56R	56+24	133' RT.	Baseline Survey SR 93	3.0	18.4	1/30/2023	0.9	17.5	102/113	0.3-1.5/0.3-1.5	ABG ⁽⁶⁾	≥18.4	

⁽¹⁾ The boring locations and ground elevations were provided by the project surveyor. Project design files were utilized in conjunction with the coordinates provided by the project surveyor to determine the station and offset of the boring locations.

⁽²⁾ Depth of boring below existing grades. Shallow borings less than 5 feet in depth were terminated due to borehole collapse from groundwater intrusion.

⁽³⁾ Depth below grade at time of boring.

⁽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⁾ We recommend the project biologist be consulted to assist with determining seasonal high groundwater table levels using biological indicators and/or available wetland information at these locations.

⁽⁷⁾ Boring names have been updated based on the new alignment nomenclature.

ABG: At or Above Existing Grade

GNE: Groundwater Not Encountered

ND: Not Determined due to a lack of natural geotechnical indicators - Disturbance with Fill.

<p align="center"> Summary of Seasonal High Groundwater Table Estimates for Roadway and Ponds I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway Lee County, Florida FPID: 446296-2-52-01 Kimley-Horn Project No.: 143435001 Tierra Project No.: 6511-21-320 </p>

Boring Name	Boring Location ⁽¹⁾			Boring Depth ⁽²⁾ (feet)	Ground Elevation ⁽¹⁾ (feet, NAVD 88)	Measured Groundwater Table			USDA Soil Survey		Estimated SHGWT ⁽⁵⁾		
	Station (feet)	Offset (feet)	Alignment			Date Recorded	Depth ⁽³⁾ (feet)	Elevation (feet, NAVD 88)	Map Symbol	Estimated SHGWT ⁽⁴⁾ Depth (feet)	Depth ⁽³⁾ (feet)	Elevation (feet, NAVD 88)	
I-75 (SR 93) Continued													
SH-59R	59+53	118' RT.	Baseline Survey SR 93	3.5	18.3	1/30/2023	1.3	17.0	132/102	+2.0-0.0/0.3-1.5	ABG ⁽⁶⁾	≥18.1	
SH-62R	62+62	108' RT.	Baseline Survey SR 93	3.0	20.0	1/30/2023	2.9	17.1	132	+2.0-0.0	0.5	19.5	
SH-65R	65+69	110' RT.	Baseline Survey SR 93	2.5	20.0	1/30/2023	2.3	17.7	129	0.5-1.5	0.5	19.5	
SH-69R	68+85	117' RT.	Baseline Survey SR 93	4.0	19.6	1/30/2023	2.2	17.4	129	0.5-1.5	ABG ⁽⁶⁾	≥19.6	
SH-72R	71+89	114' RT.	Baseline Survey SR 93	4.0	19.8	1/30/2023	2.9	16.9	119	0.3-1.5	0.5	19.3	
SH-75R	74+94	115' RT.	Baseline Survey SR 93	4.5	19.7	1/30/2023	2.7	17.0	119	0.3-1.5	0.5	19.2	
SH-77R	77+55	112' RT.	Baseline Survey SR 93	4.5	19.9	1/30/2023	2.8	17.1	119	0.3-1.5	0.5	19.4	
Ramp A (Southwest Quadrant)													
SH-1105R	1104+82	3' RT.	Baseline Survey Ramp A1	5.0	19.8	1/25/2023	2.6	17.2	6/36	0.3-1.5/0.5-1.5	1.0	18.8	
SH-1198R	1198+35	47' LT.	Baseline Survey Ramp A2	3.5	20.1	1/26/2023	2.0	18.1	28	0.5-1.5	1.0	19.1	
SH-1202R	1201+78	39' LT.	Baseline Survey Ramp A2	4.5	21.5	1/26/2023	3.5	18.0	28	0.5-1.5	1.5	20.0	
SH-1205R	1204+91	44' LT.	Baseline Survey Ramp A2	4.5	20.5	1/25/2023	2.6	17.9	28/36	0.5-1.5/0.5-1.5	1.0	19.5	
SH-1208R	1208+21	37' RT.	Baseline Survey Ramp A2	4.0	19.8	1/26/2023	2.3	17.5	36	0.5-1.5	0.5	19.3	
SH-1212L	1212+14	44' LT.	Baseline Survey Ramp A2	4.5	19.9	1/25/2023	2.6	17.3	6/28	0.3-1.5/0.5-1.5	1.0	18.9	
SH-1215L	1215+51	11' LT.	Baseline Survey Ramp A2	3.0	19.6	1/26/2023	2.1	17.5	36	0.5-1.5	0.5	19.1	
SH-1217R	1216+90	4' RT.	Baseline Survey Ramp A2	3.0	19.5	1/26/2023	2.1	17.4	36	0.5-1.5	0.5	19.0	
Ramp B (Southeast Quadrant)													
SH-1303R	1302+89	30' RT.	Baseline Survey Ramp B1	4.0	20.5	1/26/2023	2.3	18.2	36	0.5-1.5	1.0	19.5	
SH-1309L	1309+26	49' LT.	Baseline Survey Ramp B1	5.5	22.3	1/26/2023	4.3	18.0	36	0.5-1.5	2.5	19.8	
SH-1312R	1312+25	28' RT.	Baseline Survey Ramp B1	3.5	20.3	1/26/2023	1.9	18.4	36	0.5-1.5	0.5	19.8	
SH-1315R	1315+56	23' RT.	Baseline Survey Ramp B1	3.5	20.6	1/26/2023	2.3	18.3	36	0.5-1.5	0.5	20.1	
SH-1318L	1318+42	42' LT.	Baseline Survey Ramp B1	4.5	21.8	1/26/2023	3.3	18.5	36	0.5-1.5	1.0	20.8	
SH-1404L	1404+61	43' LT.	Baseline Survey Ramp B2	4.0	19.9	1/26/2023	1.6	18.3	36	0.5-1.5	ABG ⁽⁶⁾	≥19.9	
Ramp C (Northeast Quadrant)													
SH-1503L	1503+03	48' LT.	Baseline Survey Ramp C2	4.5	23.8	1/26/2023	GNE	<19.3	36	0.5-1.5	ND	ND	
SH-1506R	1506+00	26' RT.	Baseline Survey Ramp C2	2.5	18.9	1/30/2023	1.2	17.7	36	0.5-1.5	ABG ⁽⁶⁾	≥18.9	

⁽¹⁾ The boring locations and ground elevations were provided by the project surveyor. Project design files were utilized in conjunction with the coordinates provided by the project surveyor to determine the station and offset of the boring locations.

⁽²⁾ Depth of boring below existing grades. Shallow borings less than 5 feet in depth were terminated due to borehole collapse from groundwater intrusion.

(3) Depth below grade at time of boring.

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

²⁰ 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⁾ We recommend the project biologist be consulted to assist with determining seasonal high groundwater table levels using biological indicators and/or available wetland information at these locations.

⁽⁷⁾ Boring names have been updated based on the new alignment nomenclature.

ABG: At or Above Existing Grade

GNE: Groundwater Not Encountered

ND: Not Determined due to a lack of natural geotechnical indicators - Disturbance with Fill.

**Summary of Seasonal High Groundwater Table Estimates for Roadway and Ponds
I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway
Lee County, Florida
FPID: 446296-2-52-01
Kimley-Horn Project No.: 143435001
Tierra Project No.: 6511-21-320**

Boring Name	Boring Location ⁽¹⁾			Boring Depth ⁽²⁾ (feet)	Ground Elevation ⁽¹⁾ (feet, NAVD 88)	Measured Groundwater Table			USDA Soil Survey		Estimated SHGWT ⁽⁵⁾	
	Station (feet)	Offset (feet)	Alignment			Date Recorded	Depth ⁽³⁾ (feet)	Elevation (feet, NAVD 88)	Map Symbol	Estimated SHGWT ⁽⁴⁾ Depth (feet)	Depth ⁽³⁾ (feet)	Elevation (feet, NAVD 88)
Ramp C (Northeast Quadrant) Continued												
SH-1598L	1598+27	6' LT.	Baseline Survey Ramp C1	4.5	20.8	1/30/2023	3.8	17.0	36	0.5-1.5	1.5	19.3
SH-1604R	1604+16	27' RT.	Baseline Survey Ramp C1	3.0	19.8	1/26/2023	1.6	18.2	36	0.5-1.5	ABG ⁽⁶⁾	≥19.8
SH-1608L	1608+65	40' LT.	Baseline Survey Ramp C1	5.0	19.6	1/30/2023	2.1	17.5	36	0.5-1.5	1.0	18.6
SH-1611R	1611+68	42' RT.	Baseline Survey Ramp C1	4.0	20.0	1/30/2023	2.9	17.1	64/36	0.3-1.5/0.5/1.5	1.0	19.0
SH-1615L	1614+79	21' LT.	Baseline Survey Ramp C1	4.0	23.4	1/30/2023	GNE	<19.4	36	0.5-1.5	ND	ND
SH-1617R	1617+65	68' RT.	Baseline Survey Ramp C1	3.0	18.6	1/30/2023	1.3	17.3	32/64	0.5-1.5/0.3-1.5	ABG ⁽⁶⁾	≥18.6
Ramp D (Northwest Quadrant)												
SH-1702L	1702+54	66' LT.	Baseline Survey Ramp D1	4.0	19.7	1/25/2023	2.4	17.3	36	0.5-1.5	0.5	19.2
SH-1706L	1705+93	36' LT.	Baseline Survey Ramp D1	5.0	19.7	1/25/2023	2.9	16.8	36	0.5-1.5	1.0	18.7
SH-1706R	1706+50	88' RT.	Baseline Survey Ramp D1	4.5	20.3	1/25/2023	2.8	17.5	36	0.5-1.5	1.0	19.3
SH-1710L	1710+05	32' LT.	Baseline Survey Ramp D1	5.0	19.9	1/25/2023	3.0	16.9	36	0.5-1.5	1.0	18.9
SH-1712L	1712+04	19' LT.	Baseline Survey Ramp D1	5.5	21.2	1/25/2023	3.8	17.4	36	0.5-1.5	2.0	19.2
SH-1714L	1713+94	24' LT.	Baseline Survey Ramp D1	3.5	20.3	1/25/2023	2.8	17.5	36	0.5-1.5	1.0	19.3
SH-1803L	1803+35	1' RT.	Baseline Survey Ramp D2	4.0	19.7	1/25/2023	2.7	17.0	36	0.5-1.5	0.5	19.2
Pond A												
PBA-953L	953+41	218' LT.	B/L Survey SR 93	2.0	19.8	1/2/2024	GNE	<17.8	36	0.5-1.5	ABG ⁽⁶⁾	≥19.8
PBA-955L	954+91	191' LT.	B/L Survey SR 93	5.0	20.1	1/26/2023	3.0	17.1	36	0.5-1.5	1.0	19.1
PBA-956L	955+67	218' LT.	B/L Survey SR 93	2.0	19.8	1/2/2024	1.0	18.8	36	0.5-1.5	ABG ⁽⁶⁾	≥19.8
Pond B												
PBA-949R	949+00	177' RT.	B/L Survey SR 93	3.0	19.9	1/3/2024	0.7	19.2	36	0.5-1.5	ABG ⁽⁶⁾	≥19.9
PBA-952R	951+75	178' RT.	B/L Survey SR 93	3.0	19.7	1/3/2024	0.7	19.0	36	0.5-1.5	ABG ⁽⁶⁾	≥19.7
PBA-953R	952+67	382' RT.	B/L Survey SR 93	3.0	21.2	1/3/2024	1.0	20.2	36	0.5-1.5	ABG ⁽⁶⁾	≥21.2
PBA-954R	954+37	405' RT.	B/L Survey SR 93	3.0	20.0	1/2/2024	0.7	19.3	36	0.5-1.5	ABG ⁽⁶⁾	≥20.0
PBA-955R	955+47	352' RT.	B/L Survey SR 93	3.5	19.9	1/26/2023	1.7	18.2	36	0.5-1.5	ABG ⁽⁶⁾	≥19.9
PBA-956R	955+85	262' RT.	B/L Survey SR 93	4.0	19.9	1/2/2024	0.8	19.1	36	0.5-1.5	ABG ⁽⁶⁾	≥19.9

⁽¹⁾ The boring locations and ground elevations were provided by the project surveyor. Project design files were utilized in conjunction with the coordinates provided by the project surveyor to determine the station and offset of the boring locations.

⁽²⁾ Depth of boring below existing grades. Shallow borings less than 5 feet in depth were terminated due to borehole collapse from groundwater intrusion or refusal on shallow caprock.

⁽³⁾ Depth below grade at time of boring.

⁽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⁾ We recommend the project biologist be consulted to assist with determining seasonal high groundwater table levels using biological indicators and/or available wetland information at these locations.

⁽⁷⁾ Boring names have been updated based on the new alignment nomenclature.

ABG: At or Above Existing Grade

GNE: Groundwater Not Encountered

ND: Not Determined due to a lack of natural geotechnical indicators - Disturbance with Fill.

**Summary of Seasonal High Groundwater Table Estimates for Roadway and Ponds
I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway
Lee County, Florida
FPID: 446296-2-52-01
Kimley-Horn Project No.: 143435001
Tierra Project No.: 6511-21-320**

Boring Name	Boring Location ⁽¹⁾			Boring Depth ⁽²⁾ (feet)	Ground Elevation ⁽¹⁾ (feet, NAVD 88)	Measured Groundwater Table			USDA Soil Survey		Estimated SHGWT ⁽⁵⁾	
	Station (feet)	Offset (feet)	Alignment			Date Recorded	Depth ⁽³⁾ (feet)	Elevation (feet, NAVD 88)	Map Symbol	Estimated SHGWT ⁽⁴⁾ Depth (feet)	Depth ⁽³⁾ (feet)	Elevation (feet, NAVD 88)
Pond C												
PBA-961R	961+63	237' RT.	B/L Survey SR 93	5.0	20.1	1/3/2024	0.7	19.4	36	0.5-1.5	1.0	19.1
PBA-962R	962+10	211' RT.	B/L Survey SR 93	5.0	19.8	1/26/2023	2.5	17.3	36	0.5-1.5	1.0	18.8
PBA-963R	963+14	228' RT.	B/L Survey SR 93	4.0	19.7	1/3/2024	1.0	18.7	36	0.5-1.5	ABG ⁽⁶⁾	≥19.7
PBA-965R	965+47	196' RT.	B/L Survey SR 93	2.0	20.2	1/3/2024	GNE	<18.2	36	0.5-1.5	ND	ND
Pond D												
PBA-961L	961+46	182' LT.	B/L Survey SR 93	5.5	20.1	1/25/2023	3.0	17.1	36	0.5-1.5	1.0	19.1
PBA-962L	961+81	229' LT.	B/L Survey SR 93	3.0	19.6	1/3/2024	1.0	18.6	36	0.5-1.5	ABG ⁽⁶⁾	≥19.6
PBA-964L	963+81	198' LT.	B/L Survey SR 93	3.0	19.4	1/3/2024	0.7	18.7	36	0.5-1.5	ABG ⁽⁶⁾	≥19.4

⁽¹⁾ The boring locations and ground elevations were provided by the project surveyor. Project design files were utilized in conjunction with the coordinates provided by the project surveyor to determine the station and offset of the boring locations.

⁽²⁾ Depth of boring below existing grades. Shallow borings less than 5 feet in depth were terminated due to borehole collapse from groundwater intrusion or refusal on shallow caprock.

(3) Depth below grade at time of boring.

⁽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⁾ We recommend the project biologist be consulted to assist with determining seasonal high groundwater table levels using biological indicators and/or available wetland information at these locations.

(7) Boring names have been updated based on the new alignment nomenclature.

ABG: At or Above Existing Grade

GNE: Groundwater Not Encountered

ND: Not Determined due to a lack of natural geotechnical indicators - Disturbance with Fill.

Summary of Groundwater Table Measurements from Piezometers
I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway
Lee County, Florida
FPID: 446296-1-22-01
Kimley-Horn Project No.: 143435001
Tierra Project No.: 6511-21-320

Piezometer Boring Identification	Piezometer Location ⁽¹⁾			Ground Elevation ⁽¹⁾ (feet, NAVD 88)	Recorded Groundwater Levels within Piezometers							
	Station (feet)	Offset (feet)	Alignment		8/7/2023		9/23/2023		10/12/2023		10/30/2023	
					Depth (feet)	Elevation ⁽²⁾ (feet, NAVD 88)	Depth (feet)	Elevation ⁽²⁾ (feet, NAVD 88)	Depth (feet)	Elevation ⁽²⁾ (feet, NAVD 88)	Depth (feet)	Elevation ⁽²⁾ (feet, NAVD 88)
PBA-955L	954+91	191' LT.	B/L SURVEY SR 93	20.1	0.9	19.2	0.7	19.4	0.1	20.0	1.8	18.3
PBA-955R	955+47	352' RT.	B/L SURVEY SR 93	19.9	0.1	19.8	0.0	19.9	0.1	19.8	0.9	19.0
PBA-961L	961+46	182' LT.	B/L SURVEY SR 93	20.1	1.2	18.9	0.9	19.2	0.4	19.7	2.1	18.0
PBA-962R	962+10	211' RT.	B/L SURVEY SR 93	19.8	0.1	19.7	0.0	19.8	0.2	19.6	1.3	18.5
SH-1215L	1215+51	11' LT.	B/L RAMP A2	19.6	-0.1 ⁽³⁾	19.7	0.0	19.6	0.0	19.6	1.0	18.6
SH-1404L	1404+61	43' LT.	B/L RAMP B2	19.9	0.6	19.3	0.4	19.5	0.3	19.6	0.9	19.0
SH-1604R	1604+16	27' RT.	B/L RAMP C1	19.8	0.1	19.7	0.0	19.8	0.2	19.6	0.9	18.9
SH-1706R	1706+50	88' RT.	B/L RAMP D1	20.3	0.8	19.5	0.7	19.6	0.7	19.6	2.1	18.2

⁽¹⁾ Boring locations and elevations were provided by the project surveyor. The boring locations were converted to station and offset using project design files.

⁽²⁾ Groundwater elevations calculated by subtracting the depth to the groundwater from the surveyed ground elevation.

⁽³⁾ Groundwater level was measured to be above the existing ground surface.

APPENDIX D

Summary of Laboratory Test Results for Soil Classification

Summary of Laboratory Test Results for Environmental Classification

Summary of Laboratory Test Results for Soil Classification

I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway

Lee County, Florida

FPID: 446296-2-52-01

Kimley-Horn Project No.: 143435001

Tierra Project No.: 6511-21-320

Boring Name	Sample Depth (feet)	Stratum	AASHTO	% Finer					Atterberg Limits			Organic Content	Moisture Content
				#10	#40	#60	#100	#200	LL	PL	PI		
SH-1105R	4.0 - 4.5	1	A-3	100	96	79	34	10	-	-	-	-	-
SH-1202R	2.0 - 3.0	1	A-3	-	-	-	-	2	-	-	-	-	-
SH-1212L	1.0 - 2.5	1	A-3	-	-	-	-	2	-	-	-	-	-
AB-1300R	1.5 - 3.0	1	A-3	-	-	-	-	2	-	-	-	-	-
AB-1308L	2.5 - 3.5	1	A-3	-	-	-	-	3	-	-	-	-	-
AB-1310R	0.0 - 1.0	1	A-3	-	-	-	-	5	-	-	-	-	-
AB-1314R	0.0 - 1.0	1	A-3	-	-	-	-	8	-	-	-	-	-
SH-1315R	1.5 - 2.5	1	A-3	-	-	-	-	2	-	-	-	-	-
AB-1400R	2.0 - 3.5	1	A-3	100	96	80	36	4	-	-	-	-	-
AB-1403R	1.0 - 2.0	1	A-3	-	-	-	-	4	-	-	-	3.0	25
AB-1616R	3.0 - 4.0	1	A-3	-	-	-	-	8	NP	NP	NP	-	20
SH-1617R	1.0 - 2.0	1	A-3	-	-	-	-	3	-	-	-	-	-
AB-1708R	2.0 - 3.0	1	A-3	-	-	-	-	10	NP	NP	NP	-	22
AB-1709R	2.0 - 3.0	1	A-3	-	-	-	-	6	-	-	-	-	-
SH-18R	1.5 - 2.5	1	A-3	-	-	-	-	2	-	-	-	-	-
WB-29L	0.0 - 4.0	1	A-3	-	-	-	-	6	-	-	-	-	-
WB-30L2	4.0 - 8.0	1	A-3	-	-	-	-	7	-	-	-	-	-
WB-30L	33.5 - 35.0	1	A-3	-	-	-	-	10	-	-	-	-	-
WB-31L	0.0 - 4.0	1	A-3	-	-	-	-	6	-	-	-	-	-
WB-31L	8.0 - 10.0	1	A-3	-	-	-	-	8	-	-	-	-	-
SH-37R	0.5 - 1.0	1	A-3	-	-	-	-	8	-	-	-	2.5	33
AB-44L	2.5 - 5.0	1	A-3	-	-	-	-	5	-	-	-	-	-
SH-45R	0.5 - 1.5	1	A-3	-	-	-	-	7	-	-	-	-	-
SH-45L	0.5 - 1.0	1	A-3	100	95	77	34	4	-	-	-	-	-
AB-57R	1.0 - 2.0	1	A-3	-	-	-	-	7	-	-	-	-	-
SH-62R	0.5 - 1.5	1	A-3	-	-	-	-	6	-	-	-	-	-

Summary of Laboratory Test Results for Soil Classification

I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway

Lee County, Florida

FPID: 446296-2-52-01

Kimley-Horn Project No.: 143435001

Tierra Project No.: 6511-21-320

Boring Name	Sample Depth (feet)	Stratum	AASHTO	% Finer					Atterberg Limits			Organic Content	Moisture Content
				#10	#40	#60	#100	#200	LL	PL	PI		
SH-69R	3.5 - 4.0	1	A-3	-	-	-	-	7	-	-	-	-	-
SH-72R	3.5 - 4.0	1	A-3	-	-	-	-	7	-	-	-	-	-
SH-75R	3.0 - 3.5	1	A-3	-	-	-	-	8	NP	NP	NP	-	21
SH-77R	2.0 - 3.0	1	A-3	-	-	-	-	1	-	-	-	-	-
SH-930L	2.0 - 3.0	1	A-3	-	-	-	-	3	-	-	-	-	-
SH-937R	3.5 - 4.0	1	A-3	-	-	-	-	8	-	-	-	-	-
PBA-949R	0.0 - 1.0	1	A-3	100	95	77	33	6	-	-	-	-	-
PBS-949R	2.0 - 4.0	1	A-3	-	-	-	-	2	-	-	-	-	-
PBS-951L	6.0 - 8.0	1	A-3	-	-	-	-	3	-	-	-	-	-
PBA-952R	0.0 - 1.0	1	A-3	78	74	62	30	4	-	-	-	-	-
PBA-953R	1.0 - 2.0	1	A-3	100	95	79	35	2	-	-	-	-	-
PBS-953R	4.0 - 6.0	1	A-3	-	-	-	-	8	-	-	-	-	-
PBA-954R	0.0 - 1.0	1	A-3	100	96	80	38	2	-	-	-	-	-
PBA-954R	0.5 - 1.5	1	A-3	100	96	79	37	1	-	-	-	-	-
PBS-954R2	6.0 - 8.0	1	A-3	-	-	-	-	3	-	-	-	-	-
PBA-956L	0.0 - 1.0	1	A-3	100	96	82	41	4	-	-	-	-	-
PBA-956R	0.0 - 1.0	1	A-3	100	95	77	36	4	-	-	-	-	-
PBS-956R	2.0 - 4.0	1	A-3	-	-	-	-	6	-	-	-	-	-
PBS-957R	4.0 - 6.0	1	A-3	-	-	-	-	6	-	-	-	-	-
PBA-961R	1.0 - 2.0	1	A-3	90	86	72	34	4	-	-	-	-	-
PBA-962L	0.0 - 1.0	1	A-3	87	83	67	31	5	-	-	-	-	-
PBS-962R2	6.0 - 8.0	1	A-3	-	-	-	-	10	NP	NP	NP	-	17
PBS-963L	4.0 - 6.0	1	A-3	-	-	-	-	6	-	-	-	-	-
PBA-963R	0.5 - 1.5	1	A-3	100	97	81	39	3	-	-	-	-	-
PBA-964L	0.0 - 1.0	1	A-3	100	95	76	33	4	-	-	-	-	-
AB-1216L	0.0 - 3.5	2	A-2-4	100	94	78	39	12	-	-	-	-	-

Summary of Laboratory Test Results for Soil Classification

I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway

Lee County, Florida

FPID: 446296-2-52-01

Kimley-Horn Project No.: 143435001

Tierra Project No.: 6511-21-320

Boring Name	Sample Depth (feet)	Stratum	AASHTO	% Finer					Atterberg Limits			Organic Content	Moisture Content
				#10	#40	#60	#100	#200	LL	PL	PI		
SH-1712L	5.0 - 5.5	2	A-2-4	-	-	-	-	14	-	-	-	-	-
WB-29L	8.0 - 10.0	2	A-2-4	-	-	-	-	11	-	-	-	-	-
AB-38L	4.5 - 5.0	2	A-2-4	100	96	82	42	13	-	-	-	-	-
SH-50R	3.5 - 4.0	2	A-2-4	-	-	-	-	12	-	-	-	-	-
PBS-953R2	4.0 - 6.0	2	A-2-4	-	-	-	-	14	NP	NP	NP	-	19
PBS-954L	4.0 - 6.0	2	A-2-4	-	-	-	-	11	-	-	-	-	-
PBS-955R2	4.0 - 6.0	2	A-2-4	-	-	-	-	14	-	-	-	-	-
PBS-961R	4.0 - 6.0	2	A-2-4	-	-	-	-	12	-	-	-	-	-
AB-1402R	2.5 - 3.0	3	A-2-4	-	-	-	-	16	NP	NP	NP	-	31
SH-1608L	4.0 - 4.5	3	A-2-4	-	-	-	-	18	26	17	9	-	20
AB-1610R	2.5 - 3.0	3	A-2-4	-	-	-	-	15	NP	NP	NP	-	19
SH-1611R	3.5 - 4.0	3	A-2-4	-	-	-	-	17	NP	NP	NP	-	24
AB-1614R	2.0 - 3.0	3	A-2-4	-	-	-	-	16	NP	NP	NP	-	22
SH-1706R	3.0 - 3.5	3	A-2-4	-	-	-	-	16	NP	NP	NP	-	20
SH-1706R	3.5 - 4.0	3	A-2-4	100	98	86	51	19	-	-	-	-	-
AB-1803R	3.5 - 4.5	3	A-2-4	-	-	-	-	19	NP	NP	NP	-	20
SH-1803L	2.5 - 3.0	3	A-2-4	-	-	-	-	16	NP	NP	NP	-	24
WB-30L	4.0 - 8.0	3	A-2-4	-	-	-	-	26	-	-	-	-	-
AB-54R	3.0 - 4.0	3	A-2-4	-	-	-	-	15	NP	NP	NP	-	23
SH-56R	1.5 - 2.0	3	A-2-4	-	-	-	-	20	NP	NP	NP	-	22
SH-59R	1.5 - 2.0	3	A-2-4	-	-	-	-	20	-	-	-	-	-
PBS-954R	6.0 - 8.0	3	A-2-4	-	-	-	-	17	-	-	-	-	-
PBS-954R2	4.0 - 6.0	3	A-2-4	-	-	-	-	21	23	18	5	-	23
PBS-956L	2.0 - 4.0	3	A-2-4	-	-	-	-	22	23	18	5	-	28
PBA-956R	3.5 - 4.0	3	A-2-4	-	-	-	-	15	NP	NP	NP	-	21
PBS-957L	2.0 - 4.0	3	A-2-4	-	-	-	-	15	NP	NP	NP	-	17

Summary of Laboratory Test Results for Soil Classification**I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway****Lee County, Florida****FPID: 446296-2-52-01****Kimley-Horn Project No.: 143435001****Tierra Project No.: 6511-21-320**

Boring Name	Sample Depth (feet)	Stratum	AASHTO	% Finer					Atterberg Limits			Organic Content	Moisture Content
				#10	#40	#60	#100	#200	LL	PL	PI		
PBA-961L	3.0 - 3.5	3	A-2-4	-	-	-	-	20	NP	NP	NP	-	18
PBA-961L	3.5 - 4.0	3	A-2-4	-	-	-	-	16	NP	NP	NP	-	18
WB-29L	18.5 - 20.0	4	A-4	-	-	-	-	69	30	21	9	-	40
WB-29L	33.5 - 35.0	4	A-6	-	-	-	-	45	31	13	18	-	35
WB-30L2	18.5 - 20.0	4	A-4	-	-	-	-	83	NP	NP	NP	-	35
WB-30L2	23.5 - 25.0	4	A-4	-	-	-	-	64	NP	NP	NP	-	37
WB-31L	33.5 - 35.0	4	A-4	-	-	-	-	50	NP	NP	NP	-	35
SH-1212L	0.0 - 0.5	5	A-8	-	-	-	-	12	-	-	-	12	57
SH-37R	0.0 - 0.5	5	A-8	-	-	-	-	14	-	-	-	5.9	48
SH-69R	0.0 - 0.5	5	A-8	-	-	-	-	7	-	-	-	13	44
SH-930L	0.5 - 1.0	5	A-8	-	-	-	-	26	-	-	-	11	37

Summary of Laboratory Test Results for Environmental Classification

I-75 (SR 93) at CR 876 / SR 876 / Daniels Parkway

Lee County, Florida

FPID: 446296-2-52-01

Kimley-Horn Project No.: 143435001

Tierra Project No.: 6511-21-320

Boring Name	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
SH-1202R	2.0 - 3.0	1	7.6	28,000	15	15	Slightly Aggressive	Slightly Aggressive
SH-1212L	1.0 - 2.5	1	7.7	14,000	15	12	Slightly Aggressive	Slightly Aggressive
SH-1315R	1.5 - 2.5	1	7.6	3,000	15	<5	Moderately Aggressive	Moderately Aggressive
SH-1617R	1.0 - 2.0	1	7.9	12,000	15	<5	Slightly Aggressive	Slightly Aggressive
SH-18R	1.5 - 2.5	1	7.9	22,000	15	<5	Slightly Aggressive	Slightly Aggressive
WB-29L	0.0 - 4.0	1	8.4	2,300	15	<5	Moderately Aggressive	Moderately Aggressive
WB-30L2	4.0 - 8.0	1	8.5	6,800	15	30	Slightly Aggressive	Slightly Aggressive
WB-30L	4.0 - 8.0	1	8.9	6,200	30	57	Slightly Aggressive	Slightly Aggressive
WB-31L	0.0 - 4.0	1	8.9	12,000	15	<5	Slightly Aggressive	Slightly Aggressive
SH-45R	0.5 - 1.5	1	7.4	2,100	15	12	Moderately Aggressive	Moderately Aggressive
SH-62R	0.5 - 1.5	1	6.4	8,000	30	<5	Moderately Aggressive	Slightly Aggressive
SH-77R	2.0 - 3.0	1	7.9	5,100	30	<5	Slightly Aggressive	Slightly Aggressive
SH-930L	2.0 - 3.0	1	7.7	26,000	15	<5	Slightly Aggressive	Slightly Aggressive

* Based on the current FDOT Structures Design Guidelines

APPENDIX E

Summary of Resilient Modulus Test Results
(Provided by FDOT State Materials Office in Gainesville, Florida)



Florida Department of Transportation

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JARED W. PERDUE, P.E.
SECRETARY

MEMORANDUM

DATE: March 1, 2023

TO: Kisan Patel, District Geotechnical Materials Engineer

FROM: David Horhota, State Geotechnical Materials Engineer

SUBJECT: Embankment Resilient Modulus Pavement Design
District 1, Lee County
FPN 446296-1: I-75 (SR-93) at CR-876/Daniels Parkway

Ten (10), 2-bag samples were received by the State Materials Office (SMO) for determination of an embankment (roadbed) resilient modulus for pavement design. After visual observation of the ten samples, it was determined that the material from each 2-bag sample looked visually similar and the material from each of the bags were combined to form one sample from each location. After combining materials from the bags, samples from each location were obtained for classification tests (Atterberg limits, particle size analysis, and organic content), Proctor density, and resilient modulus. The classification test results are reported in Tables 1 and 2. Information provided for this project by Tierra, Inc. did not include sample depth.

Table 1. Summary of Gradation Results

Sample ID	Passing 3/4" (%)	Passing 1/2" (%)	Passing 3/8" (%)	Passing No. 4 (%)	Passing No. 10 (%)	Passing No. 40 (%)	Passing No. 60 (%)	Passing No. 100 (%)	Passing No. 200 (%)
MR-1	100.0	99.1	98.8	98.5	97.7	93.0	77.8	43.9	3.5
MR-2	100.0	100.0	99.8	99.5	99.4	95.4	79.5	43.1	2.2
MR-3	100.0	98.7	98.0	96.7	94.7	89.1	74.2	44.4	6.8
MR-4	100.0	99.2	99.0	97.6	96.5	90.4	73.1	40.4	4.1
MR-5	100.0	98.6	98.3	96.0	94.7	90.0	75.4	43.3	6.5
MR-6	100.0	99.5	99.0	98.5	97.6	93.2	78.0	42.1	9.0
MR-7	100.0	100.0	100.0	100.0	99.9	96.5	83.0	48.4	3.1
MR-8	100.0	99.8	100.0	99.5	99.1	94.2	75.9	40.6	8.0
MR-9	100.0	100.0	100.0	100.0	99.7	95.5	80.4	45.5	4.9
MR-10	100.0	99.1	99.1	98.9	98.5	94.0	76.6	40.9	3.5

Table 2. Summary of Classification Results

Sample ID	UTM East	UTM North	Soil Class.	Organic Content (%)	LL/PI
MR-1	420781	2935776	A-3	0.2	N.P.
MR-2	420848	2935983	A-3	0.5	N.P.
MR-3	420724	2936789	A-3	1.1	N.P.
MR-4	420445	2936519	A-3	0.6	N.P.
MR-5	420696	2936490	A-3	0.6	N.P.
MR-6	420910	2936510	A-3	1.6	N.P.
MR-7	421010	29365914	A-3	0.4	N.P.
MR-8	421289	2936579	A-3	0.6	N.P.
MR-9	420843	2937073	A-3	0.2	N.P.
MR-10	420899	2937729	A-3	0.9	N.P.

In addition to the classification testing, the following test program was conducted:

- (1) Standard Proctor, AASHTO T 99
- (2) Resilient Modulus (M_R), AASHTO T 307.

A summary of laboratory test results is included in Table 3. The resilient modulus values listed in this table were obtained using the relationship developed from each individual test (resilient modulus versus bulk stress - with bulk stress, Θ , defined as $\Theta = \sigma_1 + \sigma_2 + \sigma_3$), and using a bulk stress of 11 psi, which is the recommendation from Dr. Ping's research work in modeling the embankment in-situ stresses for Florida pavement conditions. The resilient modulus samples were compacted to within 1 pound per cubic foot (pcf) of the maximum density and 0.5 percent of the optimum moisture content as determined by AASHTO T99.

Table 3. Summary of T-99 and M_R Test Results

Sample ID	Passing No. 200 (%)	Standard Proctor Density (pcf)	Optimum Moisture Content (%)	Resilient Modulus @ $\Theta=11$psi (psi)
MR-1	4	104.1	13.1	10,479
MR-2	2	102.7	14.6	10,907
MR-3	7	108.9	13.2	13,043
MR-4	4	105.2	13.8	9,954
MR-5	7	106.6	13.7	11,947
MR-6	9	107.8	13.2	11,616
MR-7	3	103.1	15.0	13,978
MR-8	8	107.2	12.9	11,423
MR-9	5	104.9	14.5	11,901
MR-10	4	103.1	13.6	11,894

To obtain a design embankment resilient modulus, a 90 percent method was used as outlined in both the Flexible Pavement Design Manual and Soils and Foundations Handbook. The resilient modulus values were ranked in ascending order and the percentage of values which were greater than or equal to the individual value were determined. The results of this analysis are recorded in Table 4 and the corresponding graph of these results is included as Figure 1.

Table 4. Ranked M_R Test Results for 90 Percent Method

Rank	Sample ID	% \geq	M_R (psi)
1	MR-4	100	9,954
2	MR-1	90	10,479
3	MR-2	80	10,907
4	MR-8	70	11,423
5	MR-6	60	11,616
6	MR-10	50	11,894
7	MR-9	40	11,901
8	MR-5	30	11,947
9	MR-3	20	13,043
10	MR-7	10	13,978

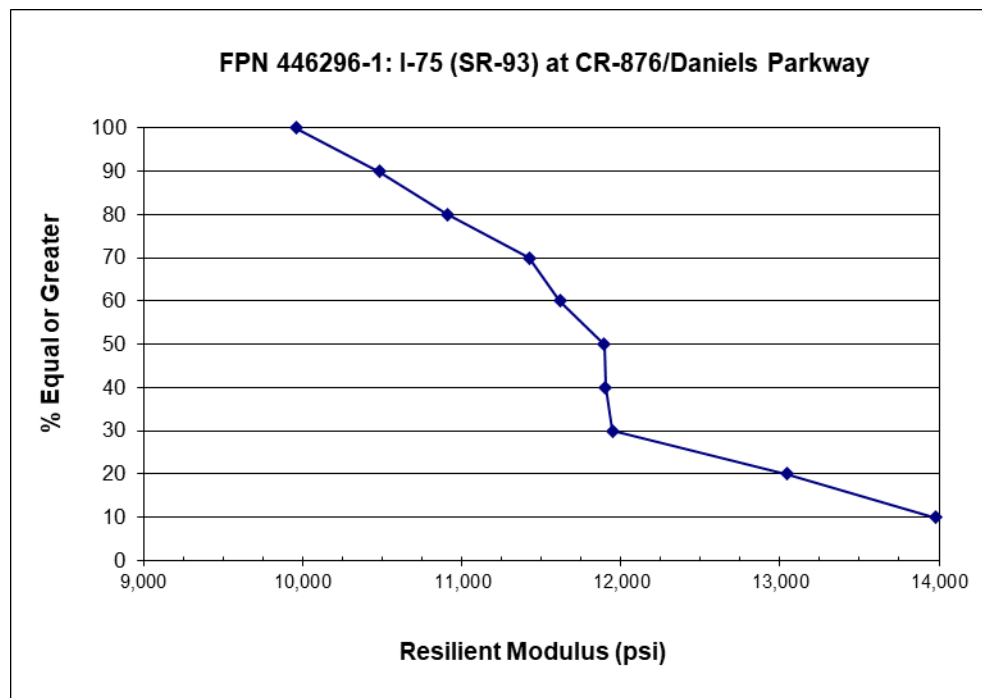


Figure 1. Ranked M_R Test Results for 90% Method

Based on the results shown in Table 4 and Figure 1, the resilient modulus corresponding to a 90th percentile is **10,500 psi**, which would represent the design embankment M_R value.