SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT
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September 10, 2021

RFP 2115- TSALA APOPKA GOLF COURSE CONTROL STRUCTURE MODIFICATION (REBID)

ADDENDUM #3
(Acknowledgment is Required)

The Respondent must acknowledge the receipt of this Addendum by signing below and including a signed copy of this Addendum with its Request for Proposal.

Please note that underlined information (*example*) is added wording and stricken information (~~*example*~~) is deleted wording.

Please note that the following additional reference documents are provided below as attachements.

1. Attachment 1: Metallization Specifications
2. Attachment 2: Geotechnical Engineering Report
3. Attachment 3: Concrete Specifications

Ari Horowitz
Procurement Specialist
cc: Project Manager

ACKNOWLEDGEMENT OF ADDENDUM #3
Note: Only signature page required for acknowledgment of Addendum #3

BY: _____
DATE

_____
(TYPE/PRINT NAME AND TITLE)

_____
COMPANY NAME

Attachment 1: Metallization Specifications

SWFWMD Tsala Apopka Golf Course Structure Modification (C680)
Existing Steel Cleaning, Thermal Spray Coating and Painting

1. GENERAL.

1.1. Scope of Work. Clean, apply thermal spray coating (TSC) and paint existing steel in accordance with the requirements of this specification and NACE 12/AWS C2.23/SSPC - CS23, "Specification for the Application of Thermal Spray Coatings (Metallizing) of Aluminum, Zinc, and Their Alloys and Composites for the Corrosion Protection of Steel." Where items conflict between NACE 12/AWS C2.23/SSPC- CS23 and this specification, the requirements of this Specification shall govern.

1.1.1. Remove the existing weir gates and a portion of the catwalk structure before initiating any cleaning, TSC and painting operations as limited/noted in the design plans.

1.1.2. During the following operations, erect and maintain containment that meets the listed requirements of SSPC Guide No. 6, "Guide for Containing Surface Debris Generated During Paint Removal Operations":

1.1.2.1. Pressurized Water Washing: Class 2W

1.1.2.2. Abrasive Blast Cleaning: Class lA

1.1.2.3. Power Tool Cleaning: Class 3P

1.1.2.4. TSC and Paint Application: Isolate the work area with tarpaulins or other materials to prevent TSC and paint from leaving the work area.

If lighting is utilized, ensure the lighting inside the containment is in accordance with SSPC Guide No. 12, "Guide for Illumination of Industrial Painting Projects. Provide lighting to a minimum of 20 foot-candles for general, 50 foot-candles for work, and 200 foot-candles for inspection.

1.2. Submittals: Provide the following submittals and receive acceptance by the District prior to performing any work associated with cleaning, TSC application and painting. Maintain certifications for the duration of the Contract. If a certification expires, is suspended, placed on probation or otherwise changes, do not perform any work until the certifications is fully valid. Notify the District immediately of any change in certification status.

1.2.1. Corporate and Site-specific QC/QA Plan: At a minimum, the plan must include:

1.2.1.1. Contractor's Organizational Chart clearly identifying line of authority and each individual's project responsibility.

1.2.1.2. Qualifications, Certifications, Training and Experience Records of the Contractor and project personnel.

1.2.1.3. Receipt, Distribution and Revisions of Project Documents.

1.2.1.4. Quality Control Inspection Standards and Equipment.

1.2.1.5. Inspection of Cleaning and Painting Equipment and Calibration of Inspection Instruments.

1.2.1.6. Standards, Equipment and Procedures.

1.2.1.7. Frequency, type, passing criterion for all QC Tests and Reports.

1.2.1.8. Repair Procedures.

1.2.1.9. Materials Control, Handling and Storage.

1.2.1.10. Adjacent Area Protection Plan.

1.2.1.11. TSC QA/QC Plan.

1.2.1.12. Sample forms and reports.

1.2.2. Corporate and Site Specific Environmental, Health and Safety (EH&S) Plan: at minimum the plan must include:

1.2.2.1. Soil Protection and Testing

1.2.2.1.1. Soil Contamination Reporting and Clean-up Procedure

1.2.2.1.2. Pre and Post Project Soil Sampling Plan - number and location of samples.

1.2.2.1.3. Certifications of the proposed laboratory.

1.2.2.2. Waste Management

1.2.2.2.1. Waste Handling, Storage, Transportation, Treatment and Disposal Procedures.

1.2.2.2.2. Laboratory Analysis and Laboratory Certification

1.2.2.2.3. Location of Waste Storage Site

1.2.2.3. Ambient Air Monitoring

1.2.2.3.1. Type, number and location of monitors.

1.2.2.3.2. Monitoring Procedures

1.2.2.3.3. Ambient Air Monitoring Sample Testing Laboratory Certification

1.2.2.4. Visible Emissions Monitoring

1.2.2.4.1. Method

1.2.2.4.2. Reports

1.2.2.4.3. Corrective Actions

1.2.2.5. Regulated Area

1.2.2.5.1. Personal Air Monitoring Plan

1.2.2.5.2. Personal Air Monitoring Sample Testing Laboratory Certification

1.2.2.5.3. Method of Demarcating Regulated Area

1.2.2.6. Containment Plan

1.2.2.6.1. Containment Drawings and Calculations

1.2.2.6.2. Dust Collection and Containment Ventilation Plan and Calculations

1.2.2.6.3. Containment Illumination Plan

1.2.2.7. Emergency Contingency Plans

1.2.2.7.1. Hurricane Evacuation Route

1.2.2.7.2. Location of nearest Emergency Medical Treatment Centers

1.2.2.7.3. First Aid Procedures

1.2.2.7.4. Spills or Leaks Plan

1.2.2.7.5. Fire or Explosion Prevention and Contingency Plans

1.2.2.8. Employee Training to include SSPC C-3 and C-S

1.2.2.9. Site Clean-up and De-mobilization Plan

1.2.2.10. Employee Medical Surveillance Plan

1.2.2.11. Personal Protective Equipment (PPE)

1.2.2.11.1. Respirator Program

1.2.2.11.2. Eye and Hearing Protection Plan

1.2.2.12. Working over Water Safety Plan

1.2.3. Materials: Product Data Sheets (PDS) and Safety Data Sheets (SDS) for all materials to be brought onto the project site. Certification from the TSC anode wire manufacturer. Certification of the wire shall indicate chemical composition, wire diameter, lot number, and manufacturing date, as a minimum. Provide paint manufacturer certification indicating the paint system is compatible for application over TSC.

1.3. Surfaces Not to be Coated. Surfaces specified not to be coated that are adjacent or in close proximity to surfaces to be coated shall be protected with suitable masking during the coatings application. The masked surfaces shall form neat horizontal and vertical lines and shall conform to the dimensions specified not to be coated. Coatings applied to areas not to be coated shall be removed. Removal of said coatings and replacement/repair of surfaces damaged during removal will be performed by the Contractor at no cost to the District.

2. MATERIALS.

2.1. Coatings:

2.1.1. Bearing Assemblies: Use a coating system consisting of a full coat of organic zinc rich epoxy primer, one full coat of 100% solids epoxy penetrant sealer, one stripe coat of aluminum epoxy mastic, one full coat of aluminum epoxy mastic, a finish coat of aliphatic polyurethane and a polyurethane clear coat listed on the Florida DOT's Approved Product List (APL) and approved by the District. Apply polyurethane clear coat to exterior bearing assemblies only.

2.1.2. Thermal Spray Coating (TSC): Apply a TSC prime coat utilizing 85% Zn / 15% Al anode wire meeting the requirements of ASTM B 833 and approved by the District. Seal the TSC prime coat with a full of 100% solids epoxy penetrant/ sealer then apply an aliphatic polyurethane finish coat followed by a polyurethane clear coat listed on the Florida DOT's Approved Product List (APL) and approved by the District.

2.2. Thinners, Solvents and Cleaners: Use thinners, solvents and cleaners listed on the coating manufacturer's PDS.

2.3. Caulking: Use caulks that are paintable, compatible with the coating system and recommended by the coating manufacturer as part of the coating system. Provide a letter signed by a technical representative of the coating manufacturer confirming the proposed caulk meets each requirement.

2.4. Soluble Salts Test Kit: Use a soluble salts test kit in accordance with SSPC Guide No. 15, "Field Methods for Extraction and Analysis of Soluble Salts on Steel and Other Nonporous Substrates", utilizing a latex sleeve or patch/cell retrieval method. Ensure the test sleeve or cell creates a sealed, encapsulated environment during ion extraction and is suitable for testing all structural steel surfaces. As an alternative, electronic conductivity meters approved for use by the District may be used.

2.5. Pressurized Washing Water: Provide and use water of sufficient purity and quality that does not prevent the surface from being cleaned to meet the cleanliness and soluble salt requirements.

2.6. Abrasives: Use properly sized abrasives to achieve the required cleanliness and anchor profile. Use abrasives meeting the requirements of SSPC-AB 1, Mineral and Slag Abrasives, SSPC-AB 2, Cleanliness of Recycled Ferrous Metallic Abrasives, or SSPC-AB 3, Newly Manufactured or Re-Manufactured Steel Abrasive and do not introduce any contamination that interferes with the coating application and performance. Provide certification to the District the abrasives used meet the requirements of this specification and do not contain any chlorides and other salts. For mineral and slag abrasives, verify compliance with the conductivity and cleanliness requirements of SSPC-AB1. For recycled abrasives, verify compliance with conductivity and cleanliness requirements of SSPC-AB 2 after each recycling or more frequently if required by the District. Select a sample from each recycling machine in use and conduct the water-soluble contaminant and oil content tests outlined in SSPC-AB 2 at least one time each week or more frequently if directed by the District. Conduct the non-abrasive residue and lead content tests as directed by the District. If test results do not meet requirements, notify the District immediately, remove and replace the abrasive, clean the recycling equipment, and conduct tests each day to confirm the equipment is functioning properly. Return to the weekly testing interval as directed by the District. For blasting of surfaces to be thermal spray coated, use angular blast media conforming to the requirements of NACE 12/AWS C2.23/SSPC-CS 23, Article 5.3 except that a profile of 3.0 to 5.0 mils shall be generated.

2.7. Storage: Store materials in conformance with the manufacturer's recommendations. Maintain a continuously monitoring and recording thermometer in the materials storage area.

3. EQUIPMENT.

3.1. Compressed Air: Use a compressed air system capable of delivering clean, dry, continuous nozzle pressure to achieve the required surface cleanliness and profile or spray pattern. The system must comply with the instructions and recommendations of the manufacturer of the abrasive blasting system or coating application system.

3.2. Abrasive Blasting System: Design the blasting system to produce the specified cleanliness and profile.

3.3. Coating Application System: Use the coating application equipment approved by and in accordance with the coating manufacturer's technical data requirements.

3.4. TSC Application System: Ensure a representative of the arc-spray equipment manufacturer is present on-site to observe and verify the suitability of the applicator, TSC equipment, and the coating application. Use a portable, electric arc-spray TSC unit capable of spraying 85% Zn/ 15% Al alloy anode wire to meet the requirements of the contract documents.

4. QUALITY CONTROL.

4.1. QC Personnel: All personnel performing QC functions must employed by the contractor performing cleaning and coating operations. QC personnel are not permitted to supervise or perform cleaning, TSC application and coating operations.

4.1.1. QC Specialist: The QC Specialist is responsible for the quality control of all cleaning, TSC application, and coating operations; and supervision of QC Inspectors. A QC Specialist, at a minimum, must be NACE International (NACE) Coatings Inspector Program (CIP) Level Ill certified. The QC Specialist shall have a minimum of two years

of experience in the inspection of TSC and coatings on steel and a minimum of five years of experience in the field of corrosion control using coatings on steel structures.

4.1.2. **QC Inspectors:** QC Inspectors, at a minimum, must be certified NACE International (NACE) CIP Coating Inspector Level I or a Society for Protective Coatings (SSPC) Level 1 Bridge Coating Inspector; have at least 1 year of experience in the inspection of TSC or coatings, whichever is applicable; and report directly to a QC Specialist who meets the requirements of 4.1.1. A QC Inspector must be on site at all times when work is performed.

4.2. **Inspection:** Ensure all inspection equipment is maintained in accordance with the manufacturer's instructions, calibrated, and in good working condition. Ensure all activities are observed and approved by a quality control coatings inspector meeting the requirements of this specification. Maintain daily inspection reports at the job site for review by the District. Provide all daily inspection reports upon completion of the project to the District or more frequently as requested by the District. The QC Specialist shall conduct random QC testing on a minimum of 50% of the square footage of the components that were thermal spray coated while the QC Specialist is absent. The random QC tests shall be in addition to the tests required by this specification. Conduct random testing at a minimum frequency of once per month. The QC Specialist shall also provide a final report to the District describing the general characteristics of the TSC work for the project including the DFT and bond strength results for each thermal spray coated component. Report all collected data in typed form. Submit reports by electronic media acceptable to the District along with four bound hard copies. The following list defines the minimum inspection hold points. If at any hold point the work or conditions do not meet contract requirements, the Contractor must cease work immediately, identify the source of non-conformity, propose corrective action and proceed only after approval of the District or their field representative.

4.2.1. Ambient conditions
4.2.2. Pre-cleaning
4.2.3. Surface Preparation
4.2.4. TSC Application (DFT)
4.2.5. Adhesion Testing
4.2.6. 100% Solids Epoxy Penetrant/Sealer Application
4.2.7. Coatings Mixing
4.2.8. Coatings Application
4.2.9. Polymeric Coating DFT
4.2.10. Visual Application Defects
4.2.11. Cleanliness between Coats
4.2.12. Recoat Windows

During Quality Control inspections, document the location and type of each defect. Notify the District of the readiness to proceed with District QA inspection. Repair with approved procedure, any defects identified. Repeat process until prepared for 90% inspection. Request 90% inspection by the District a minimum of seven days prior to requested inspection date. The size of the area(s) for 90% inspection will be at the discretion of the District.

5. QUALIFICATIONS.

5.1. Contractor: The Contractor must be SSPC-QP1 and SSPC-QP2 certified. The Contractor/ Subcontractor executing the TSC work shall have a minimum of three years' experience in providing surface preparation for TSC application and must have performed at least one similar project within the past four years. Contractor/Subcontractor executing the TSC work shall provide documentation of successful completion of projects that incorporated the use of thermal spraying, or documentation that confirms an agreement with the TSC equipment manufacturer for technical assistance by a representative at the locations where thermal spraying is to be applied. Contractor's superintendent supervising or executing the TSC work shall have a certified experience record indicating at least three years' experience on similar type work.

5.2. Thermal Spray Coating Applicator (TSCA): The TSCA shall have a minimum of one year of experience in the operation of thermal-spray equipment including documentation of prior training and experience using a wire TSC arc unit on at least one project of a similar scope. Each TSCA shall be certified by a technical representative of the thermal spray equipment manufacturer. The TSCA shall have basic knowledge of the TSC process and terminology and shall be able to demonstrate sufficient skill by passing standard Adhesion and Bend Tests as per NACE 12/AW5 C2.23/S5PC-CS 23. Each TSCA shall complete practical tests demonstrating the ability to set up and operate the thermal-spray equipment in the presence of the District and the QC Specialist. The practical tests shall consist of bend test coupons and adhesion tests as follows:

5.2.1. Each TSCA failing the initial qualification tests may be permitted to perform one complete retest. If the TSCA fails the retest, he/she shall not be qualified until completion of additional training and qualification testing provided by the equipment manufacturer.

5.2.2. As a minimum, each TSCA shall prepare nine bend tests for qualifications - three tests each in the horizontal down position, three tests each in the vertical position, and three tests each in the horizontal overhead position. T5C DFT on the bend test coupons shall be as required by this specification, applied to one side only. The bend test coupons shall be 2" wide x 4" to 8" long x 0.050" thick (before application of the TSC). The bend test coupons, with 8.0 to 12.0 mil of applied T5CA, shall be bent 180° around the 0.50" mandrel. Apply Only TSC to the bend test coupons. The pass criterion for the bend test is a smooth surface or minor cracks that cannot be lifted from the substrate with a knife blade in the area of the bend on the outside radius. Disbanding or de lamination of the T5C on the outside radius of the bend test coupon is a failure. If the bend test fails on any one of the nine coupons, the reason shall be determined and corrected, and a retest performed until passing. Only the position (horizontal, vertical, or overhead) for which the bend test failed need be repeated using three new coupons. The nine successful bend test coupons will be identified with date and TSCA initials and retained until released in writing by the District.

5.2.3. Each T5CA shall prepare a plate for adhesion test. Do not apply 100% epoxy penetrant/sealer to adhesion test plate. Adhesion tests shall be performed on 6" x 6" minimum x 1/4" thick plate. The plate shall be held vertical for purposes of applying

the TSC. The DFT of the TSC shall be as required by this TSP. At least three adhesion tests shall be performed on the test plate. The minimum adhesion value shall be 700 psi when using a calibrated portable hydraulic or pneumatic testing apparatus. Only ASTM D 4541, Type V, portable adhesion testers shall be used on this project. They shall be calibrated in accordance with adhesion tester manufacturer's recommendations. Portable adhesion testers shall be calibrated before performing any qualification testing and have their own specific calibration data provided to the District for review. Use fast cure epoxy glue that will allow completion of adhesion testing within the allowable time between TSC application and 100% epoxy penetrant/sealer application. The epoxy glue shall be applied to the end of the test dolly only. Any excess quantity of glue shall be avoided so as not to form a larger area of influence being tested. Do not move the test dolly around on the TSC.

5.2.4. The adhesion test plates and bend coupons shall be prepared with the same abrasive, TSC equipment, and wire to be used for performing the work on the weir. The same equipment may be used for qualification by all TSCA.

5.2.5. Requalification may be requested at any time at the discretion of the District, (a) to retest the proficiency of the TSCA, (b) based on the quality of the workmanship, and (c) based on a significant change in the method, material or equipment used in performing the surface preparation and/or TSC application. The District shall determine what constitutes a significant change. The District may, at any time, revoke a TSCA's previously granted qualification.

6. SURFACE PREPARATION.

6.1. General: Clean, wash, remove soluble salts, and dry abrasive blast or hand and power tool clean (if accepted by the District) to remove all corrosion in the intended locations. Abrasive blast clean all surfaces to be thermal spray coated to meet the requirements of NACE No.1/SSPC SP-5, "White Metal Blast". Abrasive blast clean all bearing assembly surfaces to meet the requirements of NACE No.2/SSPC SP-10, "Near White Blast". Notify the District immediately when any structural steel appears to be defective. Ensure all surfaces to be coated are clean, dry, and free from oil, grease, dirt, dust, soluble salts, corrosion, caulking, weld spatter, mill scale and any other surface contaminants. Sequence the surface preparations and coating operations so that freshly applied coatings will not be contaminated by dust or foreign matter. Protect all equipment and adjacent surfaces not to be coated from surface preparation operations. Protect working mechanisms against intrusion of abrasive. In the event that any rusting or contamination occurs after the completion of the surface preparation, prepare the surfaces again to the initial requirements. Perform surface preparation work only when the temperature of the steel surface is at least 5°F above the dew point temperature.

6.2. Mechanical Removal of Surface Defects: Break all corners resulting from sawing, burning, or shearing. In areas where burning has been used, remove the flame hardened surface of the steel to the extent necessary the required surface profile can be achieved by subsequent dry abrasive blasting. Remove all weld slag and weld spatter. Conduct all of this work in accordance with ASHTO/NSBA Steel Bridge Collaboration S 8.1. In addition, remove all pack rust prior to solvent cleaning.

6.3. **Cleaning:** Clean all steel surfaces in accordance with the requirements of SSPC-SP 1, "Solvent Cleaning".

6.4. **Washing:** Clean all surfaces to meet the requirements of SSPC-SPl with pressurized water with a minimum of 3,500 psi.

6.5. **Soluble Salts Detection and Removal:** Use SSPC Guide No. 15, latex sleeve or patch/cell retrieval methods to determine the chloride, sulfate and nitrate concentrations on all steel surfaces using soluble salts test kits meeting the requirements of 2.4. Measure the concentration levels using the appropriate method described in SSPC Guide No. 15. Perform the tests after washing and after each applied coat of the coating system. Ensure the non-visible surface contaminant concentrations on blast-cleaned surfaces do not exceed 7 g/gm^2 for chlorides, 10 g/cm^2 for soluble ferrous iron, 17 g/m^2 for sulfates and10 g/cm^2 for nitrates. When using electronic conductivity meters, use meters meeting the requirements of 2.4 and measure the surface conductivity as prescribed by the manufacturer. The instrument shall be properly calibrated and maintained according to the manufacturer's recommendations. Ensure the surface conductivity does not exceed 70 micro-Siemens per centimeter squared. For either contaminant assessment method (salt test kits or conductivity meter) test five random locations in the first 1000 square feet and one random location for each subsequent 1000 square feet. When any concentration or conductivity measurement exceeds the levels given above, rewash the entire surface area and retest all potentially contaminated steel to the satisfaction of the District. If additional washing does not reduce the concentration to the acceptable level, a surface treatment or water additive may be used. Use a surface treatment or water additive that is approved by the coating system supplier and the District.

6.6. **Dry Abrasive Blast Cleaning:** Protect all areas adjacent to abrasive blast cleaning. Repair any damage to adjacent areas at no cost to the District. The repair procedure must be submitted to the District for acceptance prior to any remediation. Ensure the abrasive blast cleaning does not produce holes, cause distortion, or cause thinning of the substrate. Use SSPC VIS 1 as an aid in establishing substrate cleanliness standards. Determine the surface profile in accordance with ASTM D4417, "Standard Test Methods for Field Measurement of Surface Profile of Blast Cleaned Steel," Method C. Obtain profile depth measurements at a minimum of every 550 ft^2.

6.6.1. **TSC:** Thoroughly blast all surfaces to be thermal spray coated with suitable blast media as per this specification and NACE No. 12/AWS C2.23M/SSPC-CS 23.00 prior to thermal spray application. Abrasive blast steel to remove any mill scale, corrosion, caulk, and other foreign matter present in compliance with NACE No.1/SSPC-SP S, "White Metal Blast Cleaning." The steel surface shall have a minimum of a 3.0 mil of profile depth with a sharp Angular shape. Angular profile shall not exceed 5.0 mils unless otherwise approved by the District.

6.6.2. **Bearing Assemblies:** Prepare steel by dry abrasive blast cleaning to meet the requirements of NACE No. 1/S5PC-SP 10. Use SSPC-VIS 1, "Guide and Reference Photographs for Steel Surfaces Prepare by Dry Abrasive Blasting" as an aid in establishing cleanliness. After abrasive blast cleaning, ensure the surface profile meets the requirements of the primer coating manufacturer's PDS.

6.7. Hand and Power Tool Cleaning: Prepare steel by power and hand tool cleaning as defined in SSPC-SP 11, SSPC-SP 3, and SSPC-5P 2 as approved by the District. Use SSPC VIS 3 as an aid in establishing cleanliness.

7. APPLICATION.

7.1. General: Apply a complete coating system to all structural steel surfaces except surfaces indicated in 1.3. Prior to the application of any coating, inspect the substrate (or previous coat) for contamination and defects, and prepare the surface in accordance with this specification before application of the TSC, primer or subsequent coats. Apply each coat including a stripe coat in a color that contrasts with the substrate or preceding coat. The color of the finish coat shall meet FED-ST0-595C, Color No. 20091.

7.2. Weather and Temperature limitations: Do not spray coatings when the measured wind speed in the immediate coating area ls above 15 miles per hour. Do not apply coatings when contamination from rainfall is imminent or when the ambient air temperature, relative humidity, dew point temperature, or temperature of the steel is outside limits of the coating manufacturer's PDS. Do not apply TSC or coatings when substrate temperature is less than 5 degrees F above dew point.

7.3. Sealing Using Caulk: Using caulk meeting the requirements of this specification, completely seal the perimeter of all faying surfaces, cracks and crevices, joints, and skip-welded joints open less than ½ inch. Apply the caulk to the joint following the caulk manufacturer's recommendations. Ensure the caulk bead has a smooth and uniform finish and is cured according to the caulk manufacturer's recommendation prior to the application of the coating system. For areas to be caulked on bearing assemblies, apply caulk after the application of the epoxy intermediate coat and before application of the finish coat. For areas that are thermal spray coated requiring caulking, apply caulk after application of the 100% epoxy penetrant/sealer and before application of the aliphatic polyurethane finish coat.

7.4. Mixing and Thinning: Mix all coatings in accordance with the manufacturer's PDS. Only mix complete kits. Do not add an amount of thinner which result in the coating exceeding VOC regulations. Perform all mixing operations over an impervious surface with provisions to prevent runoff of any spilled material.

7.5. Application Methods: Use coating application equipment and apply coatings per the coating manufacturer's PDS. Application with brushes may be permitted for minor touchup of spray applications, stripe coats, or when otherwise approved by the District. Adjust spray equipment to produce an even, wet coat with minimum overspray. Apply coatings in even, parallel passes, overlapping 50 percent. Agitate coatings during application as required by the coating manufacturer's PDS.

7.5.1. TSC: Perform the TSC application employing multiple spray passes to achieve a coating OFT of 8 to 12 mils as determined by OFT measurements of the thermal spray coated components. Apply TSC inside containment.

7.5.1.1. Job Reference Standard: Provide a job reference standard plate as per NACE 12/ AWS C2.23/SSPC-CS 23, Section 3.2, for every type of steel to be thermal spray coated. Apply a clear coat over the standard to preserve its condition for the duration of the project. Prepare all job reference standards in advance of production TSC.

7.5.1.2. **Test Sections:** Prior to commencing the arc-spraying operation, thermal spray coat a minimum of three on-structure test sections with minimum dimensions of 2 ft^2 each. These test sections shall be used to determine the application rate for the specified thickness and the grain size, texture acceptability and acceptance adhesion strength. The test sections shall be representative of all the conditions present on the component. Do not apply 100% epoxy penetrant/sealer prior to installing dollies. Adhesion strength shall be measured on test sections to determine the 700 psi acceptance bond strength between the steel surface and the TSC. Bond strength on the test sections shall be measured as described by ASTM D4541, "Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers", and this Section prior to 100% epoxy penetrant/sealer application. Perform preliminary test areas and adhesion tests prior to production TSC. TSC with less than 700 psi of bond strength will not be acceptable. Provide a minimum of 14 days advance notice for the application of the test patches such that the QC Specialist and appropriate District personnel or their representative may be present for the initial application and testing.

7.5.1.3. **Production:** Substrate preheating may be required in accordance with NACE12/AWS C2.23/SSPC-23, Section 8, to improve the coating tensile bond of the thermal spray coating to the substrate to meet adhesion requirements. Air blast areas to be TSC immediately prior to thermal spray coating application to remove any dust or blast media residue. Air stream shall be 100% oil and moisture free when tested per ASTM D 4285, "Standard Test Method for Indicating Oil or Water in Compressed Air." The specified coating thickness shall be applied in several crossing passes. The District may request bend test coupons at any time. For manual spraying, use right angle crossing passes to minimize the thin areas in the coating. For mechanized spraying (mechanized movement of the gun or workpiece, or both), program the overlapping and crossing passes to eliminate thin spots and stay within the specified coating thickness.

7.5.1.4. **Application Time:** Completion of abrasive blasting to achieve the specified anchor profile (or final blasting) and the completion of the TSC shall occur within the same shift. If the surface no longer meets the cleanliness requirements of NACE No. 1/SSPC-SP 5 or a defective coating appears at any time while spraying, stop and follow the procedures described in NACE 12/AWS C2.23/SSPC-CS 23 Standard, Article 8.4.2. TSC shall be continuous and un-interrupted within each component. Cold overlaps of the TSC will not be permitted unless specifically allowed by the District for phased work. When cold overlaps are approved, do not apply 100% epoxy penetrant/sealer to the overlap area until overlap has been completed. Overlap at the beginning of the next shift. If overlap is not achieved within 24 hours, re-blast and re-TSC the unsealed overlap

area in accordance with this specification. Apply 100% epoxy penetrant/sealer after accepted adhesion testing and within same work shift as TSC. If 100% epoxy penetrant/sealer cannot be applied within allotted time and if approved by the District, wrap the thermal spray coated component in plastic sheeting immediately after TSC and protect it from weather. Then prior to 100% epoxy penetrant/sealer application, verify the coating; (a) has not been oxidized or otherwise contaminated by visual inspection using a minimum 30x magnified lens and (b) is dust free ISO 8502-3, "Preparation of Steel Substrates Before Application of Paints and Related Products, Part 3," before applying the 100% epoxy penetrant/sealer.

7.5.1.5. **Tensile Strength:** Prior to 100% epoxy penetrant/sealer application, conduct a minimum of one coating adhesion strength test (pull-off test) on each thermal spray coated element or at every 550 ft^2 as applicable prior to 100% epoxy penetrant/sealer application. Conduct tests in triplicate and average the values. Record the results, which will be subject to verification by the District. Blast clean areas not meeting the required bond strength to NACE No. 1/SSPC-SPS prior to re-spraying TSC as directed by the District.

7.5.1.6. **Bend Test:** Bend test coupons shall be prepared and tested prior to application of TSC each day, change of shift or changing TSCA. Each of the TSCA shall perform Bend Tests on steel samples supplied by the Contractor. The TSCA must successfully pass the bend test to apply TSC. A change in the batch or lot of TSC wire will require a bend test coupon to be performed by the affected equipment/applicators. The same spray parameters and thickness per crossing-pass as used in real application shall be used for spraying the TSC wire and, at a minimum, will be validated and used in performance of the bend tests. The steel 2" x 4" -8" x 0.050" thick test coupons shall be prepared with the same abrasive, TSC equipment and wire that will be used in performance of the work on that shift. The position of the test coupon shall be vertical for application of the TSC unless the District requests otherwise. The District may request additional bend tests applied at different positions. Provide the steel bend test coupons and the 0.50" diameter mandrel for bending the test samples. The bend test coupons, with applied 8.0 to 12. 0 mils of TSC shall be bent 180^o around the 0.50" mandrel. The pass criterion for the bend test is a smooth surface or minor cracks that cannot be lifted from the substrate with a knife blade in the area of the bend on the outside radius. Disbonding or delamination of the TSC on the outside radius of the bend test coupon is a failure. If the bend test fails the reason will be determined and corrected and a retest performed until passing. The bend test coupons will be identified with date, TSC operator initials and retained until released in writing by the District.

7.5.2. Stripe Coating: Use an aluminum epoxy mastic that is at least 80% solids by volume. Apply stripe coats by brush only. Apply the stripe coat per the manufacturers published PDS but no less than 3 mils DFT. Apply stripe coats to achieve complete coverage on welds, comers, crevices, sharp edges, bolts, nuts, rivets, and rough or pitted surfaces. A stripe coat of translucent coatings is not required. Do not apply subsequent coats until the previous stripe coat has cured per the manufacturer's PDS for recoating.

7.5.2.1. Bearing Assemblies: Use the following sequence to stripe coat bearing assemblies: full primer coat, aluminum epoxy mastic strip, intermediate stripe coat, full intermediate coat, aluminum epoxy mastic stripe coat, full finish coat, and then polyurethane clear coat.

7.5.2.2. TSC: Use the following sequence to stripe coat areas to be thermal spray coated: TSC, full 100% epoxy penetrant/sealer, aluminum epoxy mastic stripe coat, full finish coat and then polyurethane clear coat.

7.6. Thickness of Coats: After application of each coat, thoroughly inspect the surfaces and measure the DFT in accordance with SSPC-PA 2, "Procedure for Determining Conformance to Dry Coating Thickness Requirements", Table 1, Restriction Level 2 (TSC or primer) or Restriction Level 3 (all other polymeric coatings), with a Type 2 magnetic coating thickness gage.

7.6.1. Bearing Assemblies: When the DFT is deficient or excessive, correct in accordance with the coating manufacturer's recommendations and re-measure the area.

7.6.2. TSC: Where TSC thickness values below the specified minimum are found, the deficient test section and the immediate surrounding surface around (one square foot minimum), shall receive additional TSC coating so the total thickness of the repaired area will meet the requirements of this specification. This shall be performed immediately (not to exceed two hours) following the first application or the entire element shall be returned to a NACE No. 1/SSPC SP-5 condition and thermal spray coated again. Where TSC thickness values above the maximum specified are found, submit a repair procedure to the District for review and acceptance.

7.7. Coating Drying, and Curing: Apply coatings within the time specified by the coating manufacturer's PDS for drying and recoating. Before handling, test for cure in accordance with the manufacturer's recommended method. Meet the requirements of ASTM D5402, "Standard Practice for Assessing the Solvent Resistance of Organic Coatings Using Solvent Rubs," for organic zinc primers when the manufacturer's technical data sheet does not state a specified cure test. Obtain the acceptance criteria from the coating manufacturer and report the results to the District.

7.8. Coating Finish: Apply each coat free of runs, sags, blisters, bubbles, and mud cracking; variations in color, gloss, or texture; holidays; excessive film buildup; foreign contaminants; orange peeling; overspray and other defects. Surfaces of the TSC sections shall be uniform in appearance, free of visible coating defects such as: cracking, burning, blistering, roughness and uncoated areas and/or other defects that will affect the function and/or durability of the coating. If a defective TSC is found the correction shall be performed by blast cleaning the affected area to NACE No. 1/SSPC-SP 5 and replacing the deficient TSC and coatings that may

be present in the same manner as for a deficient bond strength correction. Cold overlaps during re-application may be necessary. However, re-application of TSC over previously thermal spray coated areas shall not blister, burn, or otherwise damage the existing TSC. Should this occur, the entire element shall be fully blasted and thermal spray coated again.

7.9. Touchup and Repair: Submit a touchup and repair procedure for approval of the District.

8. ENVIRONMENTAL, HEALTH AND SAFETY REQUIREMENTS. Isolate the work areas with containment devices, canvasses, tarpaulins or screens during all surface preparation and coating application operations. Dispose of all debris and waste products generated in accordance with all Federal, State and Local regulations.

8.1. General: Establish plans and programs to protect the environment, public, contractor employees, other workers, and property from overspray, exposure to toxic heavy metals and the release and emission of hazardous materials and nuisance dusts. Include in such plans and programs a procedure for the receipt, processing, evaluation, and timely written response for claims by the public for damage resulting from the foregoing work. Provide the District with copies of any written response which denies such damage claims. Conduct all coating application and removal operations in compliance with EPA, OSHA, and other applicable Federal, State, and local regulations. Provide a contingency plan for the remediation of water and land in the event of contamination by solid or liquid paint and contaminated water.

8.2. Environmental Protection: Comply with all applicable Federal, State, and Local rules and regulations. Prepare and submit to the District, plans and programs for the protection of the environment and public based on the applicable EPA requirements, the requirements of this Section, and the Contract Documents. Include plans and programs for the protection of the air, soil/ground, and water.

8.2.1. Pollution Control: As part of the EH&S plan submit a written pollution control and monitoring plan that the clearly describes the means for complying with all Local, State and Federal regulations including pollution control provisions specified herein. The written plan must be in accordance with SSPC Project Design: Industrial Lead Paint Removal Handbook, Volume II, Phase 6, Environmental Monitoring, and specifically include, but not be limited to, providing a scaled map of the work site layout showing the proposed number and location of soil sampling, Total Suspended Particulate (TSP) monitoring sites, waste storage areas, staging areas, temporary waste storage areas, and ambient air and personnel sampling frequency. Immediately cease all operations in the event a violation of any environmental regulation or a failure to properly execute any pollution control provisions occurs. Resume operations after written proposed corrective procedures have been submitted to and approved by the District and implemented.

8.2.2. Permits: Submit all required permits from all applicable regulatory agencies to the District prior to the commencement of any work. Seek permit determination from these regulatory agencies to avoid any potential permit non-compliance issues during work activities. The Contractor is responsible for all liability resulting from non-compliance with pertinent rules and regulations including permit requirements.

8.2.3. Ambient Air Quality Compliance and Protection of the Air:

8.2.3.1. **Visible Emissions:** Assess the visible emissions using EPA Method 22, Timing of Emissions as defined by 40 CFR 60, Appendix A, Standards of Performance for New Stationary Sources. During abrasive blasting, do not allow visible emissions from a containment to exceed a random cumulative duration of more than one percent of the workday (SSPC Guide No. 6, Level 1 Emissions). During pressurized water cleaning, do not allow visible emissions from a containment to exceed a random cumulative duration of more than ten percent of the workday (SSPC Guide No. 6, Level 3 Emissions).

8.2.3.2. **Total Suspended Particulate (TSP) Matter:** Control emissions from the containment area to prevent exceeding the TSP Lead of 1.5 µg/m^3 over a 90-day period, or the daily and adjusted daily allowances of SSPC-TU 7, "Conducting Ambient Air, Soil, and Water Sampling During Surface Preparation and Paint Disturbance Activities." Conduct TSP Lead monitoring in accordance with 40 CFR 50, Appendix B, Reference Method for Determination of TSP Matter in the Atmosphere (high volume sampler required), and 40 CFR 5O, Appendix G, Reference Method for Determination of TSP Matter Collected from Ambient Air. Position the TSP monitoring equipment in general accordance with 40 CFR 58, Ambient Air Quality Surveillance. Perform TSP Lead background monitoring for a period of 3 days prior to the beginning of abrasive blast cleaning operations. Submit the results from background monitoring and the first week of monitoring during abrasive blast cleaning to the District for review within 5 calendar days after the first week of work. Continue monitoring unless otherwise directed by the District.

8.2.3.3. **Regulated Area:** Establish a regulated area around the work site to prohibit unauthorized persons from areas where exposure to hazardous airborne metals may exceed the following action levels:

Airborne Metals	Action Level
Lead	30 µg/m^3
Cadmium	2.5 µg/m^3
Arsenic	5.0 µg/m^3
Hexavalent Chromium (CR^{6+})	2.5 µg/m^3

Conduct monitoring in accordance with the National Institute for Occupational Safety and Health (NIOSH) procedures upon initiation of dust producing operations and submit the test results to the District within 72 hours of sampling. Report sample results as eight-hour Time Weighted Averages (lWA). Reestablish the regulated area and perform additional sampling when the results exceed the action levels or when directed by the District. Document all pertinent data in a field logbook. Position airsampling pumps around the project perimeter where the public or personnel can approach the work area. Place sampler inlets at breathing height. Clearly mark the

regulated area by the use of warning signs, rope, barrier tape, or temporary construction fencing.

8.2.4. **Soil/Ground Quality:** Inspect the ground beneath and in proximity to the structure in the presence of the District for visible paint chips to establish an initial job site cleanliness standard. Test soil samples prior to the beginning of operations and after project completion for heavy metals. Document the number and specific locations where the initial samples are taken as outlined in the SSPC Project Design- Industrial Lead Paint Removal Handbook, Volume 2 to ensure the post samples are collected from the same locations. Submit all samples to the District for review. If the project activities increase the heavy metal content in soil to more than 20% above the pre-job geometric mean or 100% at any one location, return the site to the pre-job levels. Conduct additional soil testing as necessary to determine the extent of contamination. Take one sample north, south, east, and west (where soil is present) of the structure. Take one additional sample for every 14 feet in length. In addition, submit a pre- and post- soil sampling plan for storage areas identifying the sample location, depth, analyses list, lab certification, and turnaround time. Once approved by the District, submit sampling results along with a scaled drawing indicating designated sample locations.

8.2.5. **Water Quality:** Do not release, discharge, or otherwise cause hazardous materials, debris, waste, or paint chips to enter the water. Protect against releases due to rain and methods of surface preparation from reaching rivers, streams, lakes, storm drains, or other bodies of water.

8.3. **Containment System:** Submit a written containment system design plan in accordance with this section and the contract documents which clearly describes the proposed containment system applicable to the intended removal method and in accordance with the requirements outlined herein. Ensure the plan includes, but is not limited to, removal method; methods for collecting debris; and containment enclosure components. Use fire retardant materials. Provide containment drawings, calculations, and assumptions, including ventilation criteria if applicable, signed and sealed by a Specialty Engineer. Provide a complete structural impact analysis prepared by the Specialty Engineer to verify the existing structure can withstand the additional dead, live and wind loads imposed by the containment system, signed and sealed by the Specialty Engineer. Include a clear description of the ventilation system components. Design ventilation meeting the requirements of this specification; SSPC Guide No.6; and cross draft of 100 feet per minute and downdraft of 50-60 feet per minute.

Isolate the immediate area of the structure to ensure compliance with current and permit requirements for air, water, soil, and pollution prevention. Protect the containment system from vehicular and pedestrian traffic. Ensure paint, paint chips, or other debris will not fall outside of the containment area under any circumstances. Repair any damage created by fastening, bracing, or handling the scaffolding and staging. If a suspended platform is constructed, use rigid or flexible materials as needed to create an air and dust impenetrable enclosure. Verify the platform and its components are designed and constructed to support at least four times its maximum intended load without failure, with wire cables capable of supporting at least six times their maximum intended load without failure. Strictly comply

with all applicable OSHA regulations regarding scaffolding. Prior to use, the must verify, in the field, the containment and staging has been erected in accordance with the signed and sealed plan. Any changes to the accepted signed, sealed and accepted plan must be made, re-signed and re-sealed by the Specialty Engineer and submitted to the District for review and acceptance.

8.4. **Worker Protection:** Comply with the requirements of OSHA 29 CFR 1926 and applicable portions of 29 CFR 1910. Include specific programs as required by 29 CFR 1926.62 (lead), 29 CFR 1926.1118 (inorganic arsenic), 29 CFR 1926.1126 (hexavalent chromium), and 29 CFR 1926.1127 (cadmium) when these hazardous agents are present. Implement appropriate safety procedures for all hazards on the job site whether specifically identified herein or not.

9. WASTE HANDLING AND MANAGEMENT.

9.1. **General:** Prepare a waste management program plan which addresses the applicable requirements from EPA regulations for hazardous waste management and the Contract Documents. Include provisions for the handling and disposal of non- hazardous waste. Dispose of all waste in accordance with all federal, state, and local laws and regulations.

9.2. **Collection and Handling of Waste:** Properly classify, package, and store all paint removal debris, both solid and liquid in accordance with SSPC Guide 7, "Guide for the Disposal of Lead-Contaminated Surface Preparation Debris, the Federal Water Pollution Control", Act with amendments, and all other current government regulations and guidelines. Comply with the Resource Conservation and Recovery Act to include, at a minimum, CFR 40 260 through CFR 40 268. Prior to identification and storage, separate solid and liquid waste, and separate individual waste streams.

9.3. **Testing and Analysis:** Laboratory analyses for all waste stream and environmental samples shall be conducted by an EPA certified, independent laboratory with an approved Quality Assurance Plan. Laboratory analyses for worker monitoring and regulated area samples shall be conducted by an American Industrial Hygiene Association (AIHA) metals accredited laboratory. Provide a copy of all sampling and test reports no later than 72 hours after collection of samples.

9.4. **Waste Identification:** Collect samples in accordance with EPA SW 846, Test Methods for Evaluating Solid Waste - Physical/Chemical Methods. Use a random and representative sampling technique. Collect a minimum of four representative samples of each waste stream. These waste streams include, but are not limited to, water, paint chips, dust, and paint chips mixed with disposable abrasives and debris. Complete the initial sampling of each waste stream immediately upon filling the first drum, but do not allow waste to accumulate for longer than 7 days before sampling. After the representative samples are collected, send them immediately to the EPA certified laboratory for analysis. Unless otherwise directed by the District, required by State regulations, or required by the waste recycling or disposal facility, once each waste stream is sampled, tested, and classified, additional sampling and analysis are not required for subsequent shipments unless the waste stream changes. Submit samples to an approved laboratory to be tested for arsenic, barium, cadmium, hexavalent chromium, lead, mercury, selenium, and silver in accordance with EPA Method 3050 and Method 6010 (content) and EPA Method 1311, Toxicity Characteristics Leaching Procedures (TCLP). Clearly label each sample with sample number, date and time of sampling, name of

collector, and location of collection. Maintain chain of custody forms for each sample. Enter each sample on a sample analysis request form. Enter sample numbers, type of waste, amount of each sample, distribution of samples, signature, and all other information into field logbook.

9.5. **Waste Storage:** Collect waste from the control devices, equipment, and all work surfaces on a daily basis. Keep hazardous and non-hazardous waste separate. Do not mix blasting debris with any other type of waste. Place waste in approved storage drums. locate all hazardous waste within a regulated area. The maximum weight for each drum, when filled, is 821 pounds. Properly seal and label all drums. Transport waste storage drums to a secured, marked, temporary storage area. locate the temporary storage area on well· drained ground not susceptible to flooding or storm water run-off. Place drums on a pallet and cover with fiber reinforced, impermeable tarpaulins. Store drums no more than two drums wide and two drums high. Arrange drums so that labels are easily readable. Do not store waste in the temporary storage area longer than 90 days.

9.6. **Waste Disposal:** Transport, treat and dispose of all hazardous and non-hazardous waste. Notify the District a minimum of three weeks prior to the date of shipment of any waste to an off- site facility. Provide the District with documentation that the receiving disposal facilities are properly licensed. Provide manifests for all hazardous and non-hazardous waste shipments. Identify any waste disposal subcontractors and provide a copy of their licensing to perform waste disposal and transport operations. Do not use any products intended for the pre-treatment of waste.

9.7. **Permits:** The Contractor is responsible for all liability resulting from non-compliance with pertinent rules and regulations including permit requirements.

TIERRA

September 21, 2018

AIM Engineering & Surveying, Inc.
5300 Lee Boulevard
Lehigh Acres, FL 33971

Attn: Mr. James E. Toombs, P.E.
Mr. Daniel Schroeder, P.E.

RE: Report of Geotechnical Engineering Services
Southwest Florida Water Management District (SWFWMD)
Water Control Structure
Tsala Apopka Golf Course Structure Modification
Citrus County, Florida
Tierra Project No. 6511-18-143

Gentlemen:

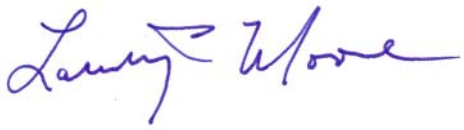
Tierra, Inc. (Tierra) has completed the geotechnical engineering study for the above referenced project. The results of the study are provided herein.

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.

Erick M. Frederick, P.E.
Senior Geotechnical Engineer
Florida License No. 63920



Larry P. Moore, P.E.
Principal Geotechnical Engineer
Florida License No. 47673

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PROJECT DESCRIPTION

Project Information

The project site is located at the Inverness Golf and Country Club within Citrus County.

Based on the information provided by AIM Engineering & Surveying, Inc. (AIM) which consisted of the SWFWMD Structure Profile Report revised 2012, we understand that the subject water control structure regulates flow in a canal between Floral City Pool and the Inverness Pool in order to maintain desirable water levels in Lake Tsala Apopka. It is our understanding that the existing control structure is planned to have the structure flow gates replaced with larger gates. The results of the geotechnical exploration in this report are provided to assist the design team with the design of the flow gate replacements.

Scope of Services

The objective of our study was to obtain information concerning subsurface conditions at the proposed project site in order to provide engineering soil parameters and geotechnical recommendations to the design team for the design of the flow gate replacements. Tierra performed the following:

1. Reviewed the “Inverness, Florida” Quadrangle Map published by the United States Geological Survey (USGS), as well as the Soil Survey of Citrus County, Florida, published by the United States Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS).

2. Executed a program of subsurface exploration consisting of three (3) Standard Penetration Test (SPT) borings and two hand auger borings, subsurface sampling, and field testing. The SPT borings were performed to depths ranging from 15 to 40 feet below grade. The hand auger borings were performed to depths on the order of 5 feet below grade.

3. Performed one (1) field permeability test.

4. Visually classified the samples in the laboratory using the Unified Soil Classification System (USCS). Identified soil conditions at the boring locations.

5. Recorded the encountered groundwater level.

6. Prepared this engineering report that summarizes the course of study pursued, the field data generated, subsurface conditions encountered and our engineering recommendations in each of the pertinent topic areas.

The scope of our services did not include an 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.

SITE AND SUBSURFACE CONDITIONS

General Site Information

The project site is located north of East Sandpiper Drive in Citrus County, Florida. The project location is in proximity to residential areas and the Inverness Golf and Country Club.

USGS Quadrangle Maps

Based on the “Inverness, Florida” United States Geological Survey (USGS) Quadrangle Map, the natural ground elevation at the project site is on the order of +45 feet to +50 feet, National Geodetic Vertical Datum of 1929 (NGVD).

USDA Soil Survey

Based on a review of the Citrus County Soil Survey published by the USDA NRCS, it appears that there is one (1) primary soil-mapping unit noted within the vicinity of the project. The general soil description is presented in the following paragraph and table, as described in the Soil Survey.

Basinger Fine Sand (Map Unit: 5) – The Basinger component makes up 80 percent of the map unit. Slopes are 0 to 2 percent. This component is on drainageways on marine terraces on coastal plains. The parent material consists of sandy marine deposits. Depth to a root restrictive layer is greater than 60 inches. The natural drainage class is poorly drained. Water movement in the most restrictive layer is high. Available water to a depth of 60 inches is low. Shrink-swell potential is low. This soil is not flooded. It is not ponded. A seasonal zone of water saturation is at 6 inches during June, July, August, September, October and November. Organic matter content in the surface horizon is about 1 percent. This soil meets hydric criteria. The soil has a slightly sodic horizon within 30 inches of the soil surface.

SUMMARY OF USDA SOIL SURVEY CITRUS COUNTY, FLORIDA							
USDA Map Symbol and Soil Name	**Soil Classification**				**pH**	**Seasonal High Water Table**	
	Depth (in)	**USCS**	**AASHTO**	**Permeability (in/hr)**		**Depth (feet)**	**Months**
(5) Basinger	0-3	SP	A-3	6.0-20.0	3.5-7.3	0.0-1.0	June-Nov
	3-8	SP, SP-SM	A-2-4, A-3	6.0-20.0	3.5-7.3		
	8-24	SP, SP-SM	A-2-4, A-3	6.0-20.0	3.5-7.3		
	24-80	SP, SP-SM	A-2-4, A-3	6.0-20.0	3.5-7.3		

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

Subsurface Conditions

The subsurface conditions within the vicinity of the project were explored using three (3) Standard Penetration Test (SPT) boring drilled to depths ranging from 15 feet to 40 feet below the ground surface and two (2) hand auger borings performed to a depth of 5 feet below grade.

The borings were located in the field using a Garmin eTrex® hand-held Global Positioning System (GPS) unit with a reported accuracy of ±10 feet. The approximate boring locations are presented on the **Boring Location Plan** in the **Appendix**.

The SPT borings were performed with the use of 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. The initial 4 feet were manually augered to verify utility clearance. SPT resistance N-values were then recorded to a depth of 10 feet and on intervals of 5 feet thereafter to the boring termination depth. The soil samples were classified in the field and transported to our laboratory for review.

The hand auger borings were performed by manually advancing a bucket auger into the ground typically in six inch increments. As each soil type was revealed, samples were collected and transported to our laboratory for review.

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

Stratum Number	Soil Description	USCS Symbol
1	Gray to Brown SAND to SAND with Silt (SP/SP-SM)	SP/SP-SM
2	Gray Sandy CLAY	CL/CH
3	Weathered Limestone	--(1)
4	Gray Clayey SAND	SC
--(1) USCS nomenclature does not include a classification for natural limestone		

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

Groundwater Information

The groundwater table was measured at a depth of 3 feet to 3½ feet below the existing grade within the borings performed. The encountered groundwater level is depicted adjacent to the soil profiles in the **Appendix**.

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.

Field Permeability Tests

One (1) field permeability test was performed at the location of hand auger HA-1. The test was performed within the Stratum 1 (SP/SP-SM) sandy soils at a depth of approximately 3 feet below existing grade at the location of HA-1. This location is depicted on the **Boring Location Plan** in the **Appendix**. The field permeability test was performed in general accordance with the 1978 U.S. Department of the Interior, Bureau of Reclamation Earth Manual. Based on the results of the field permeability test performed, the coefficient of permeability is 13 feet per day (ft/day). It should be noted that this value was measured within the surficial sand Stratum No. 1 and the rate is the un-factored field value and as such the design engineer should apply the appropriate factor of safety for the proposed design.

RECOMMENDATIONS

General

The results of the borings performed are presented on the **Soil Profiles** in the **Appendix**. The design team should review the information provided in the **Appendix** as it pertains to the proposed design. Tierra has prepared a table of soil parameters to be used by the structural engineer for the design of the proposed sheet pile walls.

The Contractor shall be responsible for all construction requirements based on the subsurface soil and groundwater conditions encountered. If buried organic soils, debris, or unsuitable material is encountered during construction, they should be removed and replaced with clean, compacted engineered fill in accordance with project requirements.

On-Site Soil Suitability

The suitability of the soil for reuse for the project should be evaluated against the project engineering fill requirements. Variations in the subsurface stratifications should be expected between borings. Fill should be placed in accordance with current County requirements.

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

Site Preparation

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

Drainage and Groundwater Concerns

The groundwater level presented in this report is the level that was measured at the time of our field activities. Fluctuation should be anticipated. We recommend that the Contractor determine the actual groundwater levels at the time of the construction to determine groundwater impact on his construction procedure. Care should be given to open excavations and site grading to minimize ponding of surface water.

Excavations

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

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

Sheet Pile Considerations

We understand that the existing sheet pile will be replaced for the structure modification. Provided in the Appendix of this report are recommended soil parameters for sheet pile wall design.

Clayey soils were encountered beneath the surficial sandy soils and the clayey soils were then underlain by weathered limestone.

To lessen the amount of seepage that will occur from the upstream portion of the control structure, we recommend that the sheet piles extend into the clayey soils encountered at depths ranging from about 20 to 25 feet below grade. The limits of sheet pile extending to the east and west of the control structure should be determined using the permeability test result provided herein (13 feet per day) within the surficial sand strata.

REPORT LIMITATIONS

The 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 is 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 boring. If, during construction, subsurface conditions different from those encountered in the exploratory borings are observed, 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.

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

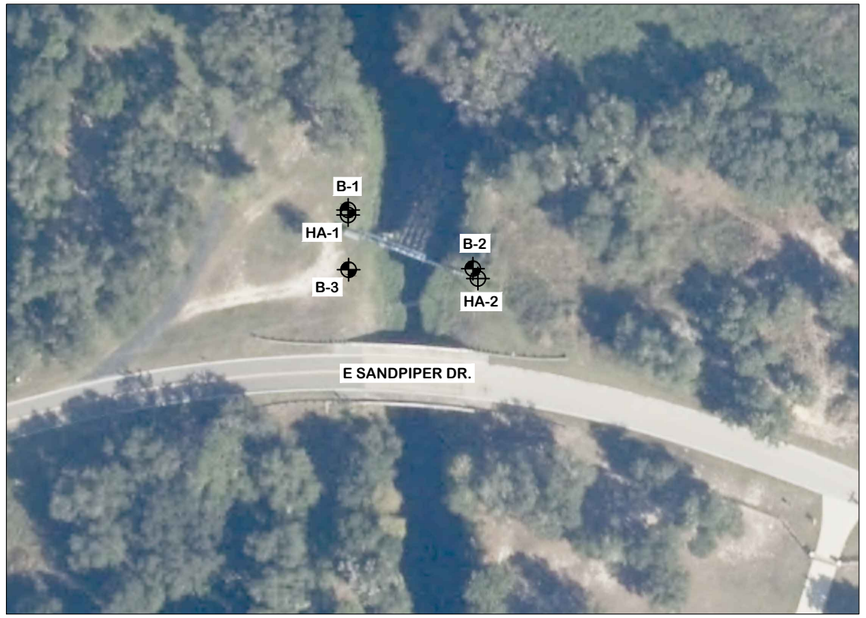
Appendix

Boring Location Plan and Soil Profiles
Recommended Soil Parameters for Sheet Pile Walls

BORING LOCATION PLAN

0 100'

PLAN SCALE

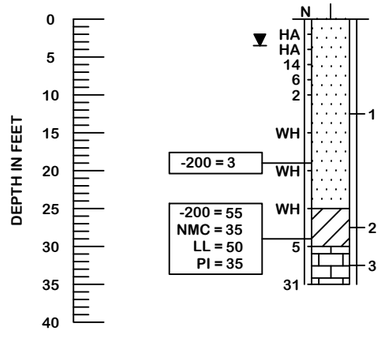


LEGEND

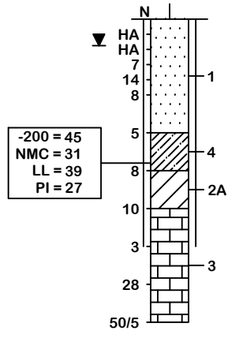
1		GRAY TO BROWN SAND TO SAND WITH SILT (SP/SP-SM)
2		GRAY SANDY CLAY (CL/CH)
3		WEATHERED LIMESTONE
4		GRAY CLAYEY SAND (SC)
		A - WITH LIMESTONE
		APPROXIMATE LOCATION OF SPT BORING
		APPROXIMATE LOCATION OF AUGER BORING
		GROUNDWATER LEVEL ENCOUNTERED DURING INVESTIGATION

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 AND LABORATORY TESTING ON SELECTED SAMPLES FOR CONFIRMATION OF VISUAL REVIEW
50/4	NUMBER OF BLOWS FOR 4 INCHES OF PENETRATION
HA	HAND AUGERED TO VERIFY UTILITY CLEARANCES
WH	FELL UNDER WEIGHT OF ROD AND HAMMER
| |	CASING
-200	PERCENT PASSING #200 SIEVE
NMC	NATURAL MOISTURE CONTENT (%)
LL	LIQUID LIMIT (%)
PI	PLASTICITY INDEX (%)
EASTING	EASTING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA WEST ZONE, N.A.D. 83 DETERMINED USING HAND-HELD GARMIN ETREX EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET
NORTHING	NORTHING COORDINATE REFERENCED TO THE FLORIDA STATE PLANE COORDINATE SYSTEM, FLORIDA WEST ZONE, N.A.D. 83 DETERMINED USING HAND-HELD GARMIN ETREX EQUIPMENT WITH A REPORTED ACCURACY OF 10 FEET

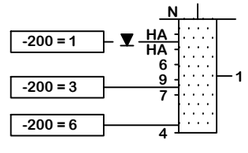
BOR # B-1
EASTING 567199
NORTHING 1628106
DATE 8/21/2018
DRILLER D. STAKELIN
HAMMER AUTOMATIC
RIG CME-55



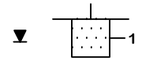
BOR # B-2
EASTING 567282
NORTHING 1628068
DATE 8/21/2018
DRILLER D. STAKELIN
HAMMER AUTOMATIC
RIG CME-55



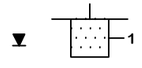
BOR # B-3
EASTING 567200
NORTHING 1628067
DATE 8/21/2018
DRILLER D. STAKELIN
HAMMER AUTOMATIC
RIG CME-55

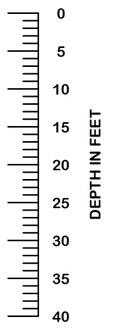


BOR # HA-1
EASTING 567199
NORTHING 1628103
DATE 8/10/2018
DRILLER A. WELCH



BOR # HA-2
EASTING 567285
NORTHING 1628061
DATE 8/10/2018
DRILLER A. WELCH





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: EMF
APPROVED BY: EMF
DATE: SEP 2018
ENGINEER OF RECORD: ERICK M. FREDERICK, P.E.
FLORIDA LICENSE NO.: 63920

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

SCALE: NOTED
PROJECT NUMBER: 6511-18-143

GEOTECHNICAL ENGINEERING SERVICES
SWFWMD WATER CONTROL STRUCTURE
TSALA APOPKA GOLF COURSE STRUCTURE MODIFICATION (P231)
CITRUS COUNTY, FLORIDA

SHEET 1

RECOMMENDED SOIL PARAMETERS FOR SHEET PILE WALLS

SWFWMD Weir Control Structure
Tsala Apopka Golf Course Structure Modification
TIERRA PROJECT NO. 6511-18-143

Soil Classification	Depth Below Grade (ft)		Unit Weight (pcf)		Cohesion/ Ultimate Shear Strength (psf)	Internal Friction Angle	Wall Friction Angle[(1)]
	from	to	Saturated/ Total	Effective			
VERY LOOSE SAND TO CLAYEY SAND	0	20	105	43	0	28°	14°
FIRM SANDY CLAY TO CLAY	20	25	115	53	625	0°	---
WEATHERED LIMESTONE	25	40	125	63	5,000	0°	---

(1) Wall friction angles and adhesion values apply to steel only.

Type of Work	Min 28-Day Compressive Strength (psi)	Maximum Size Aggregate (in)	* Cement Content per cubic yd (lbs)	* Maximum W/C Ratio (by weight)
Structural Concrete				
Roof, floor slabs, columns, walls, and all other concrete items not indicated elsewhere.	4,500	1	564 to 600	0.45
12-inch and thicker walls, slabs on grade, and footings (optional)	4,500	1-1/2	564 to 600	0.45
[Structural silica fume concrete	6000	1	564 to 600	0.38
[Structural chloride resistant concrete	5000	1	658 to 694	0.38
[Tremie Concrete]	4000	3/4	658 minimum	0.45
Pea Gravel Concrete				
Thin sections and areas with congested reinforcing, at the CONTRACTOR'S option and with the written approval of the DISTRICT for the specific location.	4,500	3/8	752 to 788	0.40
Sitework concrete	[3,500]	[1]	[470 (min)]	[0.50]
Lean concrete	2,000	1	376 (min)	0.60

* The cement content and water cement ratio are based on total cementitious material including silica fume, slag or flyash.

NOTE: The CONTRACTOR is cautioned that the limiting parameters above are not a mix design. Admixtures may be required to achieve workability required by the CONTRACTOR'S construction methods and aggregates. The CONTRACTOR is responsible for providing concrete with the required workability and strength.

H. Adjustments to Mix Design: The CONTRACTOR may elect to decrease the water/cement ratio to achieve the strength and shrinkage requirements and/or add water reducers, as required to achieve workability. The mixes shall be changed whenever such change is necessary or desirable to secure the required strength, density, workability, and surface finish, and the CONTRACTOR shall be entitled to no additional compensation because of such changes. Any changes to the accepted concrete mix design shall be submitted to the DISTRICT for review and shall be tested again in accordance with these Specifications.

I. When using a floor hardener, the water/cement ratio shall not be greater than specified by the hardener manufacturer.

2.09 CONSISTENCY:

A. The quantity of water in a batch of concrete shall be just sufficient, with a normal mixing period, to produce a concrete which can be worked properly into place without segregation and which can be