

ADDENDUM NO. 1

**City of Fort Oglethorpe Tennis Courts
Invitation to Bid (ITB) #005-23
Derthick Henley & Wilkerson Architects**

Date: 21 June 2023

File: 2212

The following amendments to the specifications and/or revisions to the drawings shall be a part of the contract documents. Bidders, therefore, shall consider them when preparing cost estimates, and the contractors shall be bound by them.

Note: The pre-bid meeting was held 6-13-2022 on site.

FRONT END

1. Updated Addenda Acknowledgement form with correct project completion date
2. Added Unit Price Form

SPECIFICATIONS

The following sections are added to the specification:

26 05 00	Common Work Results for Electrical
26 05 02	Testing for Electrical Systems
26 05 19	Low Voltage Electrical Power Conductors and Cables
26 05 26	Grounding and Bonding for Electrical Systems
26 05 33	Raceway and Boxes for Electrical Systems
26 05 53	Identification for Electrical Systems
26 28 13	Fuses
26 28 16	Enclosed Switches and Circuit Breakers
26 51 10	Sports Lighting Section
32 18 23	Tennis Pickleball Court Surfacing

Section 31 10 00 Site Clearing

1. Paragraph 3.01 revised to include requirements for temporary security fencing

Section 31 20 00 Earthwork

1. Paragraph 3.05 revised to be classified excavation.
2. Paragraph 3.09 line B revised to address unit pricing for undercutting

DRAWINGS

SHEET C100

1. Revised to list fence heights around pickleball
2. Revised to omit reference to asphalt court section at tennis courts

SHEET C301

3. Revised grading of pickleball court to 0.9% cross-slope, raising the center crown ~0.08'

SHEET C302

1. Added reference to Erosion, Sedimentation & Pollution Control Plan checklist, Appendix 1 additional BMP at LID stormwater areas.

SHEET C501

1. Added LOC (limit of construction) line
2. Added additional silt fence where construction is near the stream buffer.
3. Added reference to Appendix 1, checklist at construction sign.
4. Added GSWCC QR code for review tracking

SHEET C502

1. Added additional silt fence where construction is near the stream buffer.
2. Revised undercut depth at Sediment trap B2 to increase temporary sediment storage volume
3. Added reference to Appendix 1, checklist at grass swales
4. Added GSWCC QR code for review tracking

SHEET C504

1. Revised anticipated construction schedule
2. Revised table for disturbed area stabilization with mulching to remove asphalt chips as option.
3. Added table to summarize sediment trap storages, shown on C502.
4. Added GPS coordinates for construction exit to Detail Co
5. Added GSWCC QR code for review tracking

SHEET C505

1. Revised section on primary permittee inspections
2. Revised notes on concrete truck washout to prohibit washout of the drum.
3. Added GSWCC QR code for review tracking

SHEET C506

1. Added owner information as the primary permittee
2. Updated sampling requirement to list allowable NTU values.
3. Updated section on retention of records.
4. Added GSWCC QR code for review tracking

ADDENDA ACKNOWLEDGEMENT

NOTE: Addenda will be published on the City's website (www.fortogov.com) under the Bids and Proposals tab (<https://fortogov.com/bids-and-proposals/>).

<p style="text-align: center;">ADDENDA ACKNOWLEDGEMENT</p> <p style="text-align: center;">My signature below confirms my receipt of all addenda issued for this proposal. Numbers _____ to _____ _____</p> <p style="text-align: center;">Signature</p> <p>*This acknowledgement is separate from my signature on the bid proposal form. My signature on the bid proposal form will not be deemed as an acknowledgement of addenda.</p>

Ability to complete project by December 15, 2023.

I certify this bid complies with the Bid Requirements and Project Specifications issued by the City except as clearly marked on the Exception Sheet.

Authorized Representative /
Title
(Print or Type)

Authorized Representative

Date

BID UNIT PRICES FORM

ITB # 005-23: City of Fort Oglethorpe Tennis Courts

Bidder Name: _____

Project Location: 19 Van Cleve Street, Fort Oglethorpe, Georgia 30742

Item	Description	Constructor's Bid Unit Price \$	Unit	Estimated Volume CY	Contractor's Bid Allowance Price U.P. x Volume
1	Undercutting of unsuitable material beneath sub-grade and legally dispose of off-site		CY (loose yards)	3,000	
2	Excavation, placement, and compaction of approved offsite backfill material(including transportation) where undercutting of unsuitable material occurred.		CY (compacted in-place yards)	2,000	
4	Stone backfill (including transportation) to replace undercut areas, where recommended by onsite testing		CY (compacted in-place yards)	1,000	
5	Rock Excavation to sub-grade (including transportation offsite) Rock Excavation” shall be such material which cannot be removed by means other than by blasting or with air hammer. Materials, which can be removed by ripping, shall not be considered “Trench Rock Excavation” (see specifications).		CY (computed cut measurements)	65	
TOTAL					\$ -

SECTION 26 05 00

COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.01 DEFINITIONS

Whenever occurring in Division 26 the following words shall have the meanings given below:

- A. "Provide" shall mean to furnish, install and connect complete.
- B. "Wiring" shall mean wire or cable, installed in conduit, cable tray, or wireways with all required boxes, fittings, connectors, and accessories completely installed.
- C. "Work" shall be understood to mean the materials completely installed including the labor involved.
- D. "Plans and Specifications/Contract Documents" shall be understood to mean the complete documents, including all trades, divisions, sections, addenda, etc.
- E. "Review of Shop Drawings" - see Division 1.
- F. "Conduit" shall mean either rigid steel conduit, intermediate metal conduit (IMC), electrical metallic tubing (EMT), or plastic conduit (PVC).

1.02 The Contractor AGREES that upon the submittal of a bid, he will have read and studied ALL of the Contract Documents, and that all of the requirements and coordination resulting from these documents are included in his bid. The intent is to obtain a complete installation of electrical work to which end the Contractor shall provide ALL labor, equipment, material, freight, rigging, etc., specified, shown or scheduled on plans. He also agrees that any other accessory items which may not be specified, shown, or scheduled on the plans, but which normally are furnished or can be reasonably implied from the specifications and/or plans to be required shall be provided.

1.03 No exclusion from, or limitations in the drawings, specifications, or other contract documents for the electrical work shall be reason for the omitting of the appurtenances or accessories necessary to complete any required system or item of equipment in this project.

1.04 Should the Contractor find any discrepancies and/or omissions in the contract documents, or be in doubt as to the intent of said documents, he shall obtain clarification or correction from the Architect and the Engineer BEFORE submitting a bid for work under this division. The Contractor will not be granted monetary allowances for discrepancies between his bid and the intent or the work after the contract is let, due to failure to follow this instruction.

1.05 The contractor shall not use any material or equipment that contains asbestos, PCB's, or any other substance which is known to endanger the public health.

1.06 SCOPE OF WORK

- A. Installation of a complete sports lighting system
- B. The work of this division shall include the furnishing of all labor, supplies, materials, sales tax, permits, inspection fees, costs of testing, shop drawings, as built drawings, operation and maintenance manuals, and the performing of all operations including installation, cutting and chasing, trenching and backfilling, compaction, coordination with other trades on the job, etc., to the end of obtaining a complete installation of electrical work as shown on the drawings and called for in the written specifications.
- C. The work to be performed under the electrical contract shall include, but not be limited to:
 - 1. Sports lighting system.
- D. The owner will not make any consideration to the contractor for any alleged misunderstanding of the amount of work to be performed. Submittal of a bid for work shall convey full agreement by the Contractor to all items and conditions specified, indicated on the drawings, and/or required by the nature of the job site.

- D. Contractors desiring to bid on work under this division are required to visit the job site before bid submittal. During said visit the Contractor shall become familiar with all site conditions which will affect his work and the cost of the work. He shall also verify exact location of the equipment of the various utility companies from whom services will be required. The Contractor shall submit a letter with his bid stating that he has complied with this requirement.

1.09 PLANS AND SPECIFICATIONS

- A. While drawings are to scale, they are diagrammatic. DO NOT SCALE DRAWINGS HAVING 1/4" OR SMALLER SCALE. Equipment, conduit, outlets, etc., are not exactly positioned; therefore, the Contractor shall refer to architectural drawings for actual building dimensions, ceiling layouts, light fixture locations, work by other trades, etc.
- B. Should any conflict exist between the drawings and the written specifications, the specifications shall generally govern. Contact Engineer for clarifications.
- C. The drawings and written specifications for all divisions are part of the contract. Any work and material shown in the one and omitted in the other, or which may be reasonably implied by both or either, shall be fully furnished and performed by the Contractor, as required for a complete electrical system installation.
- D. No deviation from the drawings and specifications shall be made without the full knowledge and consent of the Architect. Should the Contractor find, at any time during the progress of the work, that, in his judgment, existing conditions make desirable a modification in requirements covering any particular item or items, he shall report such item promptly to the Architect for his decision and instructions.
- E. The right is reserved by the Architect to move any equipment, outlet, conduit, etc.; as much as ten (10) feet at no increase in cost, provided the Contractor is notified of the change before work on the detail in question is started.
- F. It shall be the responsibility of the Contractor to insure that the equipment he provides will fit into the available space, leaving reasonable space for maintenance and servicing of the equipment. If, after the installation of any equipment, it is determined that the space requirements have not been met, the Contractor shall rearrange the work at no additional cost.

1.10 COORDINATION OF WORK

- A. It is the responsibility of the Contractor to plan all work so that it proceeds with a minimum of interference with all other trades. He is to inform all parties concerned of openings in the building construction for equipment or conduit required for the electrical work. He is to coordinate the electrical work with the mechanical and plumbing installation.
- B. The contractor shall review and coordinate the locations of all electrical equipment. If there are any questions as to locations of equipment, notify the engineer for clarification prior to installation of equipment.
- C. The Contractor shall provide all required frames, sleeves, inserts, supports, anchor bolts, etc., as required for completion of the work.
- D. The Contractor shall lay out and coordinate all work well enough in advance so as to avoid conflicts or interference with other work in progress. If there is any interference, the electrical layout may be altered to suit the conditions, prior to the installation of any work and at no additional cost to the Owner. Consult the Architect for instructions.
- E. The contractor shall verify the location of all disconnect switches required by the project, prior to their installation. The installed location of any disconnect shall not impede the access to, or working space around, any piece of equipment. Neither shall the location cause any loss of equipment performance due to impeded air flow, etc. This requirement applies regardless of the location shown for the disconnects on the plans. If there is any question as to disconnect location, the contractor shall ask the engineer for clarification prior to installation. If any disconnect is found to be installed in such a way that it causes any problems as mentioned

above, it shall be relocated at the expense of the contractor.

- F. Work lines and established heights shall be in strict accordance with architectural drawings and specifications, insofar as these drawings and specifications extend. It is the Contractor's responsibility to verify all elevations and detailed dimensions not indicated.

1.11 EQUIPMENT DATA

- A. Deliver all printed tags, instructions, certified drawings, parts lists, certificates, etc., supplied with equipment items, to the Architect at completion of the project.
- B. Assemble all such printed materials into a stiff-back binder identified on its face. Provide quadruple copies.

1.12 SHOP DRAWINGS

- A. Shop drawings for panelboards, sports lighting system, and other items as might be requested, shall be submitted to the Architect's Engineer for his approval, by the Contractor promptly upon receipt of the contract for work.
- B. The engineer will review the shop drawings for errors in the contractor's interpretation of the contract documents only, and to assist the contractor in compliance with the documents. Corrections of comments made on shop drawings during the review do not relieve the contractor from compliance with requirements of the contract documents, plans, and specifications. Review of the shop drawings shall not relieve the contractor from responsibility for confirming and correlating all quantities and dimensions, coordination of his work with the other trades, and performance of his work in a safe and satisfactory manner. Review of shop drawings shall not permit any deviations from plans and specifications by the contractor, nor shall it permit changes to the plans and specifications by the engineer. Changes to, or deviations from, the contract documents may only be made by a Change Order issued by the architect and executed properly.
- C. The contractor shall review the information prepared by his suppliers and note any changes required prior to submitting the information to the. Equipment subject to shop drawing approval shall not be ordered until approved by the Engineer. Material ordered or installed without such approval, if rejected by the Engineer, shall be removed and replaced with approved items at the Contractor's expense.
- D. In order to procure approval for such equipment, the Contractor shall submit a minimum of six (6) sets of shop drawings and/or brochures describing each piece of equipment. Description shall include rated capacities, dimensions, manufacturer's catalog number, performance data with operating characteristics, optional features, modifications, etc.
- E. ALL BROCHURES AND DRAWINGS SHALL BE SUBMITTED AT THE SAME TIME. Items not approved shall be resubmitted with the necessary corrections made until final approval is obtained.
- F. See individual specification sections for additional shop drawing requirements.
- H. If equipment is substituted and approved in the shop drawing process; its use may affect electrical, mechanical, structural, and other systems which were designed based on the original equipment specifications. Any changes, and their cost, in any of the divisions of work affected by the substitution of equipment, shall be the sole responsibility of the contractor making the substitution.

PART 2 - PRODUCTS

2.01 MATERIALS AND EQUIPMENT

- A. All materials and equipment shall be new and the best grade. They shall conform to all standards and requirements governing the work. Any and all equipment and materials damaged during installation shall be immediately replaced at NO cost to the Owner.
- B. Reference shall be made to drawing schedules and details and/or specifications for manufacturer, model, catalog number, size, capacity, performance, installation, etc., of

equipment and material. Such information is used to denote design, workmanship, and quality desired.

C. The Contractor shall offer his bid for work based on the electrical equipment (including light fixtures) which is described in these specifications and described in the respective schedules on the drawings. Pre-bid approvals for substitute equipment will not be given.

D. PRODUCT SELECTION PROCEDURES:

Product selection shall be governed by the Contract Documents, and not by previous project experience which the Contractor or his suppliers may possess. Procedures governing product selection include the following:

1. PROPRIETARY SPECIFICATION REQUIREMENTS: Where only a single product or manufacturer is named, provide the product indicated. No substitutions shall be permitted.
2. SEMIPROPRIETARY SPECIFICATION REQUIREMENTS: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions shall be permitted.
3. NON-PROPRIETARY SPECIFICATONS: When the specification lists products or manufacturers that are available for incorporation into the work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product which complies with the contract requirements. Such products are still subject to the shop drawings submittal process.

E. In the submission of substitute equipment and materials, the Contractor shall note the following: (1) capacities are absolute minimum and must be equaled, (2) physical size limitations for space allotted, (3) structural properties, (4) noise levels, (5) interchangeability, (6) compatibility with other materials, (7) similar items shall be same manufacturer and style wherever possible.

F. All materials and equipment, for which a UL or NEMA standard is established, shall be so approved and labeled or stamped.

G. NEMA standards shall be taken as minimum requirements for electrical equipment.

H. Electrical equipment shall operate properly under a 10 percent plus or minus voltage variation.

I. Adhesives are not acceptable as mounting, supporting or assembling media.

PART 3 - EXECUTION

3.01 All materials required for the project shall be ordered by the Contractor in a timely manner which allows the material to be received at the job site for installation in agreement with the job schedule, so that work of the other divisions is not held up in any way.

3.02 All materials and equipment received at the job site by the Contractor shall be stored and protected from damage while they wait to be installed.

3.03 All work shall be carried out in a neat and orderly manner by experienced electricians, under the constant supervision of a competent electrician, trained and licensed in this field, who shall represent the Contractor at all times in connection with the work.

3.04 Materials or work installed, rejected by the Architect's Engineer upon inspection shall be completely removed by the Contractor, and the work redone in a manner acceptable to the Engineer by the Contractor at no charge.

3.05 When rejected work is removed, should other material, equipment, etc., be damaged in the process, the Contractor shall make all necessary repairs, so that the damaged equipment is equal in quality, strength and appearance to its original state.

3.06 SPACE REQUIREMENTS

A. The Contractor is fully responsible for determining in advance of purchase that all equipment and materials proposed for installation will fit into the space indicated while allowing sufficient clearance about the equipment and materials to allow proper maintenance and servicing of all

components requiring such, including equipment and materials of other divisions located in the vicinity.

- B. Clearances in front of panelboards, switchboards, motor starters, busway taps, and other electrical equipment requiring servicing while energized, shall be provided in accordance with the NEC, table 110-16a, as required by the code text.
- C. The contractor shall prepare, and submit for review and approval prior to ordering equipment, dimensioned rough-in drawings at 1/2" = 1'-0" scale for each equipment room and meter equipment layout. These drawings shall show all equipment to scale based on the actual equipment ordered and shall be fully dimensioned.

3.07 RECORD AND AS-BUILT DOCUMENTS

- A. The Contractor shall maintain at the job site a complete set of Contract Documents. These documents shall be kept current with all changes, substitutions, etc., to the original documents as reflected by the actual work being installed.
- B. At closeout, the Contractor shall provide the Owner with one complete set of as-built reproducible drawings, and two clean sets of complete specifications. These documents shall show installed locations, sizes, etc., of all work and material as required by the contract documents and actually installed on the project.
- C. For each piece of equipment installed or provided, the Contractor shall provide three (3) sets of:
 - 1. Manufacturer's printed catalog pages
 - 2. Manufacturer's operating and maintenance instructions
 - 3. Manufacturer's wiring and connection diagrams, etc.,
 - 4. Motor interlock and control diagrams, showing operating instructions for, and normal positions of, each motor and controller

All of this information shall be provided in bound 8-1/2" by 11" hardback booklets.

3.08 CLEANING

- A. The Contractor shall insure that all interior and exterior surfaces of panelboards, transformers, switchboards, motor starters, cabinets, etc., are cleaned so as to be free of dust, dirt, grease, plaster, debris, etc. Lighting fixtures shall be cleaned according to manufacturer's recommendations.
- B. Any electrical equipment having sustained damage to any factory painted surfaces shall have that damage repaired and restored to original factory condition.
- C. Any and all ferrous metal surfaces exposed on the electrical system shall be painted.

3.09 EXCAVATION, SHORING, AND BACKFILL

- A. The Contractor shall perform all necessary excavation required for installation of his work. Each utility shall be installed in a separate trench.
- B. Excavation shall be below that required for general construction and final grade. It is expected that the Contractor shall process normally difficulties encountered in excavation related to rocks, debris, etc. However, should the Contractor encounter "solid" rock impediments to his excavation, he shall contact the Architect for directions.
- C. Any and all trenching shall be performed strictly in accordance with OSHA, and other authorities having jurisdiction, rules and regulations regarding "cave in" safety shoring. All shoring material used shall be completely removed prior to backfilling the trench.
- D. The Contractor shall not backfill trenches until the conduit banks have been inspected by the proper authorities.
- E. Backfill shall be done simultaneously on both sides of the equipment, raceways, etc.
- F. Backfill shall be clean soil, free of rocks, cinders, wood, debris, etc.

- G. Backfill shall be installed in 12-inch layers. It shall be compacted to 85% per ASTM D-1557 in areas under sidewalks and grass; and to 95% under any paved areas.
- H. Should concrete encasement of raceways be required, the sides and floor of the trench shall be used as formwork for the concrete. This shall not apply unless the excavation is clean, free of debris, and of the proper size.

3.10 CUTTING AND PATCHING

- A. The Contractor shall be responsible for the location and size of all openings required for his work.
- B. The Contractor shall not cut into structural members or architectural finish surfaces without expressed written approval of the Architect.
- C. Any patching of surfaces required by the Contractor's work shall be made so that they are equal in quality and appearance to the original surface.

3.11 FLASHING

- A. Raceways which pass through walls or roof surfaces to the outside shall be flashed in accordance with architectural standards and with the requirements of the roofing manufacturer.
- B. Any raceways penetrating the roof shall maintain a clearance of 18 inches minimum from all parapets.
- C. Whenever raceways pass through floor structures which contain a water proofing membrane, the Contractor shall provide a watertight floor sleeve for each raceway. The lowest floor shall be exempt.

3.12 MOISTURE - DAMP PROTECTION

- A. Whenever any electrical component, such as panels, raceways, etc., will be in contact with surfaces which may become damp or wet, that component shall be mounted on standoff devices so that it is a minimum of ¼" away from the surface.

3.13 GUARANTEE AND WARRANTY

- A. The Contractor and the General Contractor shall, and hereby does, guarantee that all work executed, and all electrical equipment installed, under this division will be free of all defects in materials, manufacture, and workmanship for a period of one (1) year from the date of final acceptance of the building. The above parties agree that they will, at their expense, repair and/or replace all such defective work and equipment, and any and all other work damaged thereby, which becomes defective during the term of this guarantee.
- B. Sports Lighting System to be warranted for a period of 25 years, refer to Specification section 26 51 10 and drawings for warranty information.

END OF SECTION

SECTION 26 05 02
TESTING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. The entire electrical system shall be tested to insure proper operation and safety for building occupants and operating personnel.
- B. Testing shall insure conformity to code requirements and conformity to contract documents.

1.02 REGULATORY REQUIREMENTS

- A. Testing shall be in conformance local codes, utility company requirements, and standard industry practices.
- B. Testing shall accomplish the requirements of the NEC, Article 110.

PART 2 - PRODUCTS

2.01 Testing shall be performed with instruments and materials required and approved for the purpose.

PART 3 - EXECUTION

3.01 Perform appropriate tests on the entire electrical system before it is energized. Testing shall be performed to insure that it is free of unintended grounds, short circuits, and open circuits.

3.02 Provide safeguards to protect all personnel involved in the testing as well as for protection of equipment being tested.

3.03 Testing shall be performed in a timely manner. Reports of results shall be filed with the Architect in written form.

3.04 Testing shall include the following:

- A. Prior to connections to equipment, all service entrance conductors and feeder conductors shall be tested for unintended grounds and for insulation integrity with a megohm meter. Any conductor found to be defective in the testing shall be replaced.
- B. Ground fault protection systems on service entrance equipment shall be tested according to the NEC, Article 230-95.
- C. The grounding system network shall be tested to insure a resistance value of not more than ten (10) ohms to ground. Should the system test results be higher than 10 ohms, additional ground rods shall be driven, or alterations made to the system, to produce the 10-ohm or less value required.
- D. Full load currents of each feeder shall be measured to test for phase load balance. If the phases are not load balanced, circuit rearrangement shall be made to achieve balanced load conditions.
- E. The proper operation of all alarm and control systems installed under this division shall be verified by system operational testing.
- F. All circuits having parallel conductors shall be tested for proper phasing using hot phasing or other compatible techniques.

3.05 The Contractor shall provide additional testing as deemed necessary by the Architect to insure that all equipment functions properly and meets the requirements of the specifications and drawings.

END OF SECTION

SECTION 26 05 19

LOW VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes building wires and cables, metal clad cable, connectors, and terminations for systems rated below 600 volts.

1.02 RELATED DOCUMENTS

- A. All drawings and Division 01 of the specifications and the general conditions of the Contract apply to this section.
- B. Section 260553 – Identification for Electrical Systems

1.03 REGULATORY REQUIREMENTS

- A. All products required and furnished under this section shall be listed and labeled per the NEC by UL or other testing agency acceptable to the authority having jurisdiction, and marked for intended use.
- B. All products furnished under this section, as installed, shall meet all requirements of the NEC.

1.04 WIRE AND CABLE

- A. All wire and cable routing shown on the drawings is approximate. Field verify dimensions and routing lengths of all conductors and cables required prior to installation.
- B. All wire and cable furnished on this project shall be copper and drawings reflect conductor sizes, conduit sizes, etc. based on copper conductors.

1.05 SUBMITTAL FOR INFORMATION:

- A. Provide written data for aluminum conductor substitution to the engineer indicating the voltage drop and ampacity calculations for the aluminum conductor substitute to match the copper conductor involved.

PART 2 - PRODUCTS

2.01 CONDUCTORS

- A. Specified gauge sizes refer to American Wire Gauge, copper conductors.
- B. All wire and cable shall be of soft drawn, annealed, copper having a conductivity of not less than 98% of that of pure copper; each wire continuous without weld, splice, or joint throughout its length; uniform in cross section and free from flaws, scales and other imperfections.
- C. Sizes specified are AWG through No. 4/0 and circular mils above No. 4/0. Conductor No. 10 and smaller shall be solid; No. 8 and larger stranded.
- D. Conductors No. 4 and smaller shall be Type "THHN/THWN"; larger conductors shall be type "THW".
- E. All conductors shall be of the same name brand and shall be in the original wrapping.
- F. All conductors shall be Anaconda, Diamond, General Electric, General Cable, Parante, Phelps-Dodge, Simplex, Triangle, or Southwire.

2.02 BRANCH CIRCUIT CONDUCTORS

- A. Minimum wire size for lighting and power circuits shall be #12. #10 shall be used where the run to the first outlet exceeds 75' for 120V circuit and 150' for 277V circuit.
- B. Branch circuit wiring, which supplies more than one fluorescent fixture through the wire-way of other fixtures, shall be rated for use at 150 degrees C.

- C. All installations to be based on wire in conduit except for cases where the use of MC cable is allowed on the drawings in certain applications or instances.

2.03 METAL CLAD CABLE

- A. Provide a factory assembly of one or more 90 degrees C. insulation rated conductors enclosed in an armor of interlocking metal tape or a smooth or corrugated metallic sheath.
- B. Approved manufacturers shall be Alflex Corp., Armorlite, and American Flexible Conduit Co., or equal.
- C. Provide connectors rated specifically for use on MC cable. Connectors shall have an insulating sleeve or bushing provided between the armor and the conductors. Provide connectors that attach to cabinets with locknuts. Other types are prohibited.

2.04 SPLICES & TERMINATIONS

- A. Splices for #10 AWG and smaller wire used on Branch circuits and fixtures shall be of the "Live Spring" pressure type, Ideal Co. wing nut and/or wire nut type connectors or approved equal. Splices shall be rated 600 volts or 1000 volts when enclosed in a fixture or sign.
- B. Solderless, mechanical type lugs shall be used for terminal connections for copper conductors of #8 AWG or larger.

PART 3 - EXECUTION

3.01 WIRE AND CABLE

- A. Conductors shall be continuous from outlet to outlet and from outlet to junction box or pull box. All splices and joints shall be carefully and securely made to be mechanically and electrically solid with "Live Spring" pressure type connectors, by "IDEAL CO." or approved equal. Tape shall be "Scotch" No. 33 for indoor and NO. 88 for outdoor or approved equal. Where connection is made to any material, copper terminal lugs shall be bolted or compression fitted to the conductors. Where multiple connections are made to the same terminal, individual lugs for each conductor shall be used.
- B. Wire shall not be drawn into a conduit until all work on the conduit system, which might cause damage to the wiring, is complete. Ideal, Wire-Ease or approved equal may be used as lubricant.
- C. Where two or more circuits run to a single outlet box, tag each circuit with linen tags as a guide to the fixture hanger in making fixture connections.
- D. All stranded conductors shall be furnished with copper connecting lugs drilled or reamed the full diameter of the bare conductors.
- E. Mains and feeders shall be run their entire length in continuous pieces without joints or splices. If the runs are too long for a single conductor piece, then joint and/or splices installed per these specifications shall be used.
- F. All splices, taps, terminations, etc. in the conductors shall be kept where they are fully accessible for inspection and maintenance.
- G. All wiring in cabinets, boxes, gutters, etc., shall be neatly tied and held in place by nylon cable ties and mounting brackets.
- H. At each fixture outlet a loop or end of wire not less than 8" long shall be left for connection to fixtures.
- I. The number of crosses hatches, where indicated, designates the number of conductors to be installed when the number exceeds minimum of two (2). Where crosshatches are not indicated, the number of conductors shall be as determined by switching, homeruns, etc. This does not apply to conduit provided for telephone or other special systems.
- J. Branch circuits shall contain the necessary number of conductors to afford the switch control

- indicated.
- K. Splices, etc. in signal and/or communication conductors shall be made with crimp-on or soldered connections, which are properly insulated.
 - L. The Contractor shall not permit conductor bends to a radius less than 10 diameters or thickness on circuits of 600 volts or less.
 - M. Conductors, when installed, shall not have dents, cuts, and scars, pressure indentation, abraded areas, etc. The Contractor will be responsible for replacement of conductors so damaged, at his expense.
 - N. Lubricants used to ease conductor-pulling operations shall be specifically manufactured for that purpose. TALC only shall be used on isolated branch circuit wiring.
 - O. An UL approved non-oxidation compound or grease (PENETROX by Burndy) is to be applied at all terminations of panel feeders, secondary service conductors, and primary (high voltage) service conductors prior to connection.

END OF SECTION

SECTION 26 05 26

GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

- A. This section includes the electrical grounding of all electrical systems and equipment provided on this project.

1.02 RELATED DOCUMENTS

- A. All drawings and Division 01 of the specifications and the general conditions of the Contract apply to this section.
- B. Specification section 260519 – Low Voltage Electric Power Conductors and Cables

1.03 REGULATORY REQUIREMENTS

- A. All components, equipment, fittings, accessories, etc. required and furnished under this section shall be listed and labeled per the NEC by UL or other testing agency acceptable to the authority having jurisdiction, and marked for intended use.
- B. All components, equipment, fittings, accessories, etc. required and furnished under this section shall comply with the NEC, particularly Article 250.

1.04 GROUNDING SYSTEM

- A. Components of the grounding system shall include (but not limited to):
 - 1. Driven ground rod(s)

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. All grounding equipment shall be manufactured by ERICO International Corporation or equal.
- B. Grounding conductor manufacturers shall be per Section 260519 of these specifications.

2.02 CONDUCTORS

- A. All grounding conductors shall be copper. Conductors smaller than No. 8 AWG shall be solid; all other conductors shall be stranded. Ground conductors shall be bare or have type THHN insulation, green in color.
- B. Aluminum grounding conductors shall not be used.

2.03 GROUND RODS

- A. Ground rods shall be copper clad, sectional, solid steel, 10-ft. long, ¾ in. diameter.
- B. Rods shall be threaded on both ends.
- C. All couplings shall be bronze and made by the rod manufacturer.

2.04 CONNECTIONS

- A. Grounding connections made to ground rods, building re-steel, counterpoise systems, etc. shall be made via exothermic welding means.
- B. Grounding connections to pipes shall be made with bolted pressure type or compression type clamps manufactured for grounding purposes.
- C. Grounding connections to boxes, fixtures, etc. shall be made at the factory provided grounding terminal.

PART 3 - EXECUTION

3.01 EQUIPMENT CONNECTIONS

- A. Provide grounds to all equipment requiring them, including, but not limited to:
 - 1. Conduit and enclosures.
 - 2. All neutral conductors.
 - 3. Panelboards, switchboards, etc.
 - 4. Ground terminals on receptacles, appliances, equipment, etc.
- B. Make all connections with galvanically compatible materials.
- C. Clean all connections points so that new bare metal surfaces are involved in connections.
- D. Tighten all bolts, screws, etc. on grounding connections to torque ratings of manufacturer, or per UL 486A if there are no manufacturer's instructions on torque settings.
- E. Seal all grounding connections of dissimilar metals with inert product intended for this purpose to exclude moisture infiltration into connection joints.

3.02 Route all grounding conductors via shortest physical path possible without obstructing access to other systems or placing the conductors in locations where they will be subjected to any type of damage.

3.03 All bonding conductors (straps, jumpers, etc.) shall be installed so that their connections are isolated from equipment vibrations, etc.

3.04 In all raceway systems provide an equipment grounding conductor in addition to the circuit neutral inside the raceway with the phase conductors. Equipment grounding conductor shall be "Green" in color.

END OF SECTION

SECTION 26 05 33

RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. The General and Supplementary Conditions, and General Requirements (Division 1), apply to the work specified in this Section.

1.02 LOCATION OF OUTLETS

- A. Unless specifically indicated, all outlets are located diagrammatically on the drawings. Reference shall be made to the architectural and mechanical plans for the exact location of all outlets.
- B. Outlets shall be located so that they will be symmetrical with architectural details and power outlets shall be so located as to properly serve the equipment.

1.03 JUNCTION BOXES AND PULL BOXES

- A. Furnish and install junction and pull boxes as required to facilitate installation of the various conduit systems and as required by the NEC.

PART 2 - PRODUCTS

2.01 FEEDERS AND BRANCH CIRCUITS

- A. Rigid conduit or IMC shall be used for all feeders and sub-feeders and branch circuits, where exposed to possible physical damage. EMT shall be permitted in protected areas.

2.02 RIGID CONDUIT

- A. All rigid conduit shall be of the best quality steel of standard dimensions, hot dip galvanized, threads included, clean and smooth inside. Conduit shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp on each length of conduit.
- B. Fittings for all rigid conduits shall be steel or malleable iron as manufactured by Thomas and Betts or equal. DIE CAST FITTINGS OF ANY MATERIAL SHALL NOT BE USED.

2.03 ELECTRIC METALLIC TUBING (EMT)

- A. EMT conduit shall be of the best quality steel of standard dimensions, hot dip galvanized, clean and smooth inside. Conduit shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp on each length of conduit.
- B. Fittings for all EMT conduit shall be compression type, made of steel, with case hardened locknuts, and nylon insulated throats; or steel setscrew fillings with case hardened locknuts, and nylon insulated throats. DIE CAST FITTINGS OF ANY MATERIAL SHALL NOT BE USED. Fittings shall be manufactured by Thomas and Betts or equal.

2.04 RIGID NONMETALLIC CONDUIT (PVC)

- A. All PVC conduit shall be produced by the same manufacturer, be schedule 40, and manufactured as Electrical Conduit with the manufacturer's trade mark or stamp on each length of conduit.
- B. All PVC conduit fittings and cement shall be secured from the conduit manufacturer.
- C. All PVC conduit shall meet the following standards:
 - 1. Rated for 90 degrees centigrade.
 - 2. Shall have a tensile strength of 7,000 psi @ 73 degrees F.
 - 3. Shall have a flexural strength of 11,000 psi.
 - 4. Shall have a compressive strength of 8,600 psi.
- D. PVC not allowed above grade.

2.05 FLEXIBLE CONDUIT

- A. Flexible Steel Conduit (No Cover) shall be constructed of reduced wall galvanized steel, and shall be manufactured as Electrical Conduit with the manufacturer's trademark or stamp.
- B. PVC Extruded Cover Flexible Conduit shall be used in all outdoor applications. It shall be UL listed for outdoor use.
- C. Connectors and fittings for flexible conduit shall be steel type with nylon insulated throats. Connectors shall "bite" into the conduit under pressure of the connector bolt. All connectors and fittings shall be manufactured by Thomas and Betts or equal.

2.06 BELOW GRADE CONDUIT AND CABLE SEAL

- A. Seals for either conduit or cable below grade shall form a reliable lasting seal between building and the outside and shall be able to withstand pressures to a minimum head of 50 feet of water. The below grade seals shall be as manufactured by O.Z./Gedney and sized for the particular application.

2.07 THREADED JOINT COMPOUND

- A. Threaded joint compound shall be a corrosive inhibiting compound that is electrically conductive under pipe joint pressure. The compound shall be Thomas and Betts "KOPR-HIELD" or approved equal.

2.08 CONDUIT IDENTIFICATION TAPE

- A. Conduit identification tape for use in marking underground conduit runs shall be inert polyethylene, resistant to acids, alkalis, etc., which might be in the soil. The tape shall be a minimum of 4 mils thick, 6 inches wide, and yellow in color. It shall have the words "CAUTION – ELECTRIC LINE BURIED BELOW" imprinted along its entire length with a contrasting color permanent ink. The tape shall be "Terra Tape" as manufactured by Reef Industries, Inc., Houston, Texas; or equal.

2.09 PULL BOXES

- A. All pull boxes shall be constructed of code gauge galvanized steel of the dimensions required by Article 370 of the NEC, according to the number, size, and position of conduits entering the box.
- B. Pull boxes installed in vertical runs of conductors shall be provided with Red Seal type VVC or approved equal cable supports as required by Table 300-19 of the NEC.
- C. Pull boxes for horizontal runs of feeder conductors which contain more than one feeder shall be provided with reinforced flange and removable 12 gauge 1-1/2" by 1-1/2" galvanized channel for support of conductors. Wood supports shall not be used.
- D. Pull boxes installed in finished spaces shall be flush mounted and shall be provided with trim, hinged door, and flush latch with lock to match trims for flush mounted panelboards.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Unless otherwise specifically noted on the drawings, ALL CONDUCTORS installed on this project shall be installed in conduit as specified herein.
- B. Any conduit installed on this project shall be no smaller than 3/4", except as otherwise noted on the drawings. Where desirable for ease of installation, larger sizes than those called out on the drawings may be used. The contractor is responsible for resolution of any conflicts arising from the use of larger sizes.
- C. Conduit shall be continuous from outlet to outlet, from outlet to panelboard cabinet, junction box, and/or pull box. Conduit shall enter and be secured to all boxes, etc., in such a manner that each raceway system will be electrically continuous from the service entrance to all outlets. All conduit from panelboard cabinets and junction boxes shall terminate in approved outlet boxes or conduit

- fittings. Conduit connection to any box, which has no threaded hub for its reception, shall be installed with two locknuts.
- D. In general, the conduit installation shall follow the layout shown. However, this layout is diagrammatic only; and where changes are necessary due to structural conditions, other apparatus, or other causes, such changes shall be made without any additional cost to the Owner. Offsets in conduit are not indicated, and must be provided as required.
 - E. Junction boxes and pull boxes shall be provided and installed as required to facilitate the systems shown on the drawings. "AX" expansion fittings shall be installed in all conduit runs wherever they cross building expansion joints.
 - F. At couplings, conduit ends shall be threaded so they meet in the coupling. Right and left couplings shall not be used; conduit couplings of the Erickson type or approved equal shall be used at locations requiring such joints.
 - G. Connections in conduit installed in outdoor or indoor locations where exposed to continuous or intermittent moisture, shall provide a liquid-tight seal. The sealing hub fittings shall be of steel or malleable iron, with recessed sealing "O" ring and a nylon insulated throat, Thomas and Betts Series 370. All conduit and cable, telephone or otherwise, which extend from the interior to the exterior below grade shall be sealed with a fitting designed for that particular use so as to be watertight.
 - H. No bends will be permitted with a radius less than size (6) times the diameter of the conduit nor more than 90 degrees.
 - I. All conduits shall be concealed in the wall, in or below floors or above ceilings unless otherwise directed or indicated. Concealed conduit shall be supported from the building construction at intervals not exceeding 8'-0". Concealed conduit above the ceiling shall be supported independent of ceiling construction. Where ceilings of the lay-in type are used, conduit must be installed high enough to permit removal of ceiling panels and lighting fixtures.
 - J. Where conduit is expressly shown to be run exposed, the conduit shall be supported at intervals not exceeding 8'-0" with straps and wood screws for wood construction, machine screws for metal construction, and expansion bolts for masonry construction. Exposed conduit in finished spaces that pass through walls or ceilings shall be provided with chrome plated escutcheons. Run exposed conduit, where permitted by this specification, parallel or at right angles to the building with approved galvanized iron clamps or hangers. Devices attached to masonry or slabs shall be secured with inserts and bolts or lead expansion sleeves. Provided a support at each outlet box, at each conduit elbow, and at each junction box. Wooden plugs inserted in drilled holes are not acceptable as support bases.
 - K. Where two (2) or more conduits are run parallel and adjacent, they shall be installed on gang hangers.
 - L. Where connections are made to motors more than 2'-0" away from walls or columns, a vertical conduit, minimum size 3/4", securely attached to floor and ceiling shall be installed and the wiring carried into and out of this conduit by means of condulets and flexible conduit.
 - M. Conduit embedded in concrete, which is in contact with the earth, and conduit installed outside the building below grade shall be rigid steel conduit, IMC or PVC.
 - N. Conduit shall be located 6" minimum from surfaces with temperature ranges above 140 degrees F.
 - O. Conduit shall not be installed in any manner, which will result in the accumulation of condensation in the pipe.
 - P. In masonry construction, wooden plugs inserted in drilled holes are NOT acceptable as bases for supports for conduit. The Contractor shall use approved types of galvanized wall brackets, beam clamps, strap hangers, or pipe straps secured by means of toggle bolts in hollow masonry units, expansion bolts in concrete or brick, machine screws or bolts and nuts in metal surfaces, and

wood screws in wood surfaces.

- Q. Conduit runs left for future use shall be checked for unblocked passage by the use of a ball mandrel. Contractor shall leave a non-mildewing polyolefin pull line in each such conduit. The line shall have an average tensile strength of 200 lbs. for 1" or smaller conduit and 500-lbs. for conduit larger than 1". Pull lines shall be based on the standard set by Ideal Co. product #31-343 for 200-lb. line and 32-244 for 500-lb. line.
- R. Electrical contractor to furnish and install all conduit for controls systems. Coordinate with Steve Greeson of ALC for requirements.

3.02 CONDUIT PROTECTION

- A. Conduit shall not be installed in any manner that will result in the accumulation of water inside the pipe.
- B. Conduit shall be located a minimum of 6 inches away from any surfaces which will reach surface temperatures of 140°F. or above.
- C. All conduit installed in the ground outside of the building shall be buried a minimum of 36 inches below finished grade, but in no case shall it be buried more than 48 inches deep without the written consent of the Engineer.
- D. Conduit run inside the building below floor slabs shall be included within the concrete pour of the slab, located between the reinforcing steel vertically.
- E. For all conduit installed in the ground outside of the building, provide identifying marker tape over the entire length of the conduit run. Place tape below finished grade between 12 inches and 18 inches absolute.
- F. All conduit shall be secured in place and protected to prevent damage to work during construction. The ends of all conduit and conduit fittings shall be plugged to avoid filling with dirt, plaster, gypsum, etc. Plugs shall be Thomas and Betts series 1470.
- G. All conduit shall be blown out and swabbed clear of water and trash prior to the installation of any conductors in the conduit.

3.03 GROUNDING AND TERMINATIONS

- A. Connections to all panelboards, cabinets, pull boxes, etc., shall be installed with a grounding wedge lug between the bushings and the box; or with locknuts designed to "bite" into the metal of the box.
- B. To insure continuity of electrical ground and to improve conductivity, use Kopr-Shiel compound, series CP-8 as manufactured by Thomas and Betts on all rigid conduit threaded joints.
- C. In ALL conduit runs, rigid or otherwise provide a green colored insulated grounding conductor inside the conduit with the phase conductors.

3.04 FLEXIBLE CONDUIT

- A. Non-covered flexible steel conduit shall be used in making short connections from outlet boxes to recessed lighting fixtures. Such conduit runs shall be no longer than 72-inches.
- B. Flexible conduit runs to other equipment shall be kept as short as possible, but shall have a minimum length of 12 inches.
- C. Flexible conduit connections to dry type transformers, rotating or vibrating machinery, kitchen equipment, or any other equipment, which may result in the conduit being exposed to moisture, shall be PVC covered.

3.05 PVC CONDUIT

- A. PVC conduit shall not be used above grade under any circumstances.
- B. All PVC conduit joints of any type shall be solvent welded in accordance with the manufacturer's

recommendations.

3.07 PULL BOXES

- A. Pull boxes shall be provided where indicated on the drawings and/or where required to facilitate the installation of all required conductors or as required by NEC.
- B. Pull boxes shall be installed exposed only in unfinished spaces. They shall be accessible.
- C. Feeders within pull boxes shall be individually laced with nylon tie straps of the type with enlarged tab to permit identification of each feeder.
- D. Conductors shall not be spliced inside pull boxes except with the approval in writing of the Architect. Where splices are permitted, they shall be made with splicing sleeves attached to the conductors with hydraulic crimping tools. Split bolt connectors shall not be permitted.

END OF SECTION

SECTION 26 05 53

IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. This section includes equipment marking, wire and cable marking, and conduit marking.

1.02 RELATED SECTIONS

- A. All conditions and requirements of Division 01 shall apply to the work specified in this section.

1.03 REGULATORY REQUIREMENTS

- A. Furnish products that are manufactured and rated for labeling and marking electrical equipment.

PART 2 - PRODUCTS

2.01 EQUIPMENT NAMEPLATES

- A. Nameplates shall be engraved three-layer laminated plastic. In all cases, inner layer shall be white in color.
- B. Nameplates shall be provided on all electrical enclosures and/or cabinets.
- C. Engraved letters shall be 3/8 inches high.
- D. Nameplate outer layer color shall be:
 - 1. 480/277 Volt equipment – White
 - 2. 208/120 Volt equipment – Black
 - 3. 240/120 Volt equipment – Blue

2.02 WIRE AND CABLE MARKERS

- A. Markers shall be colored plastic tape for service entrance and feeder conductors and PVC sleeve type markers for branch circuit conductors.
- B. PVC sleeve type markers shall be equal to Thomas & Betts E-Z-Code, white with black writing.
- C. Service entrance and feeder conductor marking shall consist of phase identification follows:

208Y/120 Volt System	480Y/277 Volt System
Phase A - Black	Phase A - Brown
Phase B - Red	Phase B - Purple
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - White with Black Stripe
Ground - Green	Ground - Green

2.03 UNDERGROUND RACEWAY MARKERS

- A. Raceway route warning tape shall be inert polyethylene, resistant to acids, alkalis, etc., which might be in the soil. The tape shall be a minimum of 4 mils thick, 6 inches wide, and yellow in color. It shall have the words "CAUTION – ELECTRIC LINE BURIED BELOW" imprinted along its entire length with a contrasting color permanent ink. The tape shall be "Terra Tape" as manufactured by Reef Industries, Inc., Houston, Texas; or equal.

2.04 PANELBOARD CIRCUIT DIRECTORIES

- A. Circuit directory cards shall be white heavy cardboard manufactured for the purpose, with machine written black ink circuit number legends.
- B. Circuit identification shall be in agreement with the actual connections as guided by the panel schedules on the drawings.

PART 3 - EXECUTION

- 3.01** Clean and remove grease, etc. from all equipment surfaces that will receive nameplates.
- 3.02** Provide labels for all electrical panels, switchboards, disconnects, cabinets, feeder and service raceways, motors, and major pieces of electrical equipment installed under this division
- 3.03** Provide panelboards that have doors with a directory card of all circuits in the panel.
- 3.04** Provide circuit breakers in switchboards and in panelboards that do not have doors with labels stating the circuit number and what the breaker is supplying.
- 3.05** Mark all underground conduit runs installed outside the building with stakes set with tops flush in the ground directly over the source, end, and bends locations in the conduit run.
- 3.06** Provide marker tape over the entire length of all underground conduit runs installed outside the building. Tape shall be installed at a depth between 12 and 18 inches below the surface of the ground directly over the conduit.
- 3.07** Mark all service entrance phase conductors and the neutrals with colored plastic tape to identify phase assignments on each end of the conductor and in all pull and/or junction boxes.
- 3.08** Branch circuit conductors shall be color-coded via insulation color as follows:

208Y/120 Volt System	480Y/277 Volt System
Phase A - Black	Phase A – Brown
Phase B - Red	Phase B - Purple
Phase C - Blue	Phase C - Yellow
Neutral - White	Neutral - White with Black Stripe
Ground - Green	Ground - Green

END OF SECTION

SECTION 26 28 13

FUSES

PART 1 - GENERAL

- 1.01** This section covers over current devices used for switchboard main sections, disconnect switches, etc.
- 1.02** The equipment furnished under this section shall be designed, manufactured, and tested according to the following standards:
- A. UL 977 Fused Power Circuit Devices
 - B. UL Requirements for Class L Current Limiting and High Interrupting Fuses.

PART 2 - PRODUCTS

2.01 FUSES

- A. Fuses protecting panelboards and transformers shall be current limiting type, Class J, 600 volt, with interrupting capacity of 200,000 amps RMS. Fuses shall be as manufactured by Ferraz Shawmut or equal.
- B. Fuses protecting motor branch circuits shall be dual element type, 250 or 600 volt, with interrupting capacity of 200,000 amps RMS. They shall be sized for motor nameplate data per manufacturer's recommendations. Fuses shall be as manufactured by Ferraz Shawmut.
- C. Clips for fuses rated above 10,000 AIC shall be rejection types. Clips shall be provided in accordance with NEC 240-60 (B).

PART 3 - EXECUTION

- 3.01** Contractor shall insure that overcurrent devices are installed securely, properly and in accordance with standard industry practice. All bolt connections which secure the device to its supports shall be tight and secure. All terminal screws on lugs, etc. shall be tight and securely hold the conductor in place. Covers on enclosed devices shall be installed and left closed and secured by screws, clamp closures, or locks, as required.
- 3.02** All over-current protective devices shall be sized for the protected device, regardless of other considerations, such as the maximum size protective device that will physically fit in the subject unit.
- 3.03** The contractor shall provide the owner with a spare fuse cabinet complete with 1 set (minimum of 3) of spare fuses for each fuse size rating on the project. No more than 3 fuses of the same size rating are required.

END OF SECTION

SECTION 26 28 16

ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

- 1.01** The term enclosed switch shall refer to fused switches, motor switches, twist-lock receptacles, and any other mechanical device designed to physically interrupt a circuit other than overcurrent protective devices.
- 1.02** Equipment furnished under this section shall be designed, manufactured, and tested in accordance with the following standards:
- A. NEMA KS1 Air Break Switches
 - B. ANSI-C33.64 Safety Standard for Enclosed Switches
 - C. UL-98 Safety Standards for Enclosed Switches
 - D. NEMA AB-1 Molded Case Circuit Breakers
 - E. UL 489 Branch Circuit and Service Circuit Breakers

PART 2 - PRODUCTS

- 2.01** Switches for use on circuits of voltages at 600 and below, shall be safety switches which:
- A. Are UL listed, E-4669.
 - B. Are equipped with full cover interlocks so that they can not be opened with switch in the "ON" position, without manually overcoming the interlock as per the manufacturer's instructions.
 - C. Are equipped with quick-make, quick-break mechanisms.
 - D. Are suitable for use as service entrance equipment when installed in accordance with the NEC
 - E. Housed in NEMA 1 enclosures on indoor dry applications and NEMA 3R enclosures on outdoor or damp applications.
 - F. Have covers with handles, which can be padlocked, to secure the operating handle in the "OFF" position.
 - G. All disconnects to be heavy duty.
- 2.02** Switches shall be fusible types unless otherwise noted on the drawings.
- 2.03** Switches shall be as manufactured by GE, SIEMENS, Eaton, or Square D.
- 2.04 CIRCUIT BREAKERS**
- A. Circuit breakers shall be molded case type, equipped with a quick-make, quick-break mechanism. Breakers shall be thermal-magnetic type and have automatic release by means of thermal elements in each phase.
 - B. Breakers shall be rated for the application and be ambient temperature compensated.
 - C. Breakers shall have silver alloy contacts, be equipped with heat-absorbing arc-chutes, and have straight in wiring UL listed lugs of the same rating as the breaker frame.
 - D. Breaker ampacity shall be marked on the breaker case and be visible from the front when the breaker is installed.
 - E. When tripped, the breaker handle or toggle shall be in a position between "ON" and "OFF" and shall not be capable of re-closing until the handle or toggle is moved to the "OFF" position first.
 - F. Breakers with two or three poles shall have handles, which are factory made to trip all poles together. Field-made "tie" handles will not be permitted.
 - G. Breakers shall match and be manufactured by the same company that manufactures the

panelboard in which they are installed.

- H. Breakers shall have an interrupting capacity not less than the available fault current at the breaker. Unless otherwise specified or scheduled on the drawings, all breakers are to be series rated by the manufacturer for the available fault current indicated at the main on the drawings.
- I. All circuit breakers shall be bolt in type. Plug in breakers shall not be permitted.
- J. All circuit breakers sized 125 amp or larger to have interchangeable plug ratings.

2.05 GROUND FAULT CIRCUIT INTERRUPTER BREAKERS

- A. Ground fault protective devices shall be constructed so as to have a sensor, which encircles all conductors, including the neutral. This sensor shall react to an unbalance of current in the conductors so as to trip the circuit-interrupting device and open the circuit. The device shall detect leaks of 5 milliamperes and open the circuit within 1-1/2 to 3 cycles of current.

PART 3 - EXECUTION

- 3.01** Disconnect switches are appurtenances to the project. Their locations, while required to meet the NEC, shall not cause any impediment to the project. Therefore, the contractor shall verify the location of all disconnect switches required by the project, prior to their installation. The installed location of any disconnect shall not impede the access to, or the working space around, any piece of equipment. Neither shall the location cause any loss of equipment performance or maintainability due to impeded air flows, blocked access panels or doors, etc. As disconnect switches are generally shown diagrammatically without dimensions, this requirement applies regardless of the location shown on the drawings. If there is any question as to the location of any disconnect, the contractor shall ask the engineer for clarification prior to installation. (While it may appear that a chosen location is appropriate, coordination with other trades must be made by the contractor to insure that other equipment to be installed at a later date will not cause the disconnect location to be problematic.) If any disconnect is found to be installed in a location which causes problems for the equipment as implied above, the disconnect shall be relocated at the sole expense of the contractor.
- 3.02** Switches shall be installed so as to be readily accessible with proper spacing in front per the NEC.
- 3.03** Switches shall be securely mounted on brackets, unistrut type rails, etc. Do not mount directly to masonry, sheetrock, etc., without proper support from structure or proper standoff brackets.
- 3.04** Bolts, terminal screws, etc., for switches shall be tightened to securely hold the devices, conductors, or pads to the points of termination or support. Loose connections shall not be permitted. Multiple hole pads or termination plates shall be installed with ALL bolts required so that there are no bolt holes unused.
- 3.05** All switches shall be identified per the corresponding sections of this specification.

END OF SECTION

SECTION 26 51 10
SPORTS LIGHTING

PART 1 - GENERAL

1.01 SUMMARY

- A. Work covered by this section of the specifications shall conform to the contract documents, engineering plans as well as state and local codes.
- B. The purpose of this specification is to define the performance and design standards for Middle School Baseball and Softball. The manufacturer/contractor shall provide proper lighting design, poles, lighting equipment, controls and installation to meet or exceed the standards set forth by the criteria set forth in these specifications.
- C. Basis of Design is Musco Sports Lighting.
- D. The sports lighting will be for the following:
 - 1. Tennis Courts
 - a. The lighting system shall be designed as to Guaranty appropriate light levels for a period of (25) years – refer to drawing E002 for additional lighting system requirements. The manufacturer shall provide a Performance and Service Agreement that covers all cost for labor, materials and performance for the period designated as outlined in Part 3 this specification.
 - b. Manufacturer shall supply computer generated point-by-point light scans based on using LED fixtures.
 - c. Every manufacturer wishing to bid on this project must submit their information to the engineer for evaluation at least 15 days prior to bid. The manufacturer shall provide as minimum the following:
 - 1) Complete photometric layouts for each field or venue.
 - 2) Electronic photometric files in ies format for independent verification of photometric layouts.
 - 3) Complete fixture cut sheets.
 - 4) Complete Pole design drawings including foundation details or recommended burial depth for direct buried pole systems.
- E. Submittal packages found incomplete will be rejected. Acceptance of manufacturer, their equipment and mounting heights does not negate the Contractor or Lighting manufacturer's responsibility to fully comply with the requirements of these specifications.

1.02 SCOPE OF WORK

- A. The contractor shall provide galvanized steel poles, lighting fixtures, cross-arms and all required wiring and hardware required for a complete system. Fixtures shall be LED and manufactured by Musco Sports Lighting or pre-approved equal as specified herein and mounted on direct burial galvanized steel pole.
- B. All lighting systems shall be designed to operate within -10% and +5% of the system voltage. The system voltage shall be 240V. The manufacturer shall maintain the required lighting foot-candle level within the voltage range; provide additional fixtures, if needed onto each pole to meet this requirement.
- C. The contractor shall provide at the Shop Drawing Review Phase of the project the following:
 - 1. Point-to-Point Layout
 - 2. Provide photometric reports for each fixture used on the project including ies photometric files for independent verification of calculations.
 - 3. Aiming diagrams for each field.

PART 2 - PRODUCTS

2.01 FIXTURES

- A. Remote Drivers - Drivers shall be remotely mounted on each pole in a aluminum enclosure locate at 10' above grade for easy access for maintenance.
- C. Optical Assembly - The reflector shall be constructed of heavy gauge, precision spun anodized aluminum.
- D. Fixture shall be type "TLC-LED Series" as provided by Musco Sports Lighting.
- E. Provide glare control to minimize light trespass.

2.02 GALVANIZED STEEL POLES

- A. This project shall consist of 50-foot high (above grade) floodlight poles complete with tapered base, suitable for direct burial. The pole shall be designed to withstand 95 mph winds plus a 1.3 gust factor per AASHTO specifications.
- B. The pole shaft shall be fabricated of high strength steel with a minimum yield strength of 50,000 PSI and conforming to the requirements of ASTM - 572 for galvanized poles. Material greater than 50,000 PSI may be used, but only 50,000 PSI may be used in the pole calculations.
- C. All material to be single thickness American made steel plate with no laminations. The steel plate shall be shot blasted clean of mill scale and other foreign matter before fabrication.
- D. Each section shall be uniformly tapered and shall be joined to form the pole shaft assembly by telescoping over the next lower sections for a minimum of 1.5 times the outside diameter of the top of the lower section. The pole sections shall be pre-fitted by the manufacturer and match marked for proper assembly. The pole top shall be fitted with a wire support "J" hook welded inside the top of each pole. Each pole to be furnished with a removable pole cap secured with stainless steel set screws.
- E. The pole shaft shall be fitted with a tapered or "H" style base which is an integral part of the pole shaft and not an add-on bolt cover or shroud. This base shall be fabricated of panels formed from the same material and same thickness as the bottom section of the pole shaft. These panels will be attached together by means of longitudinal seam welds. The base shall be attached to the shaft with a 100% penetration circumferential weld. The base section shall taper to the round bottom of the base plate, and totally conceal the anchor bolts. The internal base plate shall be a cold rolled formed ring of steel with a yield strength of 50,000 PSI before forming, and shall be designed to withstand the full bending moment of the pole shaft. The surface around each hole shall be milled flat and smooth to receive the leveling nut without the use of washers.
- F. The base plate shall be attached to the tapered section by means of two circumferential fillet welds. A flush mounted door cover with stainless steel loose joint butt hinges and a padlock hasp for securing it shall be provided. The door opening will be reinforced with steel equal to the voided area of the door.
- G. Anchor bolts shall be manufactured from A576 cold drawn, stress relieved steel with a yield strength of 115,000 PSI. The anchor bolt threads shall be rolled and the threaded ends galvanized. Each bolt shall include two galvanized nuts for leveling and fastening.
- H. The pole assembly sections shall be thoroughly cleaned of weld splatter, dirt and other foreign matter. The pole assemblies manufactured of A588 self- weathering steel shall be left bare. The pole shaft, and base will be made of A572 material and shall be finished either with one coat of red oxide prime paint inside and outside and two coats of field applied finish coat outside, or hot dipped galvanized in accordance with ASTM 123, or shall receive a factory applied powder coat inside and outside of at least 4 mils thickness.
- I. The manufacturer shall furnish drawings and calculations for the approval of the engineer.

They also shall furnish instructions for assembly and erection of the pole assemblies. The contractor is responsible for following these directions. The contractor shall thoroughly clean the poles of dirt, mud, grease and other foreign matter before erecting the poles.

- J. Direct buried galvanized steel poles will be acceptable for this installation.
- K. Manufacturer shall provide remote electrical components in an aluminum enclosure approximately 10' above grade on each pole for ease of maintenance.

2.03 CROSS-ARMS

- A. The manufacturer shall provide galvanized cross-arm assemblies. The Crossarms shall be made of HSS 5/16" x 4" x 4" tubular steel and mounted on a C4x7.2 channel.
- B. Wiring access covers shall be provided for access to all wiring. All wiring to be internal to cross-arm.
- C. Manufacturer shall provide remote electrical components in an aluminum enclosure approximately 10' above grade on each pole for ease of maintenance.

PART 3 - EXECUTION

3.01 WARRANTY

- A. The following Manufacturers Warranties shall be provided:
 - 1. Manufacturer shall warrant the entire Lighting system to be free from defect in materials and workmanship for a period of seven (25) years starting from the date of acceptance by Owner of the lighting system.
 - 2. Manufacturer shall provide a warranty for labor and materials for a period of seven (25) years to replace defective parts or repair defects in workmanship.
 - 3. All warranties and agreements shall be provided to the Owner at the time of bid for the project.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Protecting existing trees to remain.
 - 2. Removing existing trees, shrubs, groundcovers, plants, and grass.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.
 - 6. Disconnecting, capping or sealing, and abandoning site utilities in place or removing site utilities.
 - 7. Temporary erosion and sedimentation control measures.
- B. Related Sections include the following:
 - 1. Division 31 Section "Earthwork" for soil materials, excavating, backfilling, and site grading.

1.03 DEFINITIONS

- A. Topsoil: Natural or cultivated surface-soil layer containing organic matter and sand, silt, and clay particles; friable, pervious, and black or a darker shade of brown, gray, or red than underlying subsoil; reasonably free of subsoil, clay lumps, gravel, and other objects more than 2 inches (50 mm) in diameter; and free of weeds, roots, and other deleterious materials.
- B. Tree Protection Zone: Area surrounding individual trees or groups of trees to be protected during construction, and defined by the drip line of individual trees or the perimeter drip line of groups of trees, unless otherwise indicated.

1.04 MATERIALS OWNERSHIP

- A. Except for materials indicated to be stockpiled or to remain Owner's property, cleared materials shall become Contractor's property and shall be removed from the site.

1.05 SUBMITTALS

- A. Photographs or videotape, sufficiently detailed, of existing conditions of trees and plantings, adjoining construction, and site improvements that might be misconstrued as damage caused by site clearing.
- B. Record drawings according to Division 1 Section "Contract Closeout."
 - 1. Identify and accurately locate capped utilities and other subsurface structural, electrical, and mechanical conditions.

1.06 QUALITY ASSURANCE

- A. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings."

1.07 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.

2. Provide alternate routes around closed or obstructed traffic ways if required by authorities having jurisdiction.
- B. Protection of Existing Improvements: Provide protection necessary to prevent damage to existing improvements indicated to remain in place.
 1. Protect improvements on adjoining properties and on Owner's property.
 2. Restore damaged improvements to their original condition, as acceptable to property owners.
- C. Improvements on Adjoining Property: Authority for performing indicated removal and alteration work on property adjoining Owner's property will be obtained by Owner before award of Contract.
- D. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- E. Notify utility locator service for area where Project is located before site clearing.
- F. Do not commence site clearing operations until temporary erosion and sedimentation control measures are in place.

1.08 EXISTING SERVICES

- A. General: Indicated locations are approximate; determine exact locations before commencing Work.
- B. Arrange and pay for disconnecting, removing capping and plugging utility services. Notify affected utility companies in advance, minimum forty-eight hours, and obtain written approval before starting work.
- C. Place markers to indicate location of disconnected services. Identify service lines and capping locations on Project Record Documents.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. Satisfactory Soil Materials: Requirements for satisfactory soil materials are specified in Division 31 Section "Earthwork."
 1. Obtain approved borrow soil materials off-site when satisfactory soil materials are not available on-site.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Provide erosion-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- C. Locate and clearly flag trees and vegetation to remain or to be relocated.
- D. Provide temporary security fencing between work areas and areas open to the public. Fencing shall be at least 6' tall and stable against normal weather patterns. Coordinate fence location with owner's representative.
- E. Protect existing site improvements to remain from damage during construction.
 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.02 TEMPORARY SEDIMENT AND EROSION CONTROL

- A. Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways,

according to requirements of authorities having jurisdiction.

- B. Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- C. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.03 TREE PROTECTION

- A. Erect and maintain a temporary fence around drip line of individual trees or around perimeter drip line of groups of trees to remain. Remove fence when construction is complete.
 - 1. Do not store construction materials, debris, or excavated material within drip line of remaining trees.
 - 2. Do not permit vehicles, equipment, or foot traffic within drip line of remaining trees.
- B. Do not excavate within drip line of trees, unless otherwise indicated.
- C. Where excavation for new construction is required within drip line of trees, hand clear and excavate to minimize damage to root systems. Use narrow-tine spading forks, comb soil to expose roots, and cleanly cut roots as close to excavation as possible.
 - 1. Cover exposed roots with wet burlap to prevent roots from drying out.
 - 2. Temporary support and protect roots from damage until they are permanently relocated and covered with soil
 - 3. Coat cut faces of roots more than 1-1/2 inches in diameter with emulsified asphalt or other approved coating formulated for use on damaged plant tissues.
 - 4. Backfill with soil as soon as possible.
- D. Maintain fenced area free of weeds and trash.
- E. Repair or replace trees and vegetation indicated to remain that are damaged by construction operations, in a manner approved by Architect.
 - 1. Employ a qualified arborist, licensed in jurisdiction where Project is located, to submit details of proposed repairs and to repair damage to trees and shrubs.
 - 2. Replace trees that cannot be repaired and restored to full-growth status, as determined by the qualified arborist.

3.04 UTILITIES

- A. Contractor shall arrange for disconnecting and sealing utilities that serve existing structures before site clearing and demolishing begins.
 - 1. Coordinate schedule with Owner.
 - 2. Verify that utilities have been disconnected and capped before proceeding with site clearing.
- B. Locate, identify, disconnect, and seal or cap off utilities indicated to be removed.
 - 1. Arrange to shut off indicated utilities with utility companies. Pay any required fees.
- C. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Architect not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Architect's written permission.
- D. Excavate for and remove underground utilities indicated to be removed.

3.05 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, grass, and other vegetation to permit installation of new construction. Removal includes digging out stumps and obstructions and grubbing roots.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be

- relocated.
 - 2. Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction.
 - 3. Completely remove stumps, roots, obstructions, and debris extending to a depth of 18 inches (450 mm) below exposed subgrade.
 - 4. Use only hand methods for grubbing within drip line of remaining trees.
 - 5. Chip removed tree branches and dispose of off-site.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material, unless further excavation or earthwork is indicated.
- 1. Place fill material in horizontal layers not exceeding 8-inch (200-mm) loose depth, and compact each layer to a density equal to adjacent original ground.

3.06 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to whatever depths are encountered in a manner to prevent intermingling with underlying subsoil or other waste materials.
- 1. Strip surface soil of unsuitable topsoil, including trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil materials away from edge of excavations without intermixing with subsoil. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust.
- 1. Limit height of topsoil stockpiles to 72 inches (1800 mm).
 - 2. Do not stockpile topsoil within drip line of remaining trees.
 - 3. Dispose of excess topsoil as specified for waste material disposal.
 - 4. Stockpile surplus topsoil and allow for respreading deeper topsoil.

3.07 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and as necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
- 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut length of existing pavement to remain before removing existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain to prevent corrosion.

3.08 DISPOSAL

- A. Disposal: Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials, including trash and debris, and legally dispose of them off Owner's property.
- B. Burning on Owner's Property: Burning may be permitted only at designated areas and times as directed by the Owner and by local and state issuing authorities. A burn permit as well as any other associated permit(s) must be obtained by the contractor by the local issuing authority. The contractor shall comply with all local codes. Provide full time monitoring personal for burning materials until fires are extinguished.

END OF SECTION

SECTION 31 20 00

EARTHWORK

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SUMMARY

- A. This Section includes the following:
 - 1. Preparing subgrades for slabs-on-grade, walks, pavements, lawns, and plantings.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage course for slabs-on-grade.
 - 4. Subbase course for concrete walks and pavements.
 - 5. Base course for asphalt paving.
 - 6. Subsurface drainage backfill for walls and trenches.
 - 7. Excavating and backfilling trenches within building lines.
 - 8. Excavating and backfilling trenches for buried mechanical and electrical utilities and pits for buried utility structures.
- B. Related Sections include the following:
 - 1. Division 3 Section "Cast-in-Place Concrete" for granular course over vapor retarder.

1.03 DEFINITIONS

- A. Backfill: Soil materials used to fill an excavation.
 - 1. Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - 2. Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Layer placed between the subbase course and asphalt paving.
- C. Bedding Course: Layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Layer supporting slab-on-grade used to minimize capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations.
 - 1. Additional Excavation: Excavation below subgrade elevations as directed by Architect. Additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
 - 2. Bulk Excavation: Excavations more than 10 feet in width and pits more than 30 feet in either length or width.
 - 3. Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- I. Subbase Course: Layer placed between the subgrade and base course for asphalt paving, or layer placed between the subgrade and a concrete pavement or walk.
- J. Subgrade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below subbase, drainage fill, or topsoil materials.

- K. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.
- L. Rock Excavation
 - 1. Sound, solid rock in its original position in ledges, bedded deposits, or masses of such hardness and texture that, in the opinion of the Engineer, cannot be loosened or broken down and removed by use of heavy construction equipment such as power shovels, bulldozers, heavy-duty rooters, etc., without drilling and blasting, or with an air-hammer shall be classified as rock excavation.
 - 2. Boulders, stones, or pieces of masonry that are one-half cubic yard or larger in volume shall be considered rock excavation.
 - 3. Hard pan, small boulders less than one-half cubic yard in volume, chert, clay, soft shale, soft and disintegrated rock, and similar material shall not be considered as rock even though the Contractor elects to excavate same by drilling and blasting, or with an air hammer.

1.04 SUBMITTALS

- A. Product Data: For the following:
 - 1. Each type of plastic warning tape.
 - 2. Separation fabric.
- B. Photographs of existing adjacent structures and site improvements
- C. Material Test Reports: From a qualified testing agency indicating and interpreting test results for compliance of the following with requirements indicated:
 - 1. Classification according to ASTM D 2487 of each on-site or borrow soil material proposed for fill and backfill.
 - 2. Laboratory compaction curve according to ASTM D 698 for each on-site or borrow soil material proposed for fill and backfill.

1.05 QUALITY ASSURANCE

- A. Codes and Standards: Perform earthwork complying with requirements of authorities having jurisdiction.
- B. Geotechnical Testing Agency Qualifications: The Geotechnical testing agency will be hired by the Owner. The Contractor shall coordinate testing requirements with the testing agency and provide access to the site.

1.06 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted in writing by Architect and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Contact utility-locator service for area where Project is located before excavating.
- B. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shut off services if lines are active.
- C. The contractor shall coordinate with Geotechnical Testing Agency for requirements regarding undercutting and importation of approved fill. The contractor shall include undercutting, offsite waste, importation and compaction of approved fill in the base bid as outlined in the geotechnical report.
- D. Contractor shall comply with the Architect's Specifications and Drawings, but they shall notify the Architect prior to performing any Work in question if they perceive conflicts between the Architect's Specifications and the recommendations of the Geotechnical Testing Agency. The Architect will resolve the questions.

PART 2 - PRODUCTS

2.01 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Imported fill soils should consist of low to moderately plastic clay or silt with a plastic index of less than thirty ($PI < 30$) and a standard Proctor maximum dry density greater than 90 pounds per cubic feet. The imported fill should contain no rock fragments larger than 4 inches in any dimension, and should be free from organic matter and other deleterious matter. The on-site soils may be used as engineered fill as approved acceptable by the Owner's Geotechnical testing agency. Existing fill soils will require evaluation by the Owner's Geotechnical testing agency to determine if they can be used as structural fill.
- C. Unsatisfactory Soils: The Geotechnical testing agency observation will determine unsatisfactory soils.
- D. Backfill and Fill: Satisfactory soil materials.
- E. Subbase: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2- inch sieve and not more than 12 percent passing a No. 200 sieve.
- F. Base: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- G. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- H. Bedding: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1- inch sieve and not more than 8 percent passing a No. 200 sieve.
- I. Drainage Fill: Washed, narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2- inch sieve and 0 to 5 percent passing a No. 8 sieve.
- J. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and 0 to 5 percent passing a No. 4 sieve.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.02 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, minimum 6 inches wide and 4 mils thick, continuously inscribed with a description of utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - 1. Red: Electric.
 - 2. Yellow: Gas, oil, steam, and dangerous materials.
 - 3. Orange: Communication, Alarm or Signal Lines, Cables or Conduit.
 - 4. Blue: Potable Water systems.
 - 5. Green: Sewer and Drain systems.
 - 6. Purple: Reclaimed Water, Irrigation and Slurry Lines, Fire Protection or other Non-potable Water lines.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations.
- B. Protect subgrades and foundation soils against freezing temperatures or frost. Provide protective insulating materials as necessary.
- C. Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
- D. Strip all topsoil, vegetation, and any debris from the construction area and either waste it from the site or use as topsoil or fill in areas to be landscaped. The stripped area should extend at least 10 feet beyond exterior foundation excavations and at least 5 feet beyond the outside edge of paved areas.

3.02 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
 - 2. Install a dewatering system to keep subgrades dry and convey ground water away from excavations. Maintain until dewatering is no longer required.

3.03 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.04 STABILITY OF EXCAVATIONS

- A. Comply with all Federal, State and local codes, ordinances and requirements of authorities having jurisdiction to maintain stable excavations.

3.05 EXCAVATION, GENERAL

- A. Excavation shall be where indicated on the drawings and to the grades indicated.
- B. Excavation shall be classified as either "common excavation" or "rock excavation." "Rock excavation" shall be such material which cannot be removed by means other than by blasting or with air hammer. Materials, which can be removed by ripping, shall not be considered "rock excavation." "Common excavation" shall include all types of materials that do not fall into the category of "rock excavation" as defined above. Classification of excavation shall be determined by the Owner. It shall be the Contractor's responsibility to notify the Owner when rock excavation is encountered. The Contractor shall include in his proposal, a unit price for "rock excavation." No payment will be made for removal of rock below the indicated sub-grade elevation.
- C. Determination of Pay Quantities
 - 4. The volumes of rock excavation or undercut for which payment will be allowed shall be expressed in cubic yards as computed from cut measurements.
 - 5. For pipeline excavation, the allowable volume of rock excavation shall be based on the maximum allowable width of trench as shown on the plans and specified herein, and on the centerline depth of rock from the top of rock to the specified bottom of the trench plus whatever depth is required by the plans and Specifications for bedding if rock extends to such depth, or to the bottom of the rock if above these depths. No allowance shall be made for excavating to extra widths for construction of pipeline appurtenances, or for any other reason, and costs of such additional rock excavation shall be included in the unit price bid for this item.
 - 6. Rock excavation shall be computed by the average-end-area method. All measurements shall be taken to the nearest 1/10 foot.
- D. Payment
 - 1. Payment for rock excavation performed under these Specifications shall be made for the quantities determined in the manner specified above at the applicable contract unit price per cubic yard as listed in the Bid Schedule.
 - 2. These amounts, so paid, shall cover the cost of furnishing all labor, materials, tools, plant, and other expense in connection with or incidental to rock excavation.

3.06 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
 - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
 - 2. Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended for bearing surface.
- B. Rock encountered in the process of excavation for structures shall be uncovered and stripped of all loose materials over the entire limits of excavation. Rock encountered for removal in a trench section shall be uncovered for a distance of not less than fifty feet (50'). In both cases, the Engineer shall be notified immediately so that the surface can be examined and the necessary measurements and elevations taken.
- B. Rock under structures shall be excavated to lines and grades shown on the Drawings. Except as hereinafter provided otherwise where rock excavation has been carried below grade, the Contractor shall backfill to grade with Class B concrete at his/her own expense.

Where rock foundation is obtained at grade for over 50 percent of the area of any one structure, the portion of the foundation that is not rock shall be excavated below grade to reach a satisfactory foundation of rock. The portion below grade shall be backfilled with Class B concrete.

Where rock foundation is obtained at grade for less than 50 percent of any one structure and satisfactory rock cannot be found over the remaining area by reasonable additional excavation, the rock shall be removed for a depth of 12 inches below grade, and the space below grade shall be backfilled with crushed stone as specified above for pipe lines.

- C. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer shall be completed before construction of any structure is started in the vicinity.

3.07 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated cross sections, elevations, and grades.

3.08 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
 - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide a working clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit, unless otherwise indicated.
 - 1. Clearance: 12 inches on each side of pipe or conduit.
- C. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe elevation to allow for bedding course. Hand excavate for bell of pipe.
 - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Rock in trenches shall be excavated over the horizontal limits of excavation and to depths as follows:

Size of Pipe Line, Inches	Depth of Excavation Below Bottom of Pipe, Inches	
	Sewer Pipe	Water Pipe
4 to 12 incl.	6	6
15 to 33 incl.	8	8
36 and over	12	12

The space below grade for pipe sewers shall then be backfilled with 3/8 inch crushed rock or gravel or other approved material and tamped to the proper grade. Where pipe sewers are constructed on concrete cradles rock shall be excavated to the bottom of the cradle as shown on the Plans.

- E. Rock excavation for all structures and adjacent trenches under this Contract and any other rock excavation directed by the Engineer shall be completed before construction of any structure is started in the vicinity.

3.09 APPROVAL OF SUBGRADE

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect or Soils Engineer determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed by architect or soil engineer. Take necessary measures to document volume of unsuitable material excavated, per paragraph 3.05. Payment will be made per the unit prices listed in the bid schedule.
- C. Proof roll subgrade with heavy pneumatic-tired equipment to identify soft pockets and areas of excess yielding. Do not proof roll wet or saturated subgrades.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect.

- E. Avoid overcompaction and smearing of subgrade below infiltrations areas such as pervious pavement and bio-retention. Rake or rip subgrade as necessary to remove any smearing of subgrade.

3.10 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill may be used when approved by Architect.
 - 1. Fill unauthorized excavations under other construction or utility pipe as directed by Architect.
- B. Where width of trench exceeds industry standard width, provide stronger pipe or special installation procedures, as required by the Architect at no cost to the Owner.

3.11 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow materials and satisfactory excavated soil materials. Stockpile soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
 - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.12 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - 1. Construction below finish grade including, where applicable, damproofing, waterproofing, and perimeter insulation.
 - 2. Surveying locations of underground utilities for record documents.
 - 3. Inspecting and testing underground utilities.
 - 7. Removing concrete formwork.
 - 8. Removing trash and debris.
 - 9. Removing temporary shoring and bracing and sheeting.
 - 10. Installing permanent or temporary horizontal bracing on horizontally supported walls

3.13 UTILITY TRENCH BACKFILL

- A. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- B. In areas where trench is under paved areas, backfill remainder of trench with Bedding or Engineered fills to subgrade.
- C. Backfill trenches excavated under footings and within 18 inches of bottom of footings; fill with concrete to elevation of bottom of footings.
- D. Provide 4-inch-thick, concrete-base slab support for piping or conduit less than 30 inches below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches of concrete before backfilling or placing roadway subbase.
- E. Place and compact initial backfill of satisfactory soil or subbase material, free of particles larger than 1 inch, to 12 inches over pipe or conduit.
- F. Where sewers, water lines, etc. are to be installed within vehicular areas, they shall be backfilled full depth with stone. If sewer is located in fill and backfill is six feet or over from the top of pipe to finished subgrade, backfill in accordance with paragraph above.
 - 1. Carefully compact material under pipe haunch and backfill evenly on both sides and along pipe or conduit to avoid damage or displacement of system.
- G. Fill voids with approved backfill materials as shoring and bracing and sheeting is removed.

- H. Place and compact final backfill of satisfactory soil material to final subgrade.
- I. Coordinate backfilling with utilities testing.
- J. Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.14 FILL

- A. Preparation: Remove vegetation, topsoil, debris, unsatisfactory soil materials, obstructions, and deleterious materials from ground surface before placing fills. Areas receiving fill shall be proof rolled in the presence of a Geotechnical Engineer prior to fill placement. Areas identified as unacceptable by the Geotechnical Engineer shall be excavated (undercut) and backfilled prior to fill placement.
 - 1. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. When subgrade or existing ground to receive fill has density less than required for fill, break up surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.
- C. Place and compact fill material in layers to required elevations as follows:
 - 1. Under grass and planted areas, use satisfactory soil material.
 - 2. Under walks and pavements, use subbase or base material, or satisfactory soil material.
 - 3. Under steps and ramps, use engineered fill.
 - 4. Under building slabs, use drainage fill over subgrade and engineered fill to bring to subgrade.
 - 5. Under footings and foundations, use engineered fill.
- D. Compact rock in accordance with the Geotechnical Engineer's recommendations

3.15 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 3 percent of optimum moisture content.
 - 1. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost or ice.
 - 2. Remove and replace, or scarify and air-dry, otherwise satisfactory soil material that exceeds optimum moisture content by 3 percent and is too wet to compact to specified dry unit weight.

3.16 COMPACTION OF BACKFILLS AND FILLS

- A. Place backfill and fill materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- C. Compact soil to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - 1. Under structures, building slabs and steps, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill material at 100 percent standard Proctor compaction.
 - 2. Under pavements, scarify and recompact top 24 inches of existing subgrade and each layer of backfill or fill material at 100 percent standard Proctor compaction.
 - 3. Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 95 percent standard Proctor compaction.
 - 4. Under lawn or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill material at 85 percent standard Proctor

compaction.

3.17 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
 - 1. Provide a smooth transition between adjacent existing grades and new grades.
 - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 1 inch.
 - 2. Walks: Plus or minus 1/2 inch.
 - 3. Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.18 SUBSURFACE DRAINAGE

- A. Subsurface Drain: Place a layer of drainage fabric around perimeter of drainage trench as indicated. Place a 6-inch course of filter material on drainage fabric to support drainage pipe. Encase drainage pipe in a minimum of 12 inches of filter material and wrap in drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of filter material to 95 percent of maximum dry unit weight according to ASTM D 698.
- B. Drainage Backfill: Place and compact filter material over subsurface drain, in width indicated, to within 12 inches of final subgrade. Overlay drainage backfill with one layer of drainage fabric, overlapping sides and ends at least 6 inches.
 - 1. Compact each course of filter material to 95 percent of maximum dry density according to ASTM D 698.

3.19 SUBBASE AND BASE COURSES

- A. Under pavements and walks, place subbase course on prepared subgrade and as follows:
 - 1. Place base course material over subbase.
 - 2. Compact subbase and base courses at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98 percent of maximum dry density according to ASTM D 698.
 - 3. Shape subbase and base to required crown elevations and cross-slope grades.
 - 4. When thickness of compacted subbase or base course is 6 inches or less, place materials in a single layer.
 - 5. When thickness of compacted subbase or base course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.20 DRAINAGE COURSE

- A. Under slabs-on-grade, place drainage course on prepared subgrade and as follows:
 - 1. Compact drainage course to required cross sections and thickness to not less than 98 percent of maximum dry unit weight according to ASTM D 698.
 - 2. When compacted thickness of drainage course is 6 inches or less, place materials in a single layer.
 - 3. When compacted thickness of drainage course exceeds 6 inches, place materials in equal layers, with no layer more than 6 inches thick or less than 3 inches thick when compacted.

3.21 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a Geotechnical engineering firm to perform field quality assurance testing.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- C. Footing Subgrade: At footing subgrades, at least one test of each soil stratum will be performed to verify design-bearing capacities. Subsequent verification and approval of other footing subgrades may be based on a visual comparison of subgrade with tested subgrade when approved by Engineer.
- D. Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - 1. Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
 - 2. Footing Subgrade: At footing subgrades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing subgrades may be based on visual comparison of each subgrade with related test strata when acceptable to the Geotechnical Engineer.
 - 3. Foundation Wall Backfill: At each compacted backfill layer, at least one test for each 100 feet or less of wall length, but no fewer than two tests.
 - 4. Trench Backfill: At each compacted initial and final backfill layer, at least one test for each 150 feet or less of trench length, but no fewer than two tests.
- E. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil to depth required; recompact and retest until specified compaction is obtained.

3.22 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.23 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off Owner's property.

END OF SECTION

SECTION 32 18 23
TENNIS PICKLEBALL COURT SURFACING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Asphalt tennis court surface color coating system.

1.2 RELATED REQUIREMENTS

- A. Section 32 11 00 – Subgrade and Base Course Preparation
- B. Section 32 12 16 – Hot Mix Asphalt Paving

1.3 REFERENCE STANDARDS

- A. American Sports Builders Association (ASBA).
- B. United States Tennis Association (USTA) Rules of Tennis.
- C. ASBA/USA Pickleball Construction Manual

1.4 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including surface and crack preparation and application instructions.
- C. Samples: Submit manufacturer's color samples of color coating.
- D. Test Reports:
 - 1. Submit independent test results for solar reflectance index.
 - 2. Submit independent test results for 2000 Hour ASTM G154, accelerated weathering UV test, to demonstrate long-term durability and fade resistance.
 - 3. Submit independent test results for 2000 Hour, accelerated weathering ASTM G155 Xenon Arc test, to demonstrate long-term fade resistance and quality of pigment.
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Manufacturer's Project References: Submit manufacturer's list of successfully completed asphalt tennis court surface color coating system projects, including project name, location, and date of application.
- G. Applicator's Project References: Submit applicator's list of successfully completed asphalt tennis court surface color coating system projects, including project name, location, type and quantity of color coating system applied, and date of application.
- H. Warranty Documentation: Submit manufacturer's standard warranty.
- I. Authorized Installer Certificate: Submit manufacturer's authorized installer certificate.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Manufacturer regularly engaged, for past 5 years, in manufacture of asphalt tennis court surface color coating systems of similar type to that specified.
 - 2. United States owned company.
 - 3. Member: ASBA.
 - 4. Manufacturer has surfaces that are classified by the ITF's (International Tennis Federation) pace classification program.
- B. Applicator's Qualifications:
 - 1. Applicator regularly engaged, for past 3 years, in application of tennis court surface color coating systems of similar type to that specified.
 - 2. Employ persons trained for application of tennis court surface color coating systems.
 - 3. Applicator must be authorized installer of the surfacing brand used.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until application.
 - 3. Store materials in clean, dry area indoors.
 - 4. Store materials out of direct sunlight.
 - 5. Keep materials from freezing.
 - 6. Protect materials during storage, handling, and application to prevent contamination or damage.
 - 7. Close containers when not in use.
 - 8. Retain manufacturer batch codes on each container and application dates, for warranty purposes.

1.7 AMBIENT CONDITIONS

- A. Do not apply asphalt tennis court surface color coating system when air or surface temperatures are below 50°F (10°C) during application or within 24 hours after application.
- B. Do not apply asphalt tennis court surface color coating system when rain is expected during application or within 24 hours after application.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Asphalt Tennis Court Surface Color Coating System: SportMaster Color Coating System.
- B. Crack Sealant: SportMaster "Crack Magic".
 - 1. 100 percent acrylic emulsion elastomeric crack sealant.
 - 2. Seals cracks up to 1/2 inch wide in asphalt pavement.
 - 3. Weight per Gallon at 77 Degrees F: 8.8 lbs., plus or minus 0.5 lbs.
 - 4. Non-Volatile Material: 61 percent, plus or minus 5 percent.
 - 5. Color: Match Finished Surface Color
- C. Crack Filler: SportMaster "Acrylic Crack Patch".
 - 1. 100 percent acrylic emulsion trowel-grade crack filler.
 - 2. Fills cracks in asphalt pavement up to 1 inch wide.
 - 3. Chemical Characteristics, by Weight, Minimum:

- a. Acrylic Emulsion: 10.0 percent.
 - b. Hiding Pigment: 0.2 percent.
 - c. Mineral Inert Fillers: 78.0 percent.
 - d. Film Formers, Additives: 1.8 percent.
 - e. Water: 8.5 percent.
- 4. Weight per Gallon at 77 Degrees F: 15.2 lbs., plus or minus 1.0 lbs.
 - 5. Non-Volatile Material: 80 percent, plus or minus 5 percent.
 - 6. Color: Match Finished Surface Color
- D. Patch Binder: SportMaster “Acrylic Patch Binder”.
- 1. 100 percent acrylic emulsion liquid binder.
 - 2. Mix on-site with sand and cement.
 - 3. Levels and repairs low spots and depressions up to 3/4 inch deep in asphalt pavement.
 - 4. Fills Cracks in Asphalt up to 1” in width.
 - 5. Weight per Gallon at 77 Degrees F: 8.8 lbs., plus or minus 0.5 lbs.
- E. Color Coating: SportMaster “ColorPlus System”.
- 1. 100 percent acrylic emulsion coating.
 - 2. Mix on-site with silica sand and water.
 - 3. Color coats tennis and multipurpose courts.
 - 4. Weight per Gallon at 77 Degrees F: 9.2 lbs., plus or minus 0.5 lbs.
 - 5. Color: Maroon out of bounds and Green in bounds (submit samples for owner review)
- F. Line Markings Primer: SportMaster “Stripe-Rite”.
- 1. 100 percent acrylic emulsion primer, clear drying.
 - 2. Primes line markings and prevents bleed-under for sharp lines.
 - 3. Chemical Characteristics, by Weight, Nominal:
 - a. Acrylic Emulsion: 38.0 percent.
 - b. Hiding Pigment: 0.0 percent.
 - c. Mineral Inert Fillers: 7.0 percent.
 - d. Film Formers, Additives: 1.5 percent.
 - e. Water: 50.0 percent.
 - 4. Weight per Gallon at 77 Degrees F: 8.9 lbs., plus or minus 0.5 lbs.
 - 5. Non-Volatile Material: 29 percent, plus or minus 5 percent.
- H. Line Paint: SportMaster “Textured Line Paint”.
- 1. Pigmented, 100 percent acrylic emulsion line paint.
 - 2. Line marking on asphalt tennis courts.
 - 3. Chemical Characteristics, by Weight, Nominal:
 - a. Acrylic Emulsion: 25.89 percent.
 - b. Pigment: 14.90 percent.
 - c. Mineral Inert Fillers: 13.12 percent.
 - d. Additives: 4.73 percent.
 - e. Water: 41.36 percent.
 - 4. Weight per Gallon at 77 Degrees F: 10.65 lbs., plus or minus 0.75 lbs.
 - 5. Non-Volatile Material: 45.17 percent, plus or minus 5 percent.
 - 6. Color: White.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine asphalt tennis court surfaces to receive color coating system.
- C. Verify asphalt tennis & pickleball courts meet ASBA construction requirements.

- C. Notify Architect of conditions that would adversely affect application or subsequent use.
- D. Do not begin surface preparation or application until unacceptable conditions are corrected.

3.2 SURFACE PREPARATION

- A. Protection of In-Place Conditions: Protect adjacent surfaces and landscaping from contact with asphalt tennis court surface color coating system.
- B. Prepare surfaces in accordance with manufacturer's instructions.
- C. Cure new asphalt surfaces a minimum of 14 to 30 days before application of asphalt tennis court surface color coating system.
- D. Remove dirt, dust, debris, oil, grease, vegetation, loose materials, and other surface contaminants which could adversely affect application of asphalt tennis court surface color coating system. Pressure wash entire surface.
- E. Repair cracks, depressions, and surface defects in accordance with manufacturer's instructions before application of filler course and color coating.
- F. Level depressions 1/8 inch and deeper with patch binder in accordance with manufacturer's instructions.
- G. Apply 1 or 2 coats of filler course as required by surface roughness and porosity to provide smooth underlayment for application of color coating.
- H. Ensure surface repairs are flush and smooth to adjoining surfaces.

3.3 APPLICATION

- A. Apply asphalt tennis court surface color coating system in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Mix materials in accordance with manufacturer's instructions.
- C. Apply Filler Course and Color Coating with a 50-60 durometer, soft rubber squeegee.
- D. Filler Course:
 - 1. Apply 2 coats on new asphalt or existing acrylic surfaces with extensive cracks or low spot repair.
 - 2. Apply 1 coat on existing acrylic surfaces with minimal repairs.
- E. Color Coating: Apply a minimum of 2 coats of color coating to prepared surfaces in accordance with manufacturer's instructions.
- F. Allow material drying times in accordance with manufacturer's instructions before applying other materials or opening completed surface to foot traffic.

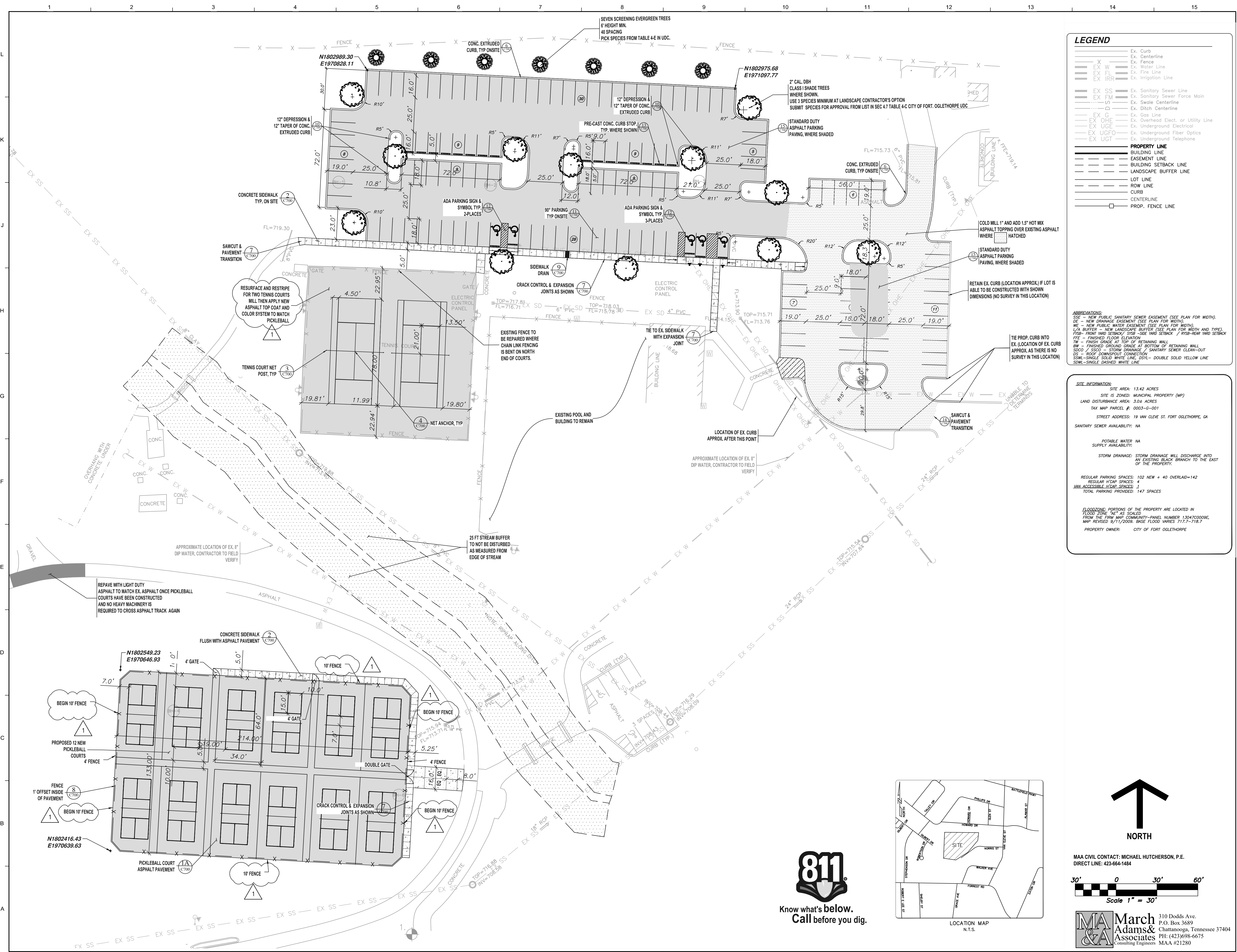
3.4 LINE MARKINGS

- A. Lay out tennis court and pickle ball line markings in accordance with USTA Rules of Tennis and applicable rules of pickle ball.
- B. Apply line markings primer, after masking tape has been laid, to seal voids between masking tape and tennis court surface to prevent bleed-under when line paint is applied.
- C. Apply a minimum of 1 coat of line paint in accordance with manufacturer's instructions.

3.5 PROTECTION

- A. Allow a minimum of 24 hours curing time before opening courts for play.
- B. Protect applied asphalt court surface color coating system to ensure that, except for normal weathering, coating system will be without damage or deterioration at time of Substantial Completion.

END OF SECTION



LEGEND

- EX Curb
- EX Centerline
- EX Fence
- EX W Water Line
- EX FL Fire Line
- EX IR Irrigation Line
- EX SS Sanitary Sewer Line
- EX FM Sanitary Sewer Force Main
- EX SW Swale Centerline
- EX D Ditch Centerline
- EX G Gas Line
- EX OHE Overhead Elect. or Utility Line
- EX UGE Underground Electrical
- EX UGFO Underground Fiber Optics
- EX UGT Underground Telephone

PROPERTY LINE

- BUILDING LINE
- EASEMENT LINE
- BUILDING SETBACK LINE
- LANDSCAPE BUFFER LINE
- LOT LINE
- ROW LINE
- CURB
- CENTERLINE
- PROP. FENCE LINE

ABBREVIATIONS:

- SSE - NEW PUBLIC SANITARY SEWER EASEMENT (SEE PLAN FOR WIDTH)
- DE - NEW DRAINAGE EASEMENT (SEE PLAN FOR WIDTH)
- WE - NEW PUBLIC WATER EASEMENT (SEE PLAN FOR WIDTH)
- L/A BUFFER - NEW LANDSCAPE BUFFER (SEE PLAN FOR WIDTH AND TYPE)
- FYSS - FRONT YARD SETBACK / SYSS - SIDE YARD SETBACK / RYSS - REAR YARD SETBACK
- ITE - FINISHED FLOOR ELEVATION
- TW - FINISH GRADE AT TOP OF RETAINING WALL
- BW - FINISHED GROUND GRADE AT BOTTOM OF RETAINING WALL
- SDDO / SSCO - STORM DRAINAGE / SANITARY SEWER CLEAN-OUT
- SS - ROOF DOWNPOUT CONNECTION
- SSWL - SINGLE SOLID WHITE LINE, DSYL - DOUBLE SOLID YELLOW LINE, SSWL - SINGLE DASHED WHITE LINE

SITE INFORMATION:

- SITE AREA: 13.42 ACRES
- SITE IS ZONED: MUNICIPAL PROPERTY (MP)
- LAND DISTURBANCE AREA: 3.06 ACRES
- TAX MAP PARCEL #: 0003-0-001
- STREET ADDRESS: 19 VAN CLEVE ST. FORT OGLETHORPE, GA
- SANITARY SEWER AVAILABILITY: NA
- POTABLE WATER NA
- SUPPLY AVAILABILITY:
- STORM DRAINAGE: STORM DRAINAGE WILL DISCHARGE INTO AN EXISTING BLACK BRANCH TO THE EAST OF THE PROPERTY.
- REGULAR PARKING SPACES: 102 NEW + 40 OVERLAP=142
- REGULAR H/OAP SPACES: 4
- VAN ACCESSIBLE H/OAP SPACES: 1
- TOTAL PARKING PROVIDED: 147 SPACES

FLOODZONE: PORTIONS OF THE PROPERTY ARE LOCATED IN FLOOD ZONE "AE" AS SHOWN FROM THE FIRM MAP COMMUNITY-PANEL NUMBER 130420009E, MAP REVISION 9/11/2008. BASE FLOOD VALUES 717.7-718.7

PROPERTY OWNER: CITY OF FORT OGLETHORPE

DH&W

ARCHITECTURE INTERIORS PLANNING
1001 Carter Street - Chattanooga - 37402-423 | 266 | 4816 www.dhw-architects.com

New Tennis Courts

Gilbert-Stephenson Park
19 Van Cleve Street
Fort Oglethorpe, GA

Date: 05/09/2023
Drawn: JP
File: 2212

Revisions
:ADDENDUM 1 6-21-23

Key Plan

GSWCC QR CODE

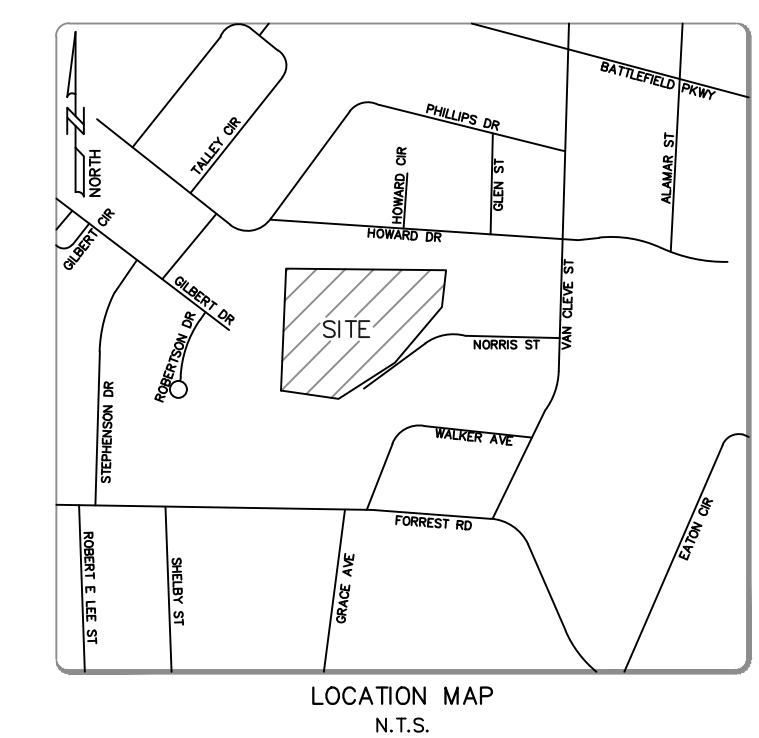
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GEORGIA REGISTERED PROFESSIONAL ARCHITECT
JOSEPH L. PANK
Level II Design Professional
Certification #53390

Title: **SITE STAKING**

Scale: _____

Sheet No. **C100**

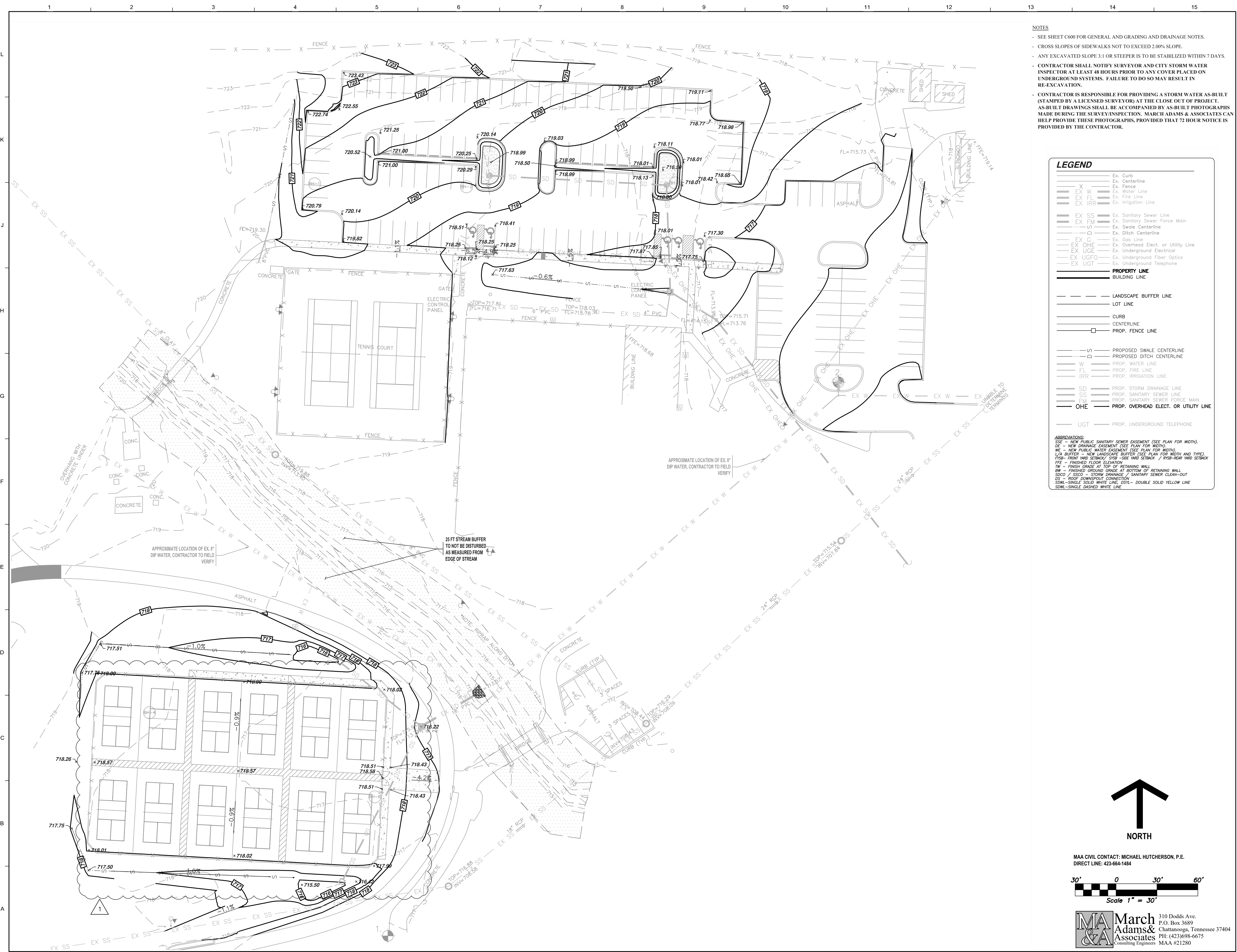


MARCH ADAMS & ASSOCIATES

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MAA CIVIL CONTACT: MICHAEL HUTCHERSON, P.E.
DIRECT LINE: 423-664-1484

Scale 1" = 30'



NOTES

- SEE SHEET C600 FOR GENERAL AND GRADING AND DRAINAGE NOTES.
- CROSS SLOPES OF SIDEWALKS NOT TO EXCEED 2.00% SLOPE.
- ANY EXCAVATED SLOPE 3:1 OR STEEPER IS TO BE STABILIZED WITHIN 7 DAYS.
- CONTRACTOR SHALL NOTIFY SURVEYOR AND CITY STORM WATER INSPECTOR AT LEAST 48 HOURS PRIOR TO ANY COVER PLACED ON UNDERGROUND SYSTEMS. FAILURE TO DO SO MAY RESULT IN RE-EXCAVATION.
- CONTRACTOR IS RESPONSIBLE FOR PROVIDING A STORM WATER AS-BUILT (STAMPED BY A LICENSED SURVEYOR) AT THE CLOSE OUT OF PROJECT. AS-BUILT DRAWINGS SHALL BE ACCOMPANIED BY AS-BUILT PHOTOGRAPHS MADE DURING THE SURVEY/INSPECTION. MARCH ADAMS & ASSOCIATES CAN HELP PROVIDE THESE PHOTOGRAPHS, PROVIDED THAT 72 HOUR NOTICE IS PROVIDED BY THE CONTRACTOR.

LEGEND

---	Ex. Curb
---	Ex. Centerline
---	Ex. Fence
---	Ex. Water Line
---	Ex. Fire Line
---	Ex. Irrigation Line
---	Ex. Sanitary Sewer Line
---	Ex. Sanitary Sewer Force Main
---	Ex. Swale Centerline
---	Ex. Ditch Centerline
---	Ex. Gas Line
---	Ex. Overhead Elect. or Utility Line
---	Ex. Underground Electrical
---	Ex. Underground Fiber Optics
---	Ex. Underground Telephone
---	PROPERTY LINE
---	BUILDING LINE
---	LANDSCAPE BUFFER LINE
---	LOT LINE
---	CURB
---	CENTERLINE
---	PROP. FENCE LINE
---	PROPOSED SWALE CENTERLINE
---	PROPOSED DITCH CENTERLINE
---	PROP. WATER LINE
---	PROP. FIRE LINE
---	PROP. IRRIGATION LINE
---	PROP. STORM DRAINAGE LINE
---	PROP. SANITARY SEWER LINE
---	PROP. SANITARY SEWER FORCE MAIN
---	PROP. OVERHEAD ELECT. OR UTILITY LINE
---	PROP. UNDERGROUND TELEPHONE

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Key Plan

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GEORGIA REGISTERED PROFESSIONAL ENGINEER
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 Certification #35350

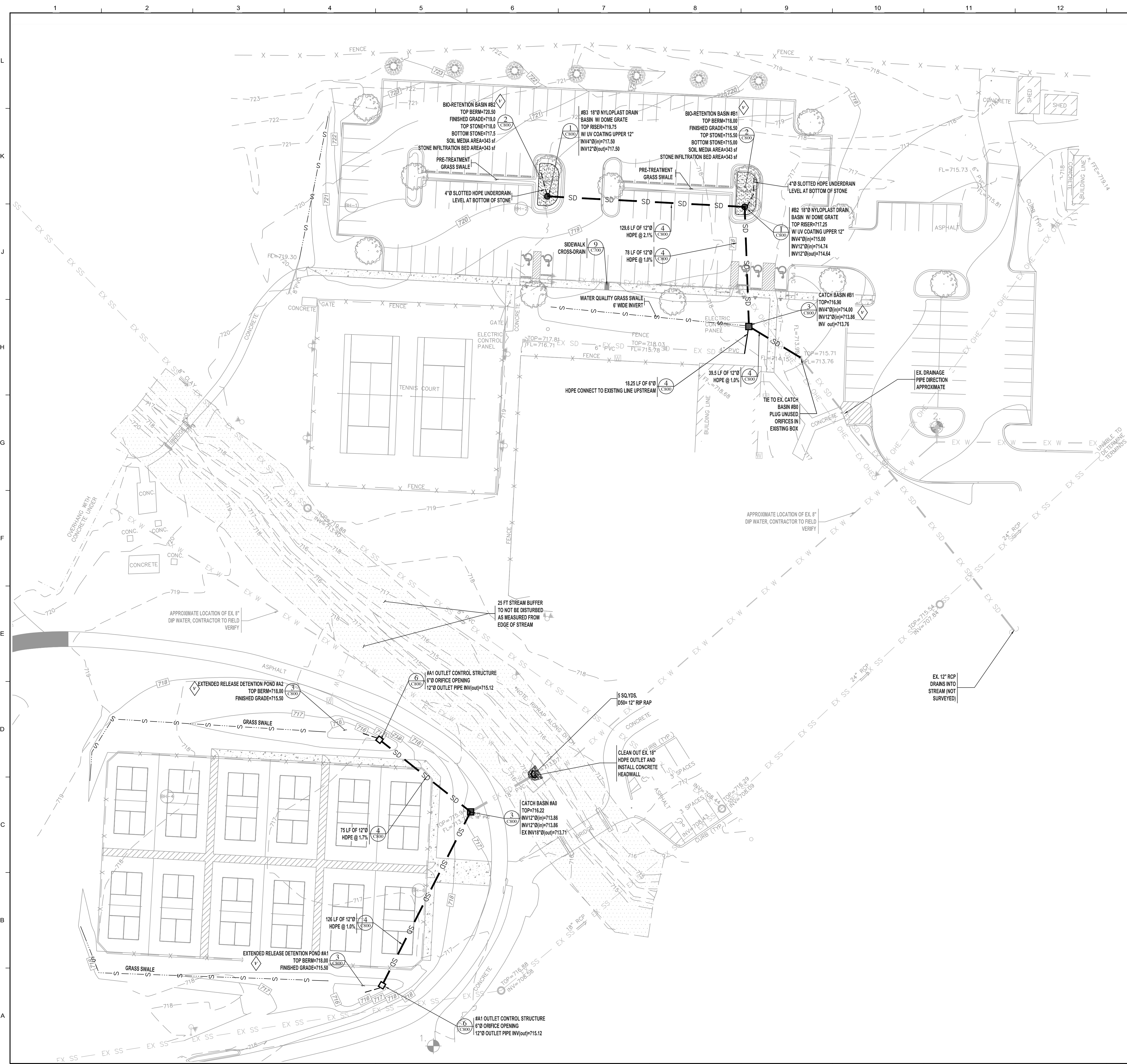
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SITE GRADING

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C301

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Ex. Sanitary Sewer Line	Ex. Sanitary Sewer Force Main	Ex. Swale Centerline	Ex. Ditch Centerline	Ex. Gas Line	Ex. Overhead Elect. or Utility Line
Ex. Underground Electrical	Ex. Underground Fiber Optics	Ex. Underground Telephone			

PROPERTY LINE

BUILDING LINE	EASEMENT LINE	BUILDING SETBACK LINE	LANDSCAPE BUFFER LINE	LOT LINE	ROW LINE	CURB	CENTERLINE	PROP. FENCE LINE
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PROPOSED

PROPOSED SWALE CENTERLINE	PROPOSED DITCH CENTERLINE	PROP. WATER LINE	PROP. FIRE LINE	PROP. IRRIGATION LINE	PROP. GAS LINE	PROP. STORM DRAINAGE LINE	PROP. SANITARY SEWER LINE	PROP. SANITARY SEWER FORCE MAIN	PROP. OVERHEAD ELECT. OR UTILITY LINE	PROP. UNDERGROUND ELECTRICAL	PROP. UNDERGROUND FIBER OPTICS	PROP. UNDERGROUND TELEPHONE
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- FFE - FINISHED FLOOR ELEVATION
- TW - FINISH GRADE AT TOP OF RETAINING WALL
- BW - FINISHED GROUND GRADE AT BOTTOM OF RETAINING WALL
- SDDO / SSCDO - STORM DRAINAGE / SANITARY SEWER CLEAN-OUT
- DS - ROOF DOWNSPOUT CONNECTION
- SSWL - SINGLE SOLID WHITE LINE, DSYL - DOUBLE SOLID YELLOW LINE
- SDWL - SINGLE DASHED WHITE LINE



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New Tennis Courts

Gilbert-Stephenson Park
19 Van Cleave Street
Fort Oglethorpe, GA

Date: 05/09/2023
Drawn: JP
File: 2212

Revisions
:ADDENDUM 16-21-23

Key Plan



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Title: SITE DRAINAGE

Scale:
Sheet No.

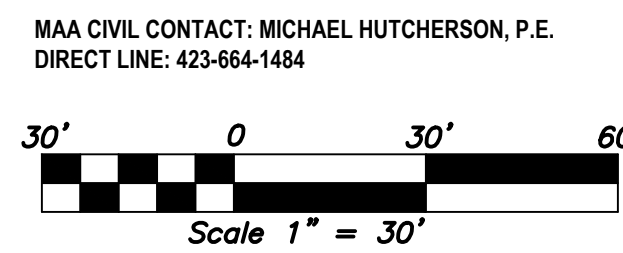
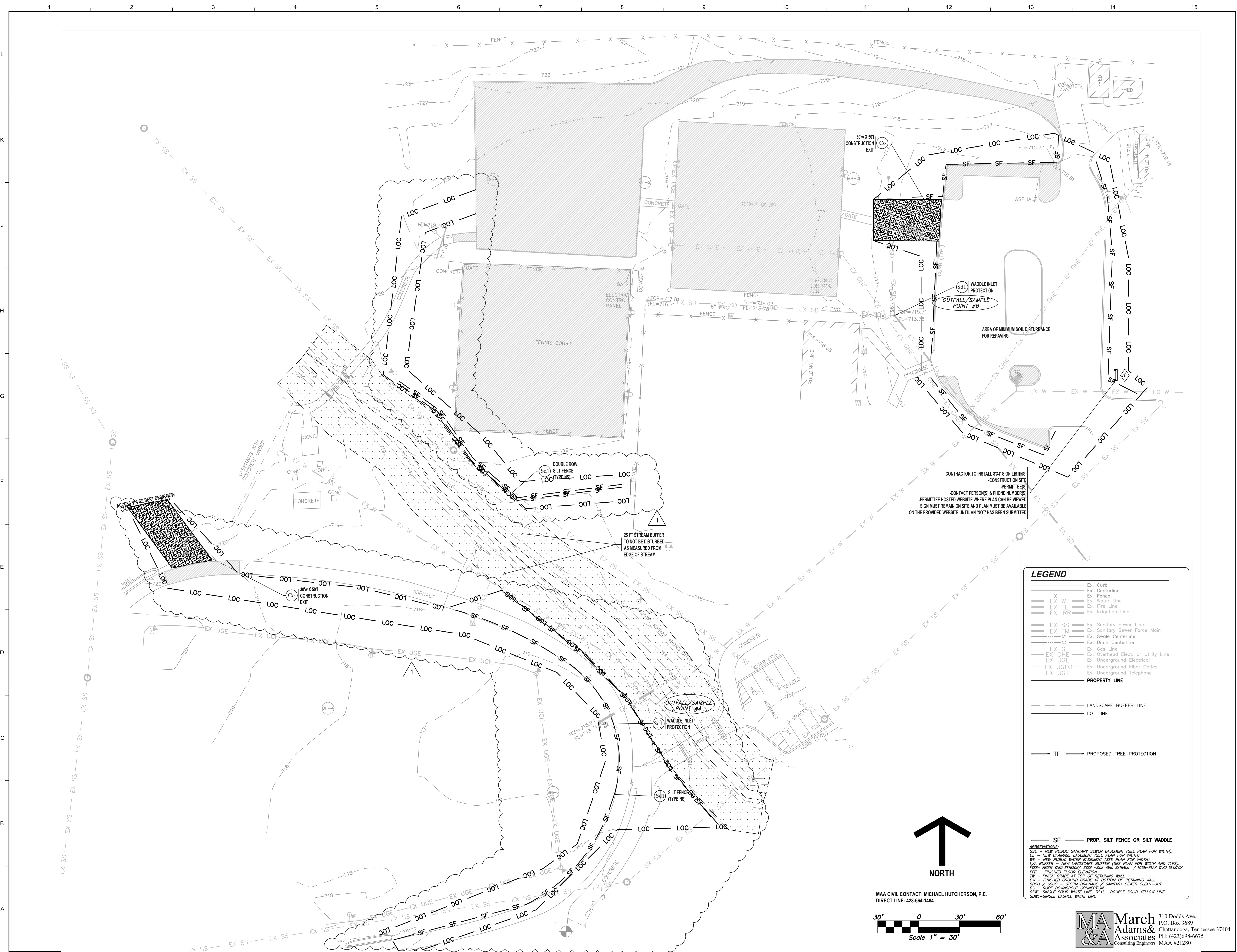
C302

↑
NORTH

MAA CIVIL CONTACT: MICHAEL HUTCHERSON, P.E.
DIRECT LINE: 423-664-1484

Scale 1" = 30'

March Adams & Associates
310 Dodds Ave.
P.O. Box 3689
Chattanooga, Tennessee 37404
PH: (423) 698-6675
Consulting Engineers MAA #21280



LEGEND

—	Ex. Curb
—	Ex. Centerline
—	Ex. Fence
—	Ex. Water Line
—	Ex. Fire Line
—	Ex. Irrigation Line
—	Ex. Sanitary Sewer Line
—	Ex. Sanitary Sewer Force Main
—	Ex. Sewer Centerline
—	Ex. Ditch Centerline
—	Ex. Gas Line
—	Ex. Overhead Elect. or Utility Line
—	Ex. Underground Electrical
—	Ex. Underground Fiber Optics
—	Ex. Underground Telephone
—	PROPERTY LINE
—	LANDSCAPE BUFFER LINE
—	LOT LINE
—	PROPOSED TREE PROTECTION

ABBREVIATIONS:

- SSE - NEW PUBLIC SANITARY SEWER EASEMENT (SEE PLAN FOR WIDTH)
- DE - NEW DRAINAGE EASEMENT (SEE PLAN FOR WIDTH)
- WE - NEW PUBLIC WATER EASEMENT (SEE PLAN FOR WIDTH)
- L/A BUFFER - NEW LANDSCAPE BUFFER (SEE PLAN FOR WIDTH AND TYPE)
- FSB - FRONT YARD SETBACK / STS - SIDE YARD SETBACK / RYSB - REAR YARD SETBACK
- FFE - FINISHED FLOOR ELEVATION
- TW - FINISH GRADE AT TOP OF RETAINING WALL
- SGCD / SGOD - FINISHED GROUND GRADE AT BOTTOM OF RETAINING WALL
- SS - STORM DRAINAGE / SANITARY SEWER CLEAN-OUT
- DS - ROCK DOWNSPOUT CONNECTION
- SSW - SINGLE SOLID WHITE LINE, DSYL - DOUBLE SOLID YELLOW LINE
- SDW - SINGLE DASHED WHITE LINE

New Tennis Courts

Gilbert-Stephenson Park
19 Van Cleave Street
Fort Oglethorpe, GA

Date: 05/09/2023
Drawn: JP
File: 2212

Revisions
: ADDENDUM 1 6-21-23

Key Plan



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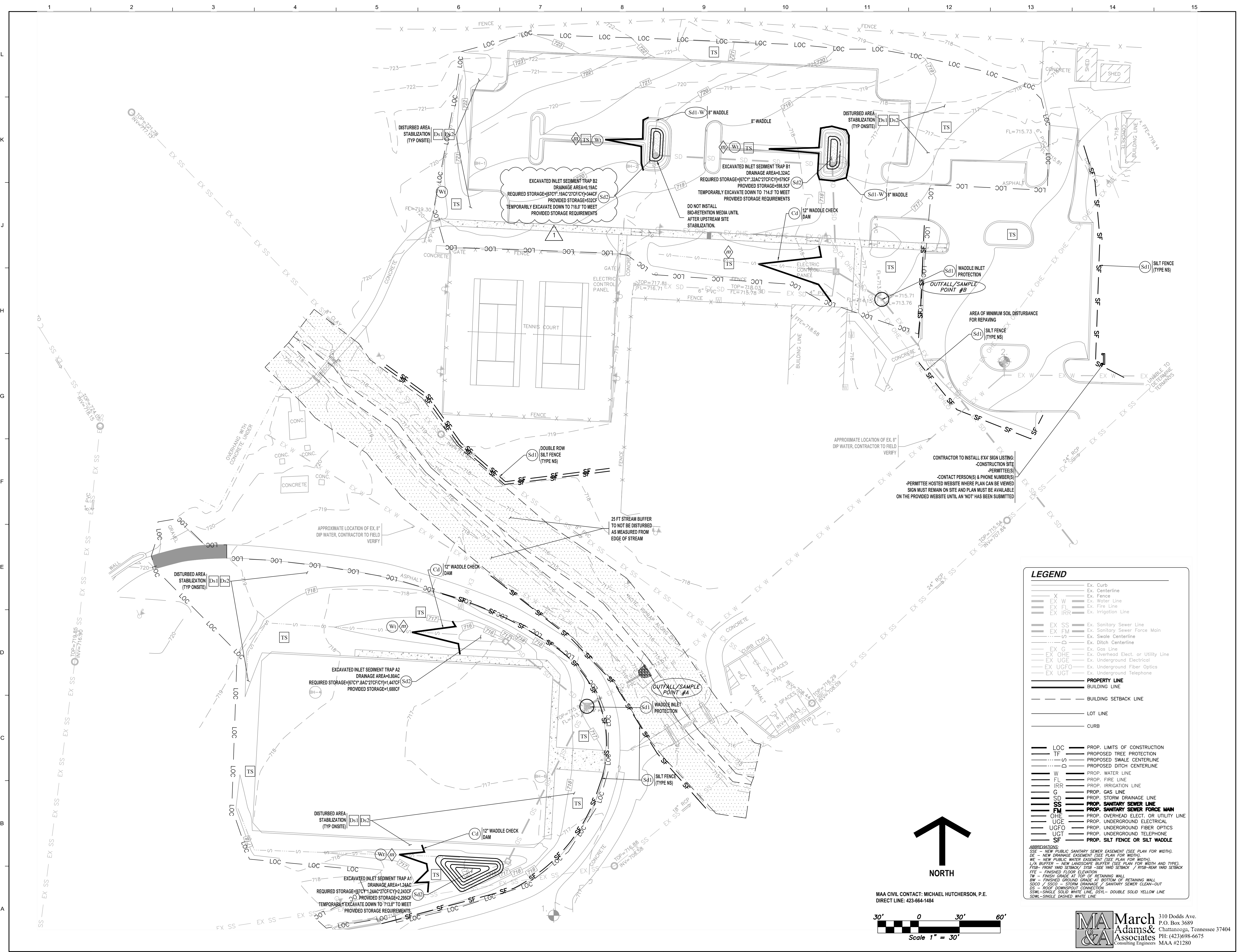


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Certification #35350

Title:
EROSION & SEDIMENT CONTROL PHASE I

Scale:
Sheet No.

C501



LEGEND

---	Ex. Curb	---	Prop. Limits of Construction
---	Ex. Centerline	---	Prop. Tree Protection
---	Ex. Fence	---	Prop. Swale Centerline
---	Ex. Water Line	---	Prop. Ditch Centerline
---	Ex. Fire Line	---	Prop. Water Line
---	Ex. Irrigation Line	---	Prop. Fire Line
---	Ex. Sanitary Sewer Line	---	Prop. Irrigation Line
---	Ex. Sanitary Sewer Force Main	---	Prop. Gas Line
---	Ex. Swale Centerline	---	Prop. Storm Drainage Line
---	Ex. Ditch Centerline	---	Prop. Sanitary Sewer Line
---	Ex. Gas Line	---	Prop. Sanitary Sewer Force Main
---	Ex. Overhead Elect. or Utility Line	---	Prop. Overhead Elect. or Utility Line
---	Ex. Undergroud Electrical	---	Prop. Undergroud Electrical
---	Ex. Undergroud Fiber Optics	---	Prop. Undergroud Fibre Optics
---	Ex. Undergroud Telephone	---	Prop. Undergroud Telephone
---	Property Line	---	Prop. Silt Fence or Silt Waddle
---	Building Line	---	
---	Building Setback Line	---	
---	Lot Line	---	
---	Curb	---	

ABBREVIATIONS:
 SSE - NEW PUBLIC SANITARY SEWER EASEMENT (SEE PLAN FOR WIDTH)
 DE - NEW PUBLIC WATER EASEMENT (SEE PLAN FOR WIDTH)
 WE - NEW PUBLIC WATER EASEMENT (SEE PLAN FOR WIDTH)
 L/A BUFFER - NEW LANDSCAPE BUFFER (SEE PLAN FOR WIDTH AND TYPE)
 FTSB - FRONT YARD SETBACK / STS - SIDE YARD SETBACK / RYSB - REAR YARD SETBACK
 FFE - FINISHED FLOOR ELEVATION
 TW - FINISH GRADE AT TOP OF RETAINING WALL
 BW - FINISHED GROUND GRADE AT BOTTOM OF RETAINING WALL
 SODD - STORM DRAINAGE / SANITARY SEWER CLEAN-OUT
 OS - ROCK DOWNSPOUT CONNECTION
 SSW - SINGLE SOLID WHITE LINE, DSYL - DOUBLE SOLID YELLOW LINE
 SSW - SINGLE DASHED WHITE LINE

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Scale 1" = 30'

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Revisions
 : ADDENDUM 1 6-21-23

Key Plan



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Title:
EROSION & SEDIMENT CONTROL PHASE II

Scale:

Sheet No.
C502

ADDENDUM NO. 2

**City of Fort Oglethorpe Tennis Courts
Invitation to Bid (ITB) #005-23
Derthick Henley & Wilkerson Architects**

Date: 5 July 2023

File: 2212

The following amendments to the specifications and/or revisions to the drawings shall be a part of the contract documents. Bidders, therefore, shall consider them when preparing cost estimates, and the contractors shall be bound by them.

FRONT END

1. See attached revised Bid Bond Form showing 5% of the bid amount.

SPECIFICATIONS

The following sections are added to the specification:

1. 32 18 23 Tennis Pickleball Court Surfacing
2. 32 31 13 PVC COATED CHAIN LINK FENCES, POSTS, AND GATES

DRAWINGS

Sheet C100 – see narrative description of changes.

Sheet C700 – see narrative description of changes.

NARRATIVE

See attached narrative for Addendum #2

REFERENCE

REPORT OF GEOTECHNICAL EXPLORATION
City of Fort Oglethorpe – Tennis Courts
Gilbert-Stephenson Park
Fort Oglethorpe, Georgia
GEOServices Project No. 41-22615

BID BOND FORM

KNOW ALL MEN BY THESE PRESENTS THAT WE (Contractor) _____

as Principal, hereinafter called the Principal, and (Surety) _____, a corporation duly organized under the laws of the State of _____ as Surety, hereinafter called the Surety, are held, and firmly bound unto

City of Fort Oglethorpe, 500 City Hall Drive Fort Oglethorpe, GA 30742, Mayor Earl Gray

as Obligee, hereinafter called Obligee, in the sum of five (5%) percent of the amount bid.

for the payment of which sum well and truly to be made, the said Principal and the said Surety, bind ourselves, our heirs, executors, administrators, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Principal has submitted a bid for

City of Fort Oglethorpe Tennis Courts, 19 Van Cleve Street, Fort Oglethorpe, Ga 30742

NOW, THEREFORE, if the Obligee shall accept the bid of the Principal and the Principal shall enter into a Contract with the Obligee in accordance with the terms of such bid, and give such bond or bonds as may be specified in the bidding or Contract Documents with good and sufficient surety for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof, or in the event of the failure of the Principal to enter such Contract and give such bond or bonds, if the Principal shall pay to the Obligee the difference not to exceed the penalty hereof between the amount specified in said bid and such larger amount for which the Obligee may in good faith contract with another party to perform the Work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect.

Signed and sealed this _____ day of _____, 202__.

(Principal)

By: _____
(Title)

(Witness)

(Surety)

By: _____
(Title)

(Witness)



MARCH ADAMS & ASSOCIATES, INC.

P.O. Box 3689 · Chattanooga, TN 37404
Ph: (423) 698-6675
Fax: (423) 698-3638
marchadams@marchadams.com

PROJECT: Tennis Courts– Fort Oglethorpe, GA

PROJECT NO. 21280

Narrative For Addendum #2

PREPARED BY: J Parks

DATE: 7-05-2023

See the following bidder questions and clarifications listed below.

1.) *I see there is a fence around the perimeter of the pickleball courts. Can you confirm that it is 10' high?*

Response: See site plan C100 from addendum 1, with fence heights of 4' and 10'. See addendum 2 revision to add an interior 4' fence.

2.) *Are there interior fences dividing the pickleball courts? There definitely should be but the plan does not show fences. If there are, where are they and how high?*

Response: See site plan C100 from addendum 2, with the addition of an interior 4' fence.

3.) *Also they show a double gate on the perimeter of the pickleball courts. The walkway is only 5' wide?*

Response: The concrete walkway next to the double gate is wider (16').

4.) *Can you confirm the thickness of the asphalt and the stone on the new pickleball courts? It says 10' of reclaimed asphalt?*

Response: See revised pickleball court section, with 6" of base stone, 2" of asphalt topping, then surface coating, per specification 32 18 23.

5.) *For the double tennis court that is to be resurfaced: Is this just repairing the cracks and repainting?*

Response: See revised C100 with spec to mill and top with 1" asphalt topping and new playing surface coating.

6.) *What are the specs to repair and paint courts?*

Response: See response above, paint per specification 32 18 23.

7.) *The plans show a cross section of stone and asphalt for the tennis courts. Do the tennis courts get new net posts and nets?*

Response: Provide new tennis court nets and posts.

8.) *Tennis Courts: In order to complete the required full depth reclamation and paving work scope at the tennis courts, we will have to remove the existing fence. Should we assume installing new fence per the fence specified at the pickleball courts?*

Response: See response to question 5. We will not use FDR. Contractor shall protect the existing tennis court fence fabric and posts. Fabric can be removed and reinstalled if required for equipment access.

9.) *Pickleball Courts: Cross section 1A/C700 calls for full depth reclamation of existing asphalt for the pickleball courts. With these requiring new construction, what stone base and paving profile will be required?*

Response: See response to question 4.

10.) *Pickleball Courts: Fence design calls for 10' fences with 1-3/4" mesh. Typical pickleball fences are 8' with standard 2" mesh as a pickleball will not lodge in the mesh due to its size. This would provide cost savings for the owner.*

Response: Keep the fence height at 10' and 4'. See revised specification 32 31 13 (2.04) (A) (2) for 2" mesh.

11.) *What are the liquidated damages for the project?*

Response: Damages shall be assessed at \$200 per working day.

12.) *Is the grading Sub contractor required to have an Underground Utilities license?*

Response: The contractor installing the lights will need electrical license.

13.) *Does this project require permits? If so, who is responsible for permitting and the associated fees?*

Response: Yes, the owner has applied for land disturbing permit and NOC from GA EPD. Contractor will be required to sign as primary permittee and provided Level 1A erosion control certified personal as required by the state.

14.) *Who is responsible for inspections and materials testing and the associated fees? If the General Contractor is responsible for the testing, please provide all the testing requirements for this project.*

Response: The owner will engage a geotechnical testing company to provide testing for earthwork and asphalt.

15.) *How would the owner want to address soft soil conditions and rocks, if encountered?*

Response: See specification 31 20 00. The project has classified excavation, with unit prices. Contractor shall provide unit prices to establish allowances for each based on the quantities listed in the updated bid unit form in addendum 1

16.) *When is the anticipated start date?*

Response: Middle of August

17.) *Will weather days count against the project?*

Response: Contractor shall track days lost for weather, rain fall amounts, and scheduled work that was delayed.

18.) *What's the budget for this project?*

Response: The project is budgeted at \$800,000

19.) *Does this project have a Force Majeure clause?*

Response: Requests for additional contract time shall be submitted to the owner for review, with original project schedule, extreme event, and schedule impacts included in the report. Force Majeure will be considered when determining if liquidated damages should be enforced.

20.) *What are the working hours? Any restrictions that we should be aware of?*

Response: Note the following city ordinance. *Construction work. The erection (including excavating), demolition, alteration or repair of any building in any residential district or section, the excavation of streets and highways in any residential district or section, other than between the hours of 7:00 a.m. and 6:00 p.m. on weekdays except in cases of urgent necessity, and then only with a permit from the city, which permit may be granted for a period not to exceed 60 days while the emergency continues.*

21.) *Any events or special dates at the park that we should stop our work for?*

Response: Access to the pool shall be maintained while it is open. Pool hours and events are listed at <https://fortogov.com/gilbert-stephenson-park/>

22.) *Can we work on the weekends?*

Response: See response to question 20 above.

23.) *What are the requirements to safe-up the project site? Do you require the placement of chain-link fences, signages, and barricades?*

Response: See revised specification 31 10 00 addendum 1.

24.) *Are there any vehicular traffic and/or pedestrian control requirements? Are there any signages required?*

Response: Contractor shall work with city to determined traffic control needs on an as needed basis. City can provide temporary signage if required.

25.) *What are the requirements for staging areas/ contractor's laydown area? Are there any designated parking areas for construction personnel? Any designated areas for dumpsters and equipment?*

Response: Contractor shall provide their recommended site logistics sketch for the owner to review.

26.) *Is there any existing irrigation system within the construction areas? If there is, how would you want us to address it?*

Response: The team is not aware of any existing operating irrigation system.

27.) *Do we have to use the services of a private underground utility locator for this project?*

Response: See specification 31 10 00 paragraphs 1.07, 1.08, & 3.04

28.) *Is there any activity on the site throughout the contract time involving the County's staff and machinery?*

Response: No.

29.) *Are there any restroom facilities on-site for the construction crew?*

Response: GC shall provide their own facilities, see sheet C505 for requirements to provided portable sanitary units.

30.) *Does this project have a subsurface investigation? If so, is the geotechnical report available?*

Response: Yes. See the attached GEOServices report for reference

31.) *Can Milling materials that were removed from the existing asphalt parking lots be used as backfill materials? We have done this with a similar project in Rockdale County and was approved by the materials testing agency, which represents the County.*

Response: Proposed backfill material shall be tested by the owner's geotechnical engineer. If the milling meet spec, then they can be used.

32.) *Are there interior fences dividing the pickleball courts? If so, what are the specs?*

Response: See revised site plan C100. (4' height, 2" mesh)

33.) *Is the walkway between the pickleball courts 5' wide?*

Response: Yes. See site plan C100.

34.) *Can you please confirm the existing fence scope at the tennis courts that get repaired? The note on drawing C100 indicates "existing fence to be repaired where chain link fencing is bent on north end of courts". See attached photos of the existing conditions. All the fencing around the entire courts is bent. Please confirm we are just re-fencing the north side only.*

Response: Yes. Bid should included repaired fabric on north end of court. If bends can't be satisfactorily repaired, as determined by architect, then new fabric shall be provided. Note mesh for tennis court if replaced shall be 1-3/4"

The following amendments to the specifications and/or revisions to the drawing shall be considered part of the contract, and shall replace documents by the same name.

Section 32 31 13 PVC Coated Chain Link Fences

1. Paragraph 2.04 revised to make proposed fence fabric 2" mesh.

SHEET C100

1. Revised to list separate detail references for tennis and pickleball courts pavement sections
2. A 4' fence has been added between the north and south row of pickleball courts

SHEET C700

1. Revised fence detail to use 2" mesh fabric
2. Revised court paving details.

SECTION 32 18 23
TENNIS PICKLEBALL COURT SURFACING

PART 1 GENERAL

1.1 SECTION INCLUDES

- A. Asphalt tennis court surface color coating system.

1.2 RELATED REQUIREMENTS

- A. Section 32 11 00 – Subgrade and Base Course Preparation
- B. Section 32 12 16 – Hot Mix Asphalt Paving

1.3 REFERENCE STANDARDS

- A. American Sports Builders Association (ASBA).
- B. United States Tennis Association (USTA) Rules of Tennis.
- C. ASBA/USA Pickleball Construction Manual

1.4 SUBMITTALS

- A. Comply with Section 01 33 00 – Submittal Procedures.
- B. Product Data: Submit manufacturer's product data, including surface and crack preparation and application instructions.
- C. Samples: Submit manufacturer's color samples of color coating.
- D. Test Reports:
 - 1. Submit independent test results for solar reflectance index.
 - 2. Submit independent test results for 2000 Hour ASTM G154, accelerated weathering UV test, to demonstrate long-term durability and fade resistance.
 - 3. Submit independent test results for 2000 Hour, accelerated weathering ASTM G155 Xenon Arc test, to demonstrate long-term fade resistance and quality of pigment.
- E. Manufacturer's Certification: Submit manufacturer's certification that materials comply with specified requirements and are suitable for intended application.
- F. Manufacturer's Project References: Submit manufacturer's list of successfully completed asphalt tennis court surface color coating system projects, including project name, location, and date of application.
- G. Applicator's Project References: Submit applicator's list of successfully completed asphalt tennis court surface color coating system projects, including project name, location, type and quantity of color coating system applied, and date of application.
- H. Warranty Documentation: Submit manufacturer's standard warranty.
- I. Authorized Installer Certificate: Submit manufacturer's authorized installer certificate.

1.5 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Manufacturer regularly engaged, for past 5 years, in manufacture of asphalt tennis court surface color coating systems of similar type to that specified.
 - 2. United States owned company.
 - 3. Member: ASBA.
 - 4. Manufacturer has surfaces that are classified by the ITF's (International Tennis Federation) pace classification program.
- B. Applicator's Qualifications:
 - 1. Applicator regularly engaged, for past 3 years, in application of tennis court surface color coating systems of similar type to that specified.
 - 2. Employ persons trained for application of tennis court surface color coating systems.
 - 3. Applicator must be authorized installer of the surfacing brand used.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- B. Storage and Handling Requirements:
 - 1. Store and handle materials in accordance with manufacturer's instructions.
 - 2. Keep materials in manufacturer's original, unopened containers and packaging until application.
 - 3. Store materials in clean, dry area indoors.
 - 4. Store materials out of direct sunlight.
 - 5. Keep materials from freezing.
 - 6. Protect materials during storage, handling, and application to prevent contamination or damage.
 - 7. Close containers when not in use.
 - 8. Retain manufacturer batch codes on each container and application dates, for warranty purposes.

1.7 AMBIENT CONDITIONS

- A. Do not apply asphalt tennis court surface color coating system when air or surface temperatures are below 50°F (10°C) during application or within 24 hours after application.
- B. Do not apply asphalt tennis court surface color coating system when rain is expected during application or within 24 hours after application.

PART 2 PRODUCTS

2.1 MATERIALS

- A. Asphalt Tennis Court Surface Color Coating System: SportMaster Color Coating System.
- B. Crack Sealant: SportMaster "Crack Magic".
 - 1. 100 percent acrylic emulsion elastomeric crack sealant.
 - 2. Seals cracks up to 1/2 inch wide in asphalt pavement.
 - 3. Weight per Gallon at 77 Degrees F: 8.8 lbs., plus or minus 0.5 lbs.
 - 4. Non-Volatile Material: 61 percent, plus or minus 5 percent.
 - 5. Color: Match Finished Surface Color
- C. Crack Filler: SportMaster "Acrylic Crack Patch".
 - 1. 100 percent acrylic emulsion trowel-grade crack filler.
 - 2. Fills cracks in asphalt pavement up to 1 inch wide.
 - 3. Chemical Characteristics, by Weight, Minimum:

- a. Acrylic Emulsion: 10.0 percent.
 - b. Hiding Pigment: 0.2 percent.
 - c. Mineral Inert Fillers: 78.0 percent.
 - d. Film Formers, Additives: 1.8 percent.
 - e. Water: 8.5 percent.
- 4. Weight per Gallon at 77 Degrees F: 15.2 lbs., plus or minus 1.0 lbs.
 - 5. Non-Volatile Material: 80 percent, plus or minus 5 percent.
 - 6. Color: Match Finished Surface Color
- D. Patch Binder: SportMaster “Acrylic Patch Binder”.
- 1. 100 percent acrylic emulsion liquid binder.
 - 2. Mix on-site with sand and cement.
 - 3. Levels and repairs low spots and depressions up to 3/4 inch deep in asphalt pavement.
 - 4. Fills Cracks in Asphalt up to 1” in width.
 - 5. Weight per Gallon at 77 Degrees F: 8.8 lbs., plus or minus 0.5 lbs.
- E. Color Coating: SportMaster “ColorPlus System”.
- 1. 100 percent acrylic emulsion coating.
 - 2. Mix on-site with silica sand and water.
 - 3. Color coats tennis and multipurpose courts.
 - 4. Weight per Gallon at 77 Degrees F: 9.2 lbs., plus or minus 0.5 lbs.
 - 5. Color: Maroon out of bounds and Green in bounds (submit samples for owner review)
- F. Line Markings Primer: SportMaster “Stripe-Rite”.
- 1. 100 percent acrylic emulsion primer, clear drying.
 - 2. Primes line markings and prevents bleed-under for sharp lines.
 - 3. Chemical Characteristics, by Weight, Nominal:
 - a. Acrylic Emulsion: 38.0 percent.
 - b. Hiding Pigment: 0.0 percent.
 - c. Mineral Inert Fillers: 7.0 percent.
 - d. Film Formers, Additives: 1.5 percent.
 - e. Water: 50.0 percent.
 - 4. Weight per Gallon at 77 Degrees F: 8.9 lbs., plus or minus 0.5 lbs.
 - 5. Non-Volatile Material: 29 percent, plus or minus 5 percent.
- H. Line Paint: SportMaster “Textured Line Paint”.
- 1. Pigmented, 100 percent acrylic emulsion line paint.
 - 2. Line marking on asphalt tennis courts.
 - 3. Chemical Characteristics, by Weight, Nominal:
 - a. Acrylic Emulsion: 25.89 percent.
 - b. Pigment: 14.90 percent.
 - c. Mineral Inert Fillers: 13.12 percent.
 - d. Additives: 4.73 percent.
 - e. Water: 41.36 percent.
 - 4. Weight per Gallon at 77 Degrees F: 10.65 lbs., plus or minus 0.75 lbs.
 - 5. Non-Volatile Material: 45.17 percent, plus or minus 5 percent.
 - 6. Color: White.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine asphalt tennis court surfaces to receive color coating system.
- C. Verify asphalt tennis & pickleball courts meet ASBA construction requirements.

- C. Notify Architect of conditions that would adversely affect application or subsequent use.
- D. Do not begin surface preparation or application until unacceptable conditions are corrected.

3.2 SURFACE PREPARATION

- A. Protection of In-Place Conditions: Protect adjacent surfaces and landscaping from contact with asphalt tennis court surface color coating system.
- B. Prepare surfaces in accordance with manufacturer's instructions.
- C. Cure new asphalt surfaces a minimum of 14 to 30 days before application of asphalt tennis court surface color coating system.
- D. Remove dirt, dust, debris, oil, grease, vegetation, loose materials, and other surface contaminants which could adversely affect application of asphalt tennis court surface color coating system. Pressure wash entire surface.
- E. Repair cracks, depressions, and surface defects in accordance with manufacturer's instructions before application of filler course and color coating.
- F. Level depressions 1/8 inch and deeper with patch binder in accordance with manufacturer's instructions.
- G. Apply 1 or 2 coats of filler course as required by surface roughness and porosity to provide smooth underlayment for application of color coating.
- H. Ensure surface repairs are flush and smooth to adjoining surfaces.

3.3 APPLICATION

- A. Apply asphalt tennis court surface color coating system in accordance with manufacturer's instructions at locations indicated on the Drawings.
- B. Mix materials in accordance with manufacturer's instructions.
- C. Apply Filler Course and Color Coating with a 50-60 durometer, soft rubber squeegee.
- D. Filler Course:
 - 1. Apply 2 coats on new asphalt or existing acrylic surfaces with extensive cracks or low spot repair.
 - 2. Apply 1 coat on existing acrylic surfaces with minimal repairs.
- E. Color Coating: Apply a minimum of 2 coats of color coating to prepared surfaces in accordance with manufacturer's instructions.
- F. Allow material drying times in accordance with manufacturer's instructions before applying other materials or opening completed surface to foot traffic.

3.4 LINE MARKINGS

- A. Lay out tennis court and pickle ball line markings in accordance with USTA Rules of Tennis and applicable rules of pickle ball.
- B. Apply line markings primer, after masking tape has been laid, to seal voids between masking tape and tennis court surface to prevent bleed-under when line paint is applied.
- C. Apply a minimum of 1 coat of line paint in accordance with manufacturer's instructions.

3.5 PROTECTION

- A. Allow a minimum of 24 hours curing time before opening courts for play.
- B. Protect applied asphalt court surface color coating system to ensure that, except for normal weathering, coating system will be without damage or deterioration at time of Substantial Completion.

END OF SECTION

SECTION 32 31 13

PVC COATED CHAIN LINK FENCES, POSTS AND GATES

PART 1 - GENERAL

1.01 SCOPE

- A. Summary: The work covered by this section includes furnishing all labor, materials, and equipment required to install Class 2b Fused and Adhered, Poly Vinyl Chloride (PVC) Coated, Steel Chain Link Fence, including all excavation, concrete, and accessories, as shown on the Drawings or specified herein.
- B. General: Like items of materials provided hereafter shall be the end products of one manufacturer in order to achieve standardization for appearance, maintenance and replacement.
- C. Delivery, Storage and Handling: Deliver material to the site in an undamaged condition. Carefully store material off the ground to provide proper protection against oxidation caused by ground moisture.

1.02 SUBMITTALS

- A. Shop Drawings: Include complete details of fence and gate construction, fence height, post spacing, dimensions and unit weights of framework and concrete footing details. Actual samples and certificates of compliance may be requested.
- B. Product Data: Provide manufacturer's catalog cuts with printed specifications. Manufacturer shall provide certification of compliance with material specifications. Actual samples of the material may be requested.

1.03 STANDARDS

- A. ASTM B 6 Slab Zinc
- B. ASTM F567 Installation of Chain Link Fence
- C. ASTM F668 Poly(Vinyl Chloride) (PVC) and Other Organic Polymer-Coated Steel Chain Link Fence Fabric, Class 2b
- D. Federal Specification RR-F-191K/1D Fencing, Wire and Post Metal (Chain-Link Fence Fabric), Type IV
- E. American Association of State Highway Transportation Officials (AASHTO) M-181 Chain Link Fence, Type IV, Class A
- F. ASTM F1043 Strength and Protective Coating on Metal Industrial Chain Link Fence Framework Group I-A and Group I-C Heavy Industrial
- G. ASTM F934 Standard Colors for Polymer-Coated Chain Link Fence Materials
- H. Federal Specification RR-F-191K/3D Fencing, Wire and Post Metal (Chain-Link Fence Posts, Topsails and Braces), Class 1, Grade A or B
- I. American Association of State Highway Transportation Officials (AASHTO) M-181 Chain Link Fence, Grades 1 and 2

PART 2 - PRODUCTS

2.01 FENCE FABRIC

- A. The base metal of the chain link fence fabric shall be composed of commercial quality, medium-carbon galvanized (zinc coated) steel wire. The vinyl coating shall be thermally bonded to a thermoset-bonding layer over a galvanized steel wire. Vinyl coating thickness, coating weight, and wire tensile strength conform to Federal specification RR-F-191K/1D, ASTM F668, Class 2b and (AASHTO) M-181, Type IV, Class A, as shown in Table 1. The

wire is PVC coated before weaving, is free and flexible at all joints, and is knuckled at both selvages.

Table 1-PVC Coated Steel Wire Characteristics

Zinc Coated Core Wire Size			PVC Coated Finished Wire Size	PVC Coated Wire Allowable Variance			Core Wire Zinc Coating Weight, Min		PVC Coating Thickness		Breaking Strength, minimum		Tensile Strength, min	
ga	inch	mm	ga	Inch	mm	oz/ft ²	g/m ²	Inch	mm	lbf	N	ksi	MPa	
9	0.148	3.76	8	+-. 0.005	+-.0.13	0.30	92	0.006 to 0.010	0.15 to 0.25	1,290	5,740	75	515	

- B. Coating: Only plasticized poly(vinyl chloride) (PVC) with a low temperature (-20°C, -4°F) plasticizer and no extenders or extraneous matter other than the necessary stabilizers and pigments, is used. The PVC coating resists attack from prolonged exposure to dilute solutions of most common mineral acids, seawater, and dilute solutions of most salts and alkali. The vinyl coating is thermally bonded to a thermoset-bonding layer over a galvanized steel wire. The wire is PVC coated before weaving and is free and flexible at all joints.
- C. Color: Shall Conform to ASTM F934, Black

2.02 FENCE POSTS AND RAILS

- A. The base metal of the posts and rails shall be commercial steel conforming to ASTM F1043 Group I-A and I-C, Heavy Industrial Fence, and also conform to Federal specification RR-F-191, Class 1, Grades A and B and ASSHTO M181 Grades 1 and 2. The thickness of the PVC coating shall be a minimum 0.010 to 0.015 in.
- B. Coating: Only plasticized poly(vinyl chloride) (PVC) with a low temperature (-20°C, -4°F) plasticizer and no extenders or extraneous matter other than the necessary stabilizers and pigments, is used. The PVC coating resists attack from prolonged exposure to dilute solutions of most common mineral acids, seawater, and dilute solutions of most salts and alkali.

2.03 FITTINGS

- A. Fittings and other accessories shall be zinc-coated (galvanized) pressed steel, cast steel or malleable iron, as specified and are coated with matching PVC by the same process as post and rails. PVC coating thickness shall be a minimum 0.006 mils. Painted fittings are not acceptable.
- B. Color: Shall Conform to ASTM F934, Black

2.04 FENCE MATERIALS

- A. Fabric
 - Fused and Adhered Poly(Vinyl Chloride)-PVC Coated Steel Chain Link Fence Fabric
 - 1. 9 gauge zinc coated core wire with 8 gauge PVC coated finished wire size
 - 2. 2.00-inch mesh
 - 3. Knuckled at both selvages unless otherwise specified.
- B. Posts: Steel pipe, ASTM F1043, capped
 - 1. Line post: 2 1/2 inch O.D.
 - 2. Corner, end, angle, and pull posts: 3 inch O.D., Schedule 40
 - 3. Gate posts, 4 inch O.D. Schedule 40
- C. Top rail: 1 5/8 inch O.D., with expansion couplings spaced at not less than 10 feet intervals.

- D. Mid rail: 1 5/8 inch O.D., with expansion couplings spaced at not less than 10 feet intervals.
- E. Bottom rail: 1 5/8 inch O.D., with expansion couplings spaced at not less than 10 feet intervals.
- F. Fittings: pressed steel, cast steel or heavy malleable iron.

2.05 GATE

- A. Pedestrian Type: 4 foot minimum, single swing
- B. Frames
 - 1. 2 inch O.D. pipe
 - 2. Material: Galvanized steel.
 - 3. Construction: Welded corners or assembled with corner fittings and 3/8-inch steel truss rods.
 - 4. Provide horizontal 2 inch brace rail and 3/8-inch truss rod for gates 5 feet wide or greater.
 - 5. Provide vertical 2 inch brace rail for gates 6 feet wide or wider, spacing not to exceed 5-foot centers.
- C. Hinges
 - 1. Standard type.
 - 2. Size to accommodate gate frame and post.
- D. Latches
 - 1. Industrial gate latch with drop rod or center stop.
 - 2. See plan for latches at playgrounds
- E. Keepers
 - 1. Mechanical keeper for each gate leaf.
 - 2. Secure free end of gate when in full open position.

2.06 CONCRETE

- A. Posts shall be placed in masonry wall as shown on the details. Concrete shall be a min. 3000 psi.

PART 3 - EXECUTION

3.01 PREPARATION

- A. Verify that final grading in fence location is complete without irregularities, which would interfere with fence installation.
- B. Measure and lay out complete fence line.
- C. Locate line posts at equal distance spacing, not exceeding 10-foot centers.
- D. Use corner posts at positions where fence changes direction more than 10 degrees.
- E. Contractor to grout entire length of masonry wall to the top of last block after installation of fence posts, fabric, and net poles.

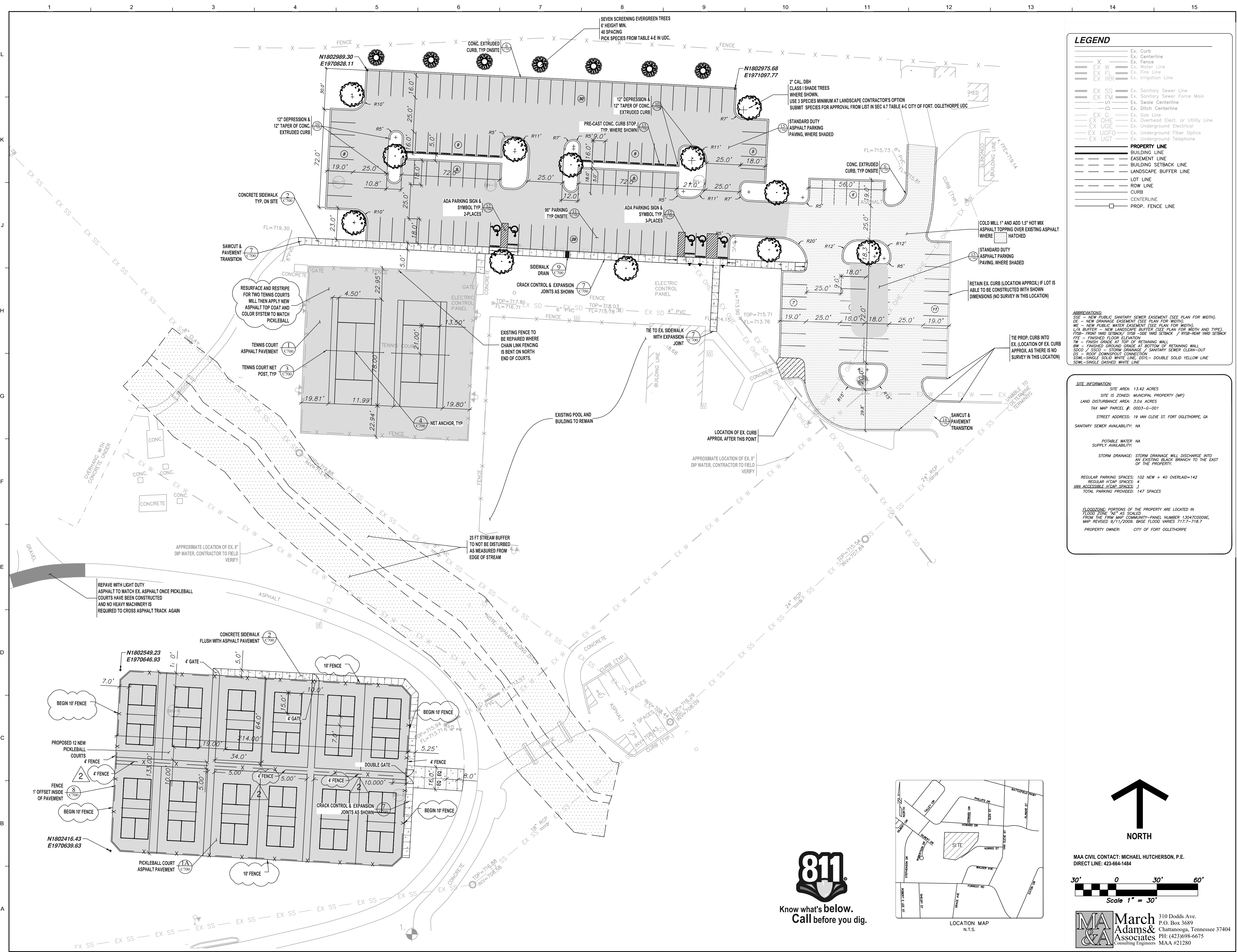
3.02 INSTALLATION

- A. Install Fence, Fence Posts and Gates in accordance with ASTM practice 567.

3.03 ADJUST AND CLEAN

- A. Adjust brace rails for rigid installation.
- B. Tighten hardware, fasteners and accessories.
- C. Level and smooth all disturbed areas.

END OF SECTION



LEGEND

- EX Curb
- EX Centerline
- EX Fence
- EX W Water Line
- EX FL Fire Line
- EX IR Irrigation Line
- EX SS Sanitary Sewer Line
- EX FM Sanitary Sewer Force Main
- EX SW Swale Centerline
- EX D Ditch Centerline
- EX G Gas Line
- EX OHE Overhead Elect. or Utility Line
- EX UGE Underground Electrical
- EX UGFO Underground Fiber Optics
- EX UGT Underground Telephone

PROPERTY LINE

- BUILDING LINE
- EASEMENT LINE
- BUILDING SETBACK LINE
- LANDSCAPE BUFFER LINE
- LOT LINE
- ROW LINE
- CURB
- CENTERLINE
- PROP. FENCE LINE

ABBREVIATIONS:
 SSE - NEW PUBLIC SANITARY SEWER EASEMENT (SEE PLAN FOR WIDTH).
 SDE - NEW DRAINAGE EASEMENT (SEE PLAN FOR WIDTH).
 WE - NEW PUBLIC WATER EASEMENT (SEE PLAN FOR WIDTH).
 L/A BUFFER - NEW LANDSCAPE BUFFER (SEE PLAN FOR WIDTH AND TYPE).
 F/SB - FRONT YARD SETBACK / S/SB - SIDE YARD SETBACK / R/SB - REAR YARD SETBACK
 FTE - FINISHED FLOOR ELEVATION
 TW - FINISH GRADE AT TOP OF RETAINING WALL
 BW - FINISHED GROUND GRADE AT BOTTOM OF RETAINING WALL
 SDCO / SSCO - STORM DRAINAGE / SANITARY SEWER CLEAN-OUT
 SS - ROOF DOWNPOUT CONNECTION
 SSWL - SINGLE SOLID WHITE LINE, DSWL - DOUBLE SOLID YELLOW LINE
 SDWL - SINGLE DASHED WHITE LINE

SITE INFORMATION:
 SITE AREA: 13.42 ACRES
 SITE IS ZONED: MUNICIPAL PROPERTY (MP)
 LAND DISTURBANCE AREA: 3.06 ACRES
 TAX MAP PARCEL #: 0003-0-001
 STREET ADDRESS: 19 VAN CLEVE ST. FORT OGLETHORPE, GA
 SANITARY SEWER AVAILABILITY: NA
 POTABLE WATER: NA
 SUPPLY AVAILABILITY:
 STORM DRAINAGE: STORM DRAINAGE WILL DISCHARGE INTO AN EXISTING BLACK BRANCH TO THE EAST OF THE PROPERTY.
 REGULAR PARKING SPACES: 102 NEW + 40 OVERLAP=142
 REGULAR H/OAP SPACES: 4
 VAN ACCESSIBLE H/OAP SPACES: 1
 TOTAL PARKING PROVIDED: 147 SPACES
 FLOODZONE: PORTIONS OF THE PROPERTY ARE LOCATED IN FLOOD ZONE "AE" AS SHOWN.
 FROM THE FIRM MAP COMMUNITY-PANEL NUMBER 1304200009E, MAP REVISION 9/11/2008. BASE FLOOD VALUES 717.7-718.7
 PROPERTY OWNER: CITY OF FORT OGLETHORPE

DH&W
 ARCHITECTURE INTERIORS PLANNING
 1001 Carter Street - Chattanooga - 37402 -
 423 | 266 | 4816 www.dhw-architects.com

New Tennis Courts
 Gilbert-Stephenson Park
 19 Van Cleve Street
 Fort Oglethorpe, GA

Date: 05/09/2023
 Drawn: JP
 File: 2212

Revisions

1	ADDENDUM 1	6-21-23
2	ADDENDUM 2	7-05-23

Key Plan

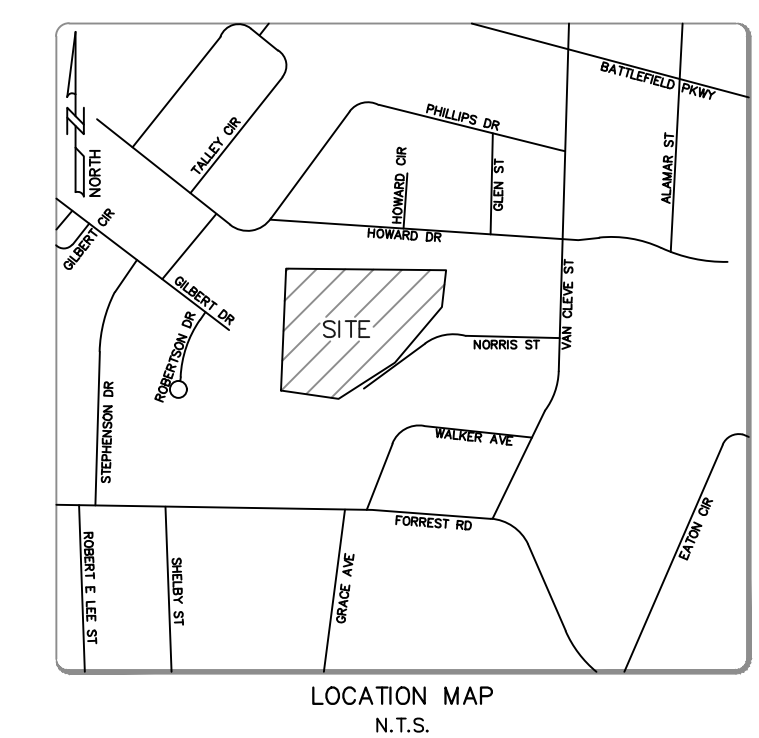
GSWCC QR CODE

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Title: **SITE STAKING**

Scale: _____

Sheet No. **C100**



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Scale 1" = 30'



September 23, 2022

DH&W Architects
1001 Carter Street
Chattanooga, TN 37402

ATTENTION: Mr. Raymond Boaz, Jr., AIA
rboaz@dhw-architects.com

Subject: **REPORT OF GEOTECHNICAL EXPLORATION**
City of Fort Oglethorpe – Tennis Courts
Gilbert-Stephenson Park
Fort Oglethorpe, Georgia
GEOServices Project No. 41-22615

Dear Mr. Boaz:

We are submitting the results of the geotechnical exploration performed for the subject project. The geotechnical exploration was performed in general accordance with GEOS Proposal No. 14-22370, dated July 5, 2022. The following report presents our findings and recommendations for the proposed park expansion in Fort Oglethorpe, Georgia.

GEOServices sincerely appreciates the opportunity to serve as your geotechnical consultant. Should you have any questions regarding this report, or if we can be of any further assistance, please contact us at your convenience.

Sincerely,
GEOServices, LLC

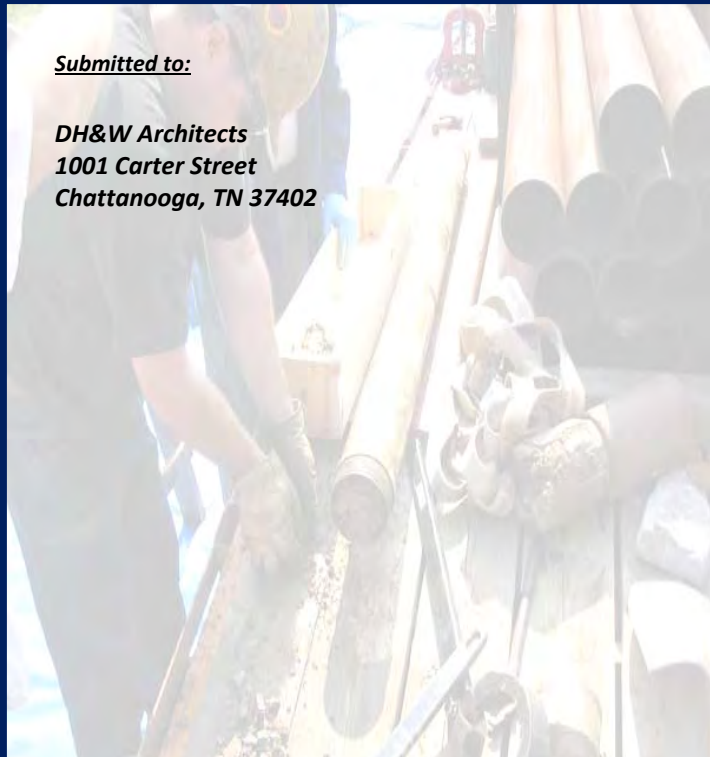
Jeremy T. Haley, P.E. (TN)
Geotechnical Engineer



Jacob E. Ervin, P.E.
Geotechnical Engineer
GA 048666

Submitted to:

**DH&W Architects
1001 Carter Street
Chattanooga, TN 37402**



REPORT OF GEOTECHNICAL EXPLORATION

CITY OF FORT OGLETHORPE – TENNIS COURTS

**Gilbert-Stephenson Park
Fort Oglethorpe, Georgia**

Submitted by:

**GEOServices, LLC
6607 Mountain View Road, Suite 139
Ooltewah, Tennessee 37363**

**Phone (423) 614-6471
FAX (423) 614-6479**



**GEOSERVICES, LLC
PROJECT NO. 41-22615**

TABLE OF CONTENTS

	<u>Page</u>
1.0 INTRODUCTION	1
1.1 PURPOSE	1
1.2 PROJECT INFORMATION AND SITE DESCRIPTION	1
1.3 SCOPE OF STUDY	1
2.0 EXPLORATION AND TESTING PROGRAMS	3
2.1 FIELD EXPLORATION	3
2.2 LABORATORY TEST PROGRAM	3
3.0 SUBSURFACE CONDITIONS	5
3.1 GEOLOGIC CONDITIONS	5
3.2 SUBSURFACE CONDITIONS	5
3.2.1 <i>Surficial Materials</i>	6
3.2.2 <i>Existing Fill</i>	6
3.2.3 <i>Residual Soils</i>	6
3.2.4 <i>Subsurface Water</i>	7
3.2.5 <i>Auger Refusal Conditions</i>	7
4.0 CONCLUSIONS AND RECOMMENDATIONS	8
4.1 SITE ASSESSMENT	8
4.1.1 <i>Existing Fill Soils</i>	8
4.1.2 <i>Soft to Firm Surficial Residual Soils</i>	9
4.1.3 <i>Potentially Difficult Excavations</i>	9
4.1.4 <i>Karst Geology</i>	9
4.2 SITE PREPARATION	10
4.2.1 <i>Subgrade</i>	10
4.2.2 <i>Structural Soil Fill</i>	10
4.2.3 <i>Compacted Crushed Stone Fill</i>	11
4.3 PAVEMENT DESIGN RECOMMENDATIONS	11
4.3.1 <i>Tennis Court Pavement Design</i>	12
4.3.2 <i>Flexible Pavement Design (Parking Lot)</i>	14
4.4 LATERAL EARTH PRESSURES	15
5.0 CONSTRUCTION CONSIDERATIONS	17
5.1 EXCAVATIONS	17
5.2 MOISTURE SENSITIVE SOILS	17
5.3 DRAINAGE AND SURFACE WATER CONCERNS	18
5.4 SINKHOLE CONSIDERATIONS	18
6.0 LIMITATIONS	20
APPENDICES	
APPENDIX A – Figures and Test Boring Records	
APPENDIX B – Soil Laboratory Data	

1.0 INTRODUCTION

1.1 PURPOSE

The purpose of this geotechnical exploration was to characterize the subsurface conditions for the design and construction of the proposed expansion at the existing Gilbert-Stephenson Park in Fort Oglethorpe, Georgia. This report provides recommendations for general site preparation, excavation and fill requirements, and pavement recommendations for the proposed park expansion.

1.2 PROJECT INFORMATION AND SITE DESCRIPTION

Project information was provided by Mr. Ray Boaz with DH&W Architects. We were also provided with a Conceptual Site Plan prepared by DH&W Architects. The site for the proposed expansion is located at the existing Gilbert-Stephenson Park at 19 Van Cleve Street in Fort Oglethorpe, Georgia. Based on the provided information, we understand that the project will consist of the construction of four new tennis courts, the resurfacing of existing tennis courts, and a new parking area. The area for the new tennis courts currently exists as a relatively level grass covered field in the southern portion of the park. The area for the new parking area currently exists as an asphalt covered parking area, a set of two tennis courts, and the surrounding grass covered areas in the northern portion of the park. No grading information was available at the time of this report; however, based on the existing grades, we anticipate earthwork cuts and fills will be on the order of 3 feet or less in order to establish the proposed grades at the site.

1.3 SCOPE OF STUDY

This geotechnical exploration involved a site reconnaissance, field drilling, laboratory testing, and engineering analysis. The following sections of this report present discussions of the field exploration, site conditions, and conclusions and recommendations. Following the text of this

report, Appendix A presents figures and test boring records. Appendix B presents a summary of laboratory test results.

The scope of services did not include an environmental assessment for determining the presence or absence of wetlands, or hazardous or toxic materials in the soil, bedrock, surface water, subsurface water, or air, on or below, or around this site. Any statements in this report or on the boring logs regarding odors, colors, and unusual or suspicious items or conditions are strictly for informational purposes.

2.0 EXPLORATION AND TESTING PROGRAMS

2.1 FIELD EXPLORATION

The site subsurface conditions were explored with a total of six (6) soil test borings (B-1 through B-6). Three of the borings (B-1 through B-3) were performed within the proposed northern parking area and three of the borings (B-4 through B-6) were performed within the proposed southern tennis court area. The boring locations and depths were selected by GEOServices personnel in conjunction with the Conceptual Site Plan prepared by DH&W Architects. Approximate boring locations are shown on the Boring Location Plan, Figure 3 of Appendix A. The boring locations were located and staked in the field by GEOServices personnel. Drilling was performed on September 16, 2022. The depths reference the ground surface elevations at the site that existed at the time of the exploration. The borings were advanced using 3.25-inch inside diameter hollow stem augers (HSA) with a tracked Geoprobe drill rig. The drill crew worked in general accordance with ASTM D6151 (HSA Drilling). Sampling of overburden soils was accomplished using the standard penetration test procedure (ASTM D1586). The borings were backfilled with soil cuttings prior to leaving the site. Detailed test boring records are presented in Appendix A.

In split–spoon sampling, a standard 2-inch O.D. split-spoon sampler is driven into the bottom of the boring with a 140-pound hammer falling a distance of 30 inches. The number of blows required to advance the sampler the last 12 inches of the standard 18 inches of total penetration is recorded as the Standard Penetration Resistance (N-value). These N-values are indicated on the boring logs at the testing depth and provide an indication of the relative density of granular materials and strength of cohesive materials.

2.2 LABORATORY TEST PROGRAM

Soil samples collected during drilling were transported to our laboratory for visual classification and laboratory testing. The following laboratory testing was performed on select samples to determine various properties of the soil:

- Atterberg Limits (ASTM D4318): Two (2) Atterberg limits tests were performed for this project. These tests help us to confirm our visual classifications according to the Unified Soil Classification System (USCS). The plastic limit and liquid limit represent the moisture content at which a cohesive soil changes from a semi-solid to a plastic state and from a plastic state to liquid state, respectively.
- Natural Moisture Content (ASTM D2216): Moisture content determinations were performed on fifteen (15) samples for this project. The natural moisture content is defined as the ratio of the weight of water present in the soil to the dry weight of soil.

The test results are presented on individual laboratory data sheets and a Soil Data Summary, both enclosed in Appendix B.

3.0 SUBSURFACE CONDITIONS

3.1 GEOLOGIC CONDITIONS

The project site, as most of north Georgia, lies in the Appalachian Valley and Ridge Physiographic Province. The Province is characterized by elongated, northeasterly-trending ridges formed on highly resistant sandstones and shales. Between ridges, broad valleys and rolling hills are formed primarily on less resistant limestones, dolomites and shales.

Published geologic information indicates that the proposed construction area is underlain by limestones of the Chickamauga Group. The Chickamauga Group is comprised mostly of limestone with minor amounts of shale. Weathering of the Chickamauga Group generally produces a medium to high plasticity clay soil with minor amounts of chert gravel.

Since the bedrock formation at the site contains limestone, the site is susceptible to the typical carbonate hazards of irregular weathering, cave and cavern conditions, and overburden sinkholes. Carbonate rock, while appearing very hard and resistant, is soluble in slightly acidic water. This characteristic, plus differential weathering of the bedrock mass, is responsible for the hazards. Of these hazards, the occurrence of sinkholes is potentially the most damaging to overlying soil supported structures. In north Georgia, sinkholes occur primarily due to differential weathering of the bedrock and "flushing" or "raveling" of overburden soils into the cavities in the bedrock. The loss of solids creates a cavity or "dome" in the overburden. Growth of the dome over time or excavation over the dome can create a condition in which rapid, local subsidence or collapse of the roof of the dome occurs.

3.2 SUBSURFACE CONDITIONS

The below subsurface description is of a generalized nature to highlight the major subsurface stratification features and material characteristics. The boring logs included in Appendix A should be reviewed for specific information at individual boring locations. The depth and

thickness of the subsurface strata indicated on the boring cross-sections were generalized from and interpolated between test locations. The transition between materials will be more or less gradual than indicated and may be abrupt. Information on actual subsurface conditions exists only at the specific boring locations and is relevant to the time the exploration was performed. Variations may occur and should be expected between boring locations. The stratification lines were used for our analytical purposes and, unless specifically stated otherwise, should not be used as the basis for design or construction cost estimates.

3.2.1 Surficial Materials

A surficial layer of asphalt and stone approximately 6 inches in thickness was encountered in one of the six borings (B-1). A surficial layer of topsoil ranging from 3 to 6 inches in thickness was encountered in the remaining five borings (B-2 through B-6). Beneath these surficial layers, existing fill soils and residual soils were encountered to auger refusal depths ranging from 5.6 to 8.3 feet.

3.2.2 Existing Fill

Beneath the surficial topsoil layer in two of the six borings (B-2 and B-3), existing fill soils were encountered to a depth of approximately 2 feet. Fill is generally classified as material that has been transported and placed by man. The fill soils generally consisted of dark brown and gray clays with trace amounts of organics. The N-values of the fill soils ranged from 2 to 6 blows per foot (bpf), indicating a consistency of very soft to firm. The natural moisture contents of the fill soils ranged from 30 to 37 percent.

3.2.3 Residual Soils

Beneath the existing fill soils in two of the borings (B-2 and B-3) and beneath the surficial layers in the remaining four borings (B-1 and B-4 through B-6), residual soils were encountered to auger refusal depths ranging from 5.6 to 8.3 feet. Residual soils are classified as soils which have been formed in place from the weathering of the underlying bedrock. The residual soils generally consisted of brown, light brown, and gray clays with varying amounts of rock fragments. The N-values of the residuum ranged from 4 bpf to 50 blows per one inch of

penetration, indicating a consistency of soft to very hard. The residuum was generally firm in consistency. The natural moisture contents of the residuum ranged from 17 to 28 percent. Atterberg limits testing on two select samples of the residuum revealed liquid limits (LL) of 32 and 35 percent and plasticity indices (PI) of 17 and 18 percent, respectively. These soils are classified as CL (lean clay) in general accordance with the Unified Soil Classification System.

3.2.4 Subsurface Water

Subsurface water was not observed in any of the six borings at the time of drilling. Subsurface water levels may fluctuate due to seasonal changes in precipitation amounts. Additionally, discontinuous zones of perched water may exist within the overburden and/or at the contact with bedrock. The groundwater information presented in this report is the information that was collected at the time of our field activities.

3.2.5 Auger Refusal Conditions

Auger refusal materials were encountered in each of the six borings at depths ranging from 5.6 to 8.3 feet during field exploration. Refusal is a designation applied to any material that cannot be penetrated by the power auger. Auger refusal may indicate dense gravel or cobble layers, boulders, rock ledges or pinnacles, or the top of continuous bedrock. A summary of the auger refusal depths encountered is shown below:

Table 1 – Auger Refusal Summary

Boring No.	Auger Refusal Depth (Feet)
B-1	6.5
B-2	8.3
B-3	6.8
B-4	5.6
B-5	5.8
B-6	7.6

Note: Depths reference the existing ground elevations at the time of the exploration.

4.0 CONCLUSIONS AND RECOMMENDATIONS

4.1 SITE ASSESSMENT

The results of the field exploration indicate that the site is adaptable for the proposed construction, however, there are some challenges associated with the development of this site. These challenges include the existing fill soils, the soft to firm surficial residual soils, the potentially difficult excavations, and the underlying karst geology.

4.1.1 Existing Fill Soils

Existing fill was encountered in two of the six borings (B-2 and B-3) to a depth of approximately 2 feet. We have not been provided with testing records for the fill at the time of this report. Accordingly, there are certain risks associated with construction on these types of fill. The risk primarily consists of excessive and/or non-uniform settlement caused by extensive zones or pockets of soft, loose, or uncompacted material.

The boring data indicates the fill soils generally consisted of dark brown and gray clays with trace amounts of organics. The N-values of the fill soils ranged from 2 to 6 blows per foot (bpf), indicating a consistency of very soft to firm. Typically, an engineered fill would have N-values in excess of 8 to 10 bpf and would be generally free of deleterious material. Based on our observations of the fill, the majority of the fill appears to have been subjected to only limited compactive efforts and does contain deleterious material in the form of organics. At this time, the existing fill soils were only encountered within the proposed northern parking areas around the existing tennis courts. We would recommend that any existing fill that is soft in consistency and/or contains deleterious material be removed and replaced with suitable structural soil fill. Additionally, for the proposed parking lot addition, it may be more advantageous to treat the soil subgrade with a soil cement stabilization process than undercut and replacement.

It has been our experience that existing fill can change abruptly and may contain isolated pockets of unsuitable materials. As such, we recommend that the existing fill soils be subjected

to a detailed proofroll prior to placement of new fill (in fill areas) or at final subgrade elevation (in cut areas) under the supervision of the geotechnical engineer or their qualified representative. Any areas judged to perform unsatisfactorily during the proofroll should be remediated at the engineer's discretion. Remedial measures typically include undercutting and replacement with structural soil fill or dense graded aggregate.

4.1.2 Soft to Firm Surficial Residual Soils

Soft to firm surficial residual soils (N-values ranging from 4 to 8 bpf) were encountered in five of the six borings (B-1 and B-3 through B-6). Depending on when the construction is performed, there is a high probability that the upper residual soils (on the order of approximately 3 to 5 feet) will need to be scarified, dried, and recompacted or undercut prior to placement of new fill over these areas. Additionally, for the tennis court construction, it may be more advantageous to treat the soil subgrade with a soil cement stabilization process in order to create a stable subgrade. There is the potential of encountering softer, saturated soils between the boring locations, depending on the time of year when grading and/or construction occurs.

4.1.3 Potentially Difficult Excavations

Auger refusal materials were encountered in each of the six borings at depths ranging from 5.6 to 8.3 feet. No grading information was available at the time of this report; however, based on the existing grades, we anticipate the refusal materials will be below any potential grading activities at the site. It is possible that these materials may be encountered in utility excavations, especially in any excavations greater than 5 feet. It has been our experience that subsurface rock elevations can vary in short distances. Based on the subsurface auger refusal conditions, these auger refusal materials will likely require difficult excavation techniques such as excavators with rock teeth, hoe-ramming, or blasting.

4.1.4 Karst Geology

A certain degree of risk with respect to sinkhole formation and subsidence should be considered with any site located within geologic areas underlain by potentially soluble rock units. While a rigorous effort to assess the potential for sinkhole formation on this site was beyond the scope of

this evaluation, our borings did not encounter obvious indications of sinkhole development. However, a review of the USGS topographic map of the area did reveal the presence of a single closed depression, which may denote past sinkhole activity, to the southeast of the project site. Based on these findings and our experience with this formation at other sites, we consider that this site has no greater risk for sinkhole activity than other sites in the immediate vicinity of this site.

4.2 SITE PREPARATION

4.2.1 Subgrade

Gravel, topsoil, asphalt, concrete, rock fragments greater than 6 inches, and other debris should be removed from the proposed construction areas. In previously developed areas, it is often common to find buried zones of construction debris. If these materials are encountered, they should be undercut and replaced at the discretion of the geotechnical engineer.

After completion of any stripping operations and any required excavations to reach subgrade level, we recommend that the subgrade be proofrolled with a fully-loaded, tandem-axle dump truck or other pneumatic-tired construction equipment of similar weight. The geotechnical engineer or their qualified representative should observe proofrolling. Areas judged to perform unsatisfactorily should be remediated at the geotechnical engineer's discretion. Typically, remedial options consist of undercutting and replacement with structural soil fill or dense graded aggregate. There is a good likelihood that the upper soils currently covering the site may require some scarifying and drying due to exposure to weather (precipitation and freeze/thaw) for an extended period of time.

4.2.2 Structural Soil Fill

Material considered suitable for use as compacted fill should be clean soil free of organics, trash, and other deleterious material, containing no rock fragments greater than 6 inches in any one dimension. Preferably, borrow material to be used as structural soil fill should have a standard Proctor maximum dry density of 90 pounds per cubic foot (pcf) or greater and a plasticity index (PI)

of 35 percent or less. All material being used as soil fill should be tested and confirmed by the geotechnical engineer to be in accordance with the project requirements before being placed. Based on limited laboratory testing, we anticipate the on-site soils are suitable for use as structural soil fill provided that the existing fill is screened to remove all organics prior to placement as structural soil fill.

Structural fill should be placed in loose, horizontal lifts not exceeding 8 inches in thickness. Each lift should be compacted to at least 95 percent of maximum dry density per the standard Proctor method (ASTM D698) and within the range of minus 2 percent to plus 3 percent of the optimum moisture content. Each lift should be compacted and tested by geotechnical personnel to confirm that the contractor's method is capable of achieving the project requirements before placing any subsequent lifts. Any areas which have become soft or frozen should be removed before additional structural fill is placed.

4.2.3 Compacted Crushed Stone Fill

Compacted crushed stone fill should be Group 1 Aggregates in accordance with Section 815 of the Georgia Department of Transportation specifications. The crushed stone fill should be placed in loose, horizontal lifts not exceeding 10 inches in loose thickness. Each lift should be compacted to at least 98 percent of maximum dry density per the standard Proctor method (ASTM D698). Each lift should be compacted and tested by geotechnical personnel to confirm that the contractor's method is capable of achieving the project requirements before placing any subsequent lifts.

4.3 PAVEMENT DESIGN RECOMMENDATIONS

Our recommendations are based upon the assumption that the subgrade has been properly prepared as described in previous report sections and that any off-site soil borrow to be used to backfill to the final subgrade meets the requirements for structural soil fill.

All paved areas should be constructed with positive drainage to direct water off-site and to minimize surface water seeping into the pavement subgrade. The subgrade should have a

minimum slope of 1 percent. In down grade areas, the basestone should extend through the slope to allow any water entering the basestone a path to exit. For rigid pavements, water-tight seals should also be provided at formed construction and expansion joints.

4.3.1 Tennis Court Pavement Design

We recommend that all tennis court surface construction conform to the recommendations of the *A.S.B.A Guidelines for Tennis Court Construction*. Based on this, we would recommend the following asphalt surface for the proposed tennis courts:

Table 2 – Asphalt Surface Summary

Recommended Thickness (Inches)	
Pavement Materials	Tennis Court
Bituminous Asphalt Surface Mix	1.0
Bituminous Asphalt Binder Mix	2.0
Compacted Crushed Aggregate Base	6.0
Total Flexible Pavement Thickness	9.0

The recommended pavement thickness' presented in this report section are considered typical and minimum for the assumed parameters in the general site area. We understand that budgetary considerations sometimes warrant thinner pavement sections than those presented. However, the client, the owner, and the project designers should be aware that thinner pavement sections may result in increased maintenance costs and lower than anticipated pavement life.

Due to the soft to firm surficial residual soils encountered in the proposed construction areas, it may be advantageous to treat the soil subgrade with a soil cement stabilization process in order to create a stable subgrade for the proposed tennis courts. We anticipate that this process will improve the conditions and strength of the soil subgrade, and the basestone section listed above can be reduced to a minimum of 4 inches in thickness. This could help offset the cost of the soil cement stabilization but will still facilitate under court drainage.

A summary of the A.S.B.A recommendations is presented below. It should be noted that this summary only includes the recommendations for the subgrade and pavement thicknesses. For all other items, please refer to the *A.S.B.A Guidelines for Tennis Court Construction*.

The subgrade shall be prepared such that the finished subgrade is 4 to 6 inches above the surrounding ground. The finished subgrade shall not have slopes of less than 0.83 percent and not more than 1 percent. Each court shall slope on a true plane, preferably from side to side to facilitate proper drainage and runoff. The court shall not slope from the center to the sides or from the sides to the center.

Base course materials shall meet the requirements of the geotechnical report and all applicable ASTM standards. The material shall be spread and compacted using equipment and methods which result in a uniform thickness and density. The aggregate base course shall be compacted to a minimum density of 95 percent of the standard Proctor density.

The intermediate pavement course shall consist of a hot mix asphalt with a maximum aggregate size of 3/4 inches in accordance with the state's Department of Transportation. The intermediate pavement course shall be spread and compacted using equipment and methods which result in a uniform thickness and density. The finished intermediate pavement course shall not vary more than 1/4 inches in 10 feet when measured in any direction.

The asphaltic surface course shall be a hot mix asphalt with a minimum aggregate size of 1/4 inches and a maximum aggregate size of 3/8 inches in accordance with the state's Department of Transportation. The asphaltic surface course shall have a minimum of 5.5 percent liquid asphalt bitumen and a maximum void content of 7 percent or in accordance with the state's Department of Transportation, whichever is more stringent. The asphaltic surface course shall be spread and compacted using equipment and methods which result in a uniform thickness and density. The finish surface of the court shall not vary more than 1/8 inches in 10 feet when measured in any direction. The asphaltic surface course shall be allowed to cure for a minimum of 14 days prior to application of the playing surface.

4.3.2 Flexible Pavement Design (Parking Lot)

AASHTO flexible pavement design methods have been utilized for pavement recommendations. Our recommendations are based on the assumptions that the subgrade has been properly prepared as described previously. Traffic loading had not been provided at the time this report was prepared; however, we anticipate that the traffic will be mainly cars with occasional delivery trucks. Based on our experience with similar projects with flexible pavement, we recommend the following light duty and medium duty flexible pavement section:

Table 3 – Flexible Pavement Section Summary

Recommended Thickness (Inches)		
Pavement Materials	Light Duty	Medium Duty
Bituminous Asphalt Surface Mix	1.5	1.5
Bituminous Asphalt Base Mix	2.0	2.5
Compacted Crushed Aggregate Base	6.0	8.0

We recommend a base stone equivalent to a Group 1 Aggregate in accordance with Section 815 of the Georgia Department of Transportation specifications. The bituminous asphalt pavement should be 9.5mm Super Pave as per Section 400 for the surface mix and 19mm Super Pave as per Section 400 for the binder mix. Compaction requirements for the crushed aggregate base and the bituminous asphalt pavement should generally follow Georgia Department of Transportation specifications.

The recommended pavement thickness' presented in this report section are considered typical and minimum for the assumed parameters in the general site area. We understand that budgetary considerations sometimes warrant thinner pavement sections than those presented. However, the client, the owner, and the project designers should be aware that thinner pavement sections may result in increased maintenance costs and lower than anticipated pavement life.

As mentioned with the tennis court construction, due to the soft to firm surficial residual soils and existing fill soils encountered in the proposed construction areas, it may be advantageous

to treat the soil subgrade with a soil cement stabilization process in order to create a stable subgrade for the proposed tennis courts. We anticipate that this process will improve the conditions and strength of the soil subgrade, and the basestone section listed above can be reduced to a minimum of 4 inches in thickness. This could help offset the cost of the soil cement stabilization but will still facilitate under pavement drainage.

4.4 LATERAL EARTH PRESSURES

At this time, we are not aware of any retaining walls; however, we understand that this is a possibility. Therefore, we are providing equivalent fluid pressures for three backfill conditions for cantilever-type walls. These are 1) active earth pressure for granular backfill (clean sand or gravel), 2) at-rest earth pressure for granular backfill, and 3) at-rest earth pressure for fine-grained (silt or clay) backfill.

Condition 1 - The active earth pressure for granular backfill (free draining) will result in an equivalent fluid pressure of 30 pounds per cubic foot (pcf). If the granular backfill is to develop active earth pressure conditions, walls must be flexible and/or free to rotate or translate at the top approximately one inch laterally for every 20 feet of wall height.

Condition 2 - The at-rest earth pressure for granular backfill (free draining) will result in an equivalent fluid pressure of 45 pcf. For retaining walls that will not rotate or translate, such as building walls or other walls rigidly connected to structures, at-rest conditions will develop.

Condition 3 - Walls backfilled with fine-grained material (silt or clay) should be designed using the at-rest earth pressure whether restrained at the top, or not. Fine-grained soils typically creep over time which produces additional lateral stresses to the wall. The equivalent fluid pressure for this case is 70 pcf.

In all cases, forces from any expected surcharge loading including sloping backfill should be added to the equivalent fluid pressures. The walls should be properly drained to remove water or

hydrostatic pressure should be added to the design pressure. Also, all backfill for the walls should be placed in accordance with the structural fill recommendations described hereinafter.

Table 4 – Earth Pressure Summary

Earth Pressure Condition	Backfill Type	Unit Weight (pcf)	Earth Pressure Coefficient
Active (Ka)	Granular	105	0.271
	On-Site Silts and Clays	120	0.390
At-Rest (Ko)	Granular	105	0.426
	On-Site Silts and Clays	120	0.562
Passive (Kp)	Granular	105	3.690
	On-Site Silts and Clays	120	2.561

Note: In each instance the earth pressure coefficients provided are unfactored.

For rigid, cast-in-place concrete walls, a friction factor of 0.35 between foundation concrete and the bearing soils may be used when evaluating friction. If a stone leveling course is utilized beneath the foundation, a friction factor of 0.50 between foundation concrete and the dense graded aggregate base may be used when evaluating friction. Also, an ultimate passive earth pressure resistance of well-compacted soil fill can be utilized to resist sliding (in conjunction with friction). However, to limit deformation when relying on passive strength, we recommend using a minimum safety factor of 3.0 applied to the ultimate passive resistance value. Additionally, this is based on the upper 2 feet of soil being neglected during the calculation of passive resistance.

5.0 CONSTRUCTION CONSIDERATIONS

5.1 EXCAVATIONS

Excavations should be sloped or shored in accordance with local, state, and federal regulations, including OSHA (29 CFR Part 1926) excavation trench safety standards. The contractor is usually solely responsible for site safety. This information is provided only as a service and under no circumstances should GEOServices be assumed to be responsible for construction site safety.

As previously mentioned, auger refusal materials were encountered in each of the six borings at depths ranging from 5.6 to 8.3 feet. No grading information was available at the time of this report; however, based on the existing grades, we anticipate the refusal materials will be below any potential grading activities at the site. It is possible that these materials may be encountered in utility excavations, especially in any excavations greater than 5 feet. It has been our experience that subsurface rock elevations can vary in short distances. Based on the subsurface auger refusal conditions, these auger refusal materials will likely require difficult excavation techniques such as excavators with rock teeth, hoe-ramming, or blasting.

5.2 MOISTURE SENSITIVE SOILS

The fine-grained soils encountered at this site will be sensitive to disturbances caused by construction traffic and changes in moisture content. During wet weather periods, increases in the moisture content of the soil can cause significant reduction in the soil strength and support capabilities. Construction traffic patterns should be varied to prevent the degradation of previously stable subgrade. In addition, plastic soils which become wet, may be slow to dry and thus significantly retard the progress of grading and compaction activities. We caution if site grading is performed during the wet weather season, methods such as discing and allowing the material to dry will be required to meet the required compaction recommendations. It will, therefore, be advantageous to perform earthwork and foundation construction activities during dry weather. Climate data for nearby Ringgold, Georgia obtained from Weatherbase indicate in the following

table the average monthly precipitation. The average amount of precipitation does not vary much throughout the year. However, December through March is typically the difficult grading period due to the limited drying conditions that exist.

Table 5 – Average Precipitation Summary

Month	Monthly Precipitation Average (Inches)	Month	Monthly Precipitation Average (Inches)
January	5.0	July	4.1
February	5.0	August	3.1
March	5.4	September	4.2
April	4.0	October	3.2
May	4.0	November	4.3
June	3.4	December	4.7

5.3 DRAINAGE AND SURFACE WATER CONCERNS

To reduce the potential for undercut and construction induced sinkholes, water should not be allowed to collect in the foundation excavations, on floor slab areas, or on prepared subgrades of the construction area either during or after construction. Undercut or excavated areas should be sloped toward one corner to facilitate removal of any collected rainwater, subsurface water, or surface runoff. Positive site surface drainage should be provided to reduce infiltration of surface water around the perimeter of the building and beneath the floor slabs. The grades should be sloped away from the building and surface drainage should be collected and discharged such that water is not permitted to infiltrate the backfill and floor slab areas of the building.

5.4 SINKHOLE CONSIDERATIONS

There is some inherent risk associated with building on any site underlain by carbonate rock. This risk can be reduced but not eliminated by preparing the site as described in this report. At this site, control of surface water during construction and over the project life will be very

important to reduce the potential for sinkhole development. If a sinkhole develops, the appropriate corrective action is dependent on the size and location of the sinkhole. As described herein, GEOservices should be retained to observe site and subgrade preparation activities. If sinkhole conditions are observed, the type of corrective action is most appropriately determined by GEOservices on a case-by-case basis.

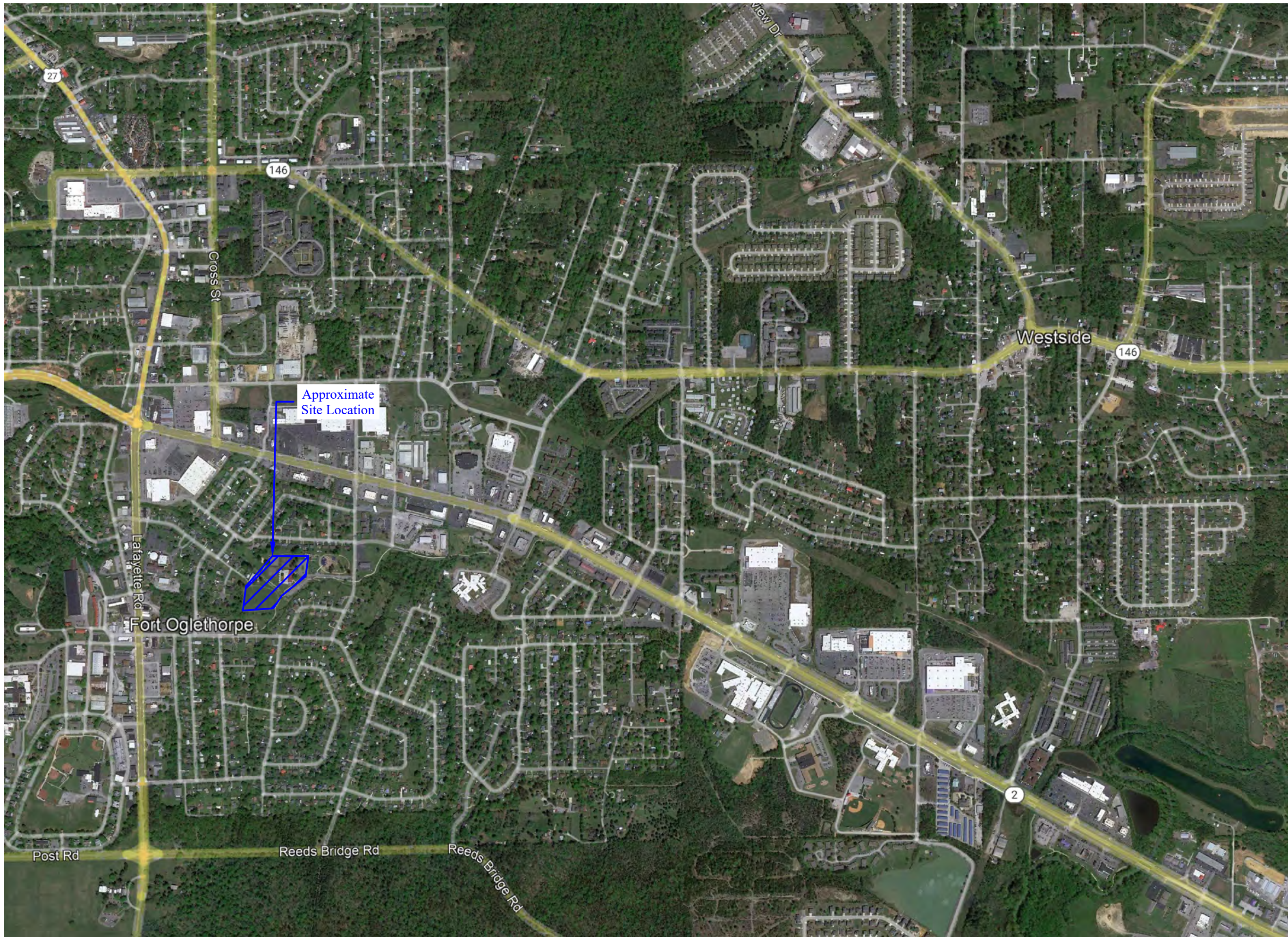
6.0 LIMITATIONS

This report has been prepared in accordance with generally accepted geotechnical engineering practice for specific application to this project. This report is for our geotechnical work only, and no environmental assessment efforts have been performed. The conclusions and recommendations contained in this report are based upon applicable standards of our practice in this geographic area at the time this report was prepared. No other warranty, express or implied, is made.

The analyses and recommendations submitted herein are based, in part, upon the data obtained from the exploration. The nature and extent of variations between the borings will not become evident until construction. We recommend that GEOServices be retained to observe the project construction in the field. GEOServices cannot accept responsibility for conditions which deviate from those described in this report if not retained to perform construction observation and testing. If variations appear evident, then we will re-evaluate the recommendations of this report. In the event that any changes in the nature, design, or location of the project are planned, the conclusions and recommendations contained in this report will not be considered valid unless the changes are reviewed and conclusions modified or verified in writing. Also, if the scope of the project should change significantly from that described herein, these recommendations may have to be re-evaluated.

APPENDIX A

Figures and Test Boring Records



NOTES:

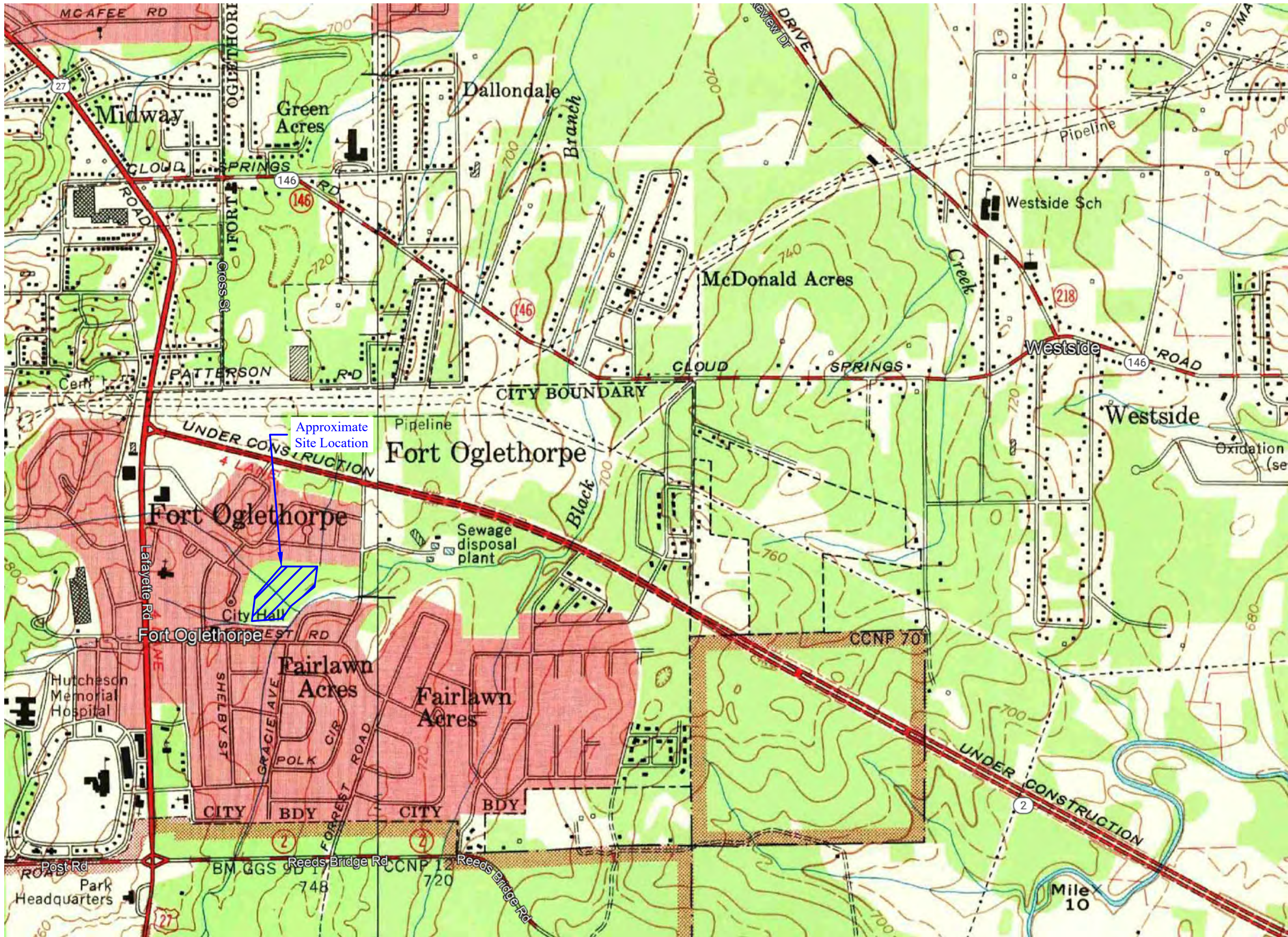
1.) BASE MAP PROVIDED BY GOOGLE EARTH PRO (10/06/20).

SITE VICINITY MAP
Fort Oglethorpe Tennis Courts
 Fort Oglethorpe, Georgia

DRAWN BY:	EDP
APPROVED BY:	DKK
SCALE:	NTS
JOB NO.:	41-22615
DATE:	09/20/2022



FIGURE 1



Approximate Site Location

NOTES:

- 1.) BASE MAP PROVIDED BY USGS TOPOGRAPHIC MAP (1969) - FORT OGLETHORPE QUADRANGLE (GA-TN). (1969) - EAST RIDGE QUADRANGLE (TN-GA).

USGS TOPOGRAPHIC MAP
Fort Oglethorpe Tennis Courts

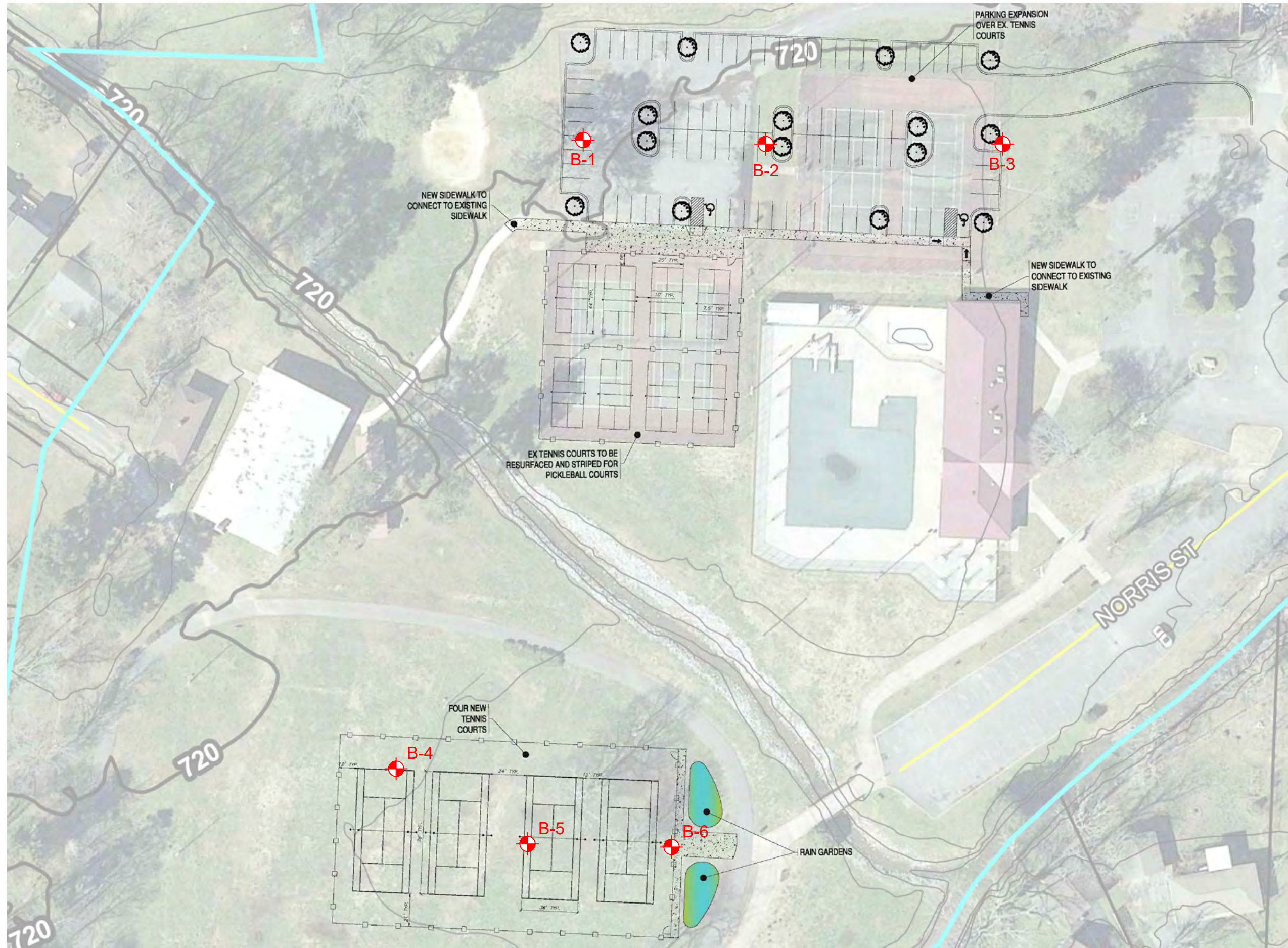
Fort Oglethorpe, Georgia

DRAWN BY:	EDP
APPROVED BY:	DKK
SCALE:	NTS
JOB NO.:	41-22615
DATE:	09/20/2022



FIGURE 2





- NOTES:**
- 1.) BORING LOCATIONS ARE SHOWN IN GENERAL ARRANGMENT ONLY.
 - 2.) DO NOT USE BORING LOCATIONS FOR DETERMINATIONS OF DISTANCES OR QUANTITIES.
 - 3.) BASE MAP PROVIDED BY DH&W ARCHITECTS.
- SOIL TEST BORING LOCATION

BORING LOCATION PLAN
Fort Oglethorpe Tennis Courts
 Fort Oglethorpe, Georgia

DRAWN BY:	EDP
APPROVED BY:	DKK
SCALE:	NTS
JOB NO.:	41-22615
DATE:	09/20/2022



FIGURE 3

GENERAL NOTES

FINE AND COARSE GRAINED SOIL PROPERTIES

PARTICLE SIZE

BOULDERS:	GREATER THAN 300 mm
COBBLES:	75 mm to 300 mm
GRAVEL:	4.74 mm to 75 mm
COARSE SAND:	2 mm to 4.74 mm
MEDIUM SAND:	0.425 mm to 2 mm
FINE SAND:	0.075 mm to 0.425 mm
SILTS & CLAYS:	LESS THAN 0.075 mm

COARSE GRAINED SOILS (SANDS & GRAVELS)

N-VALUE	RELATIVE DENSITY
0 - 4	VERY LOOSE
5 - 10	LOOSE
11 - 30	MEDIUM DENSE
31 - 50	DENSE
OVER 50	VERY DENSE

FINE GRAINED SOILS (SILTS & CLAYS)

N-VALUE	CONSISTENCY	Qu, PSF
0 - 2	VERY SOFT	0 - 500
3 - 4	SOFT	500 - 1000
5 - 8	FIRM	1000 - 2000
9 - 15	STIFF	2000 - 4000
16 - 30	VERY STIFF	4000 - 8000
OVER 31	HARD	8000 +

STANDARD PENETRATION TEST (ASTM D1586)

THE STANDARD PENETRATION TEST AS DEFINED BY ASTM D1586 IS A METHOD TO OBTAIN A DISTURBED SOIL SAMPLE FOR EXAMINATION AND TESTING AND TO OBTAIN RELATIVE DENSITY AND CONSISTENCY INFORMATION. THE 1.4 INCH I.D./2.0 INCH O.D. SAMPLER IS DRIVEN 3-SIX INCH INCREMENTS WITH A 140 LB. HAMMER FALLING 30 INCHES. THE BLOW COUNTS REQUIRED TO DRIVE THE SAMPLER THE FINAL 2 INCREMENTS ARE ADDED TOGETHER AND DESIGNATED THE N-VALUE. AT TIMES, THE SAMPLER CAN NOT BE DRIVEN THE FULL 18 INCHES. THE FOLLOWING REPRESENTS OUR INTERPRETATION OF THE STANDARD PENETRATION TEST WITH VARIATIONS.

BLOWS/FOOT (N-VALUE)

DESCRIPTION

25.....25 BLOWS DROVE SAMPLER 12" AFTER INITIAL 6" SEATING
75/10".....75 BLOWS DROVE SAMPLER 10" AFTER INITIAL 6" SEATING
50/PR.....PENETRATION REFUSAL OF SAMPLER AFTER INITIAL 6" SEATING

SAMPLING SYMBOLS

ST:	UNDISTURBED SAMPLE
SS:	SPLIT SPOON SAMPLE
CORE:	ROCK CORE SAMPLE
AU:	AUGER OR BAG SAMPLE

SOIL PROPERTY SYMBOLS

N:	STANDARD PENETRATION, BPF
M:	MOISTURE CONTENT %
LL:	LIQUID LIMIT %
PI:	PLASTICITY INDEX %
Qp:	POCKET PENETROMETER VALUE, TSF
Qu:	UNCONFINED COMPRESSIVE STRENGTH, TSF
DUW:	DRY UNIT WEIGHT, PCF

ROCK PROPERTIES

ROCK HARDNESS

ROCK QUALITY DESIGNATION (RQD)


PERCENT	QUALITY
90 TO 100	EXCELLENT
75 TO 90	GOOD
50 TO 75	FAIR
25 TO 50	POOR
0 TO 25	VERY POOR

VERY SOFT:	ROCK DISINTEGRATES OR EASILY COMPRESSES TO TOUCH: CAN BE HARD TO VERY HARD SOIL.
SOFT:	ROCK IS COHERANT BUT BREAKS EASILY TO THUMB PRESSURE AT SHARP EDGES AND CRUMBLES WITH FIRM HAND PRESSURE.
MODERATELY HARD:	SMALL PIECES CAN BE BROKEN OFF ALONG SHARP EDGES BY CONSIDERABLE HARD THUMB PRESSURE: CAN BE BROKEN BY LIGHT HAMMER BLOWS.
HARD:	ROCK CAN NOT BE BROKEN BY THUMB PRESSURE, BUT CAN BE BROKEN BY MODERATE HAMMER BLOWS.
VERY HARD:	ROCK CAN BE BROKEN BY HEAVY HAMMER BLOWS.

PROJECT NAME City of Fort Oglethorpe - Tennis Courts
 DATE 9/16/22
 DRILLING CONTRACTOR Tri-State Drilling
 DRILLING METHOD Hollow Stem Auger
 GROUND ELEVATION --- PROPOSED FFE ---
 REFUSAL Depth 6.5 ft
 TOP OF ROCK Depth 6.5 ft
 BEGAN CORING ---
 FOOTAGE CORED (LF) ---
 BOTTOM OF HOLE Depth 6.5 ft

GEOservices PROJECT# 41-22615
 PROJECT LOCATION Fort Oglethorpe, Georgia
 LOGGED BY J. Haley ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---

GROUND WATER LEVELS:
 AT END OF DRILLING ---
 AFTER 1 HOUR ---
 AFTER 24 HOURS ---



DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0			ASPHALT (2 inches) / GRAVEL (4 inches)						
			LEAN CLAY (CL) with rock fragments - brown and gray; firm to very hard; moist (RESIDUUM)	SS 1		1-3-4 (7)	18	32	17
				SS 2		2-3-5 (8)	17		
5				SS 3		50/1"	25		

Refusal at 6.5 feet.
 Bottom of borehole at 6.5 feet.

NOTES:

PROJECT NAME City of Fort Oglethorpe - Tennis Courts
 DATE 9/16/22
 DRILLING CONTRACTOR Tri-State Drilling
 DRILLING METHOD Hollow Stem Auger
 GROUND ELEVATION --- PROPOSED FFE ---
 REFUSAL Depth 8.3 ft
 TOP OF ROCK Depth 8.3 ft
 BEGAN CORING ---
 FOOTAGE CORED (LF) ---
 BOTTOM OF HOLE Depth 8.3 ft

GEOservices PROJECT# 41-22615
 PROJECT LOCATION Fort Oglethorpe, Georgia
 LOGGED BY J. Haley ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---
 GROUND WATER LEVELS:
 AT END OF DRILLING ---
 AFTER 1 HOUR ---
 AFTER 24 HOURS ---



DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0			TOPSOIL (3 inches)						
			FAT CLAY (CH) with trace organics - dark brown and gray; very soft; moist (FILL)	SS 1		0-0-2 (2)	30		
			LEAN CLAY (CL) with rock fragments - brown, light brown, and gray; stiff to very stiff; moist (RESIDUUM)	SS 2		4-5-9 (14)	18		
5				SS 3		4-6-11 (17)	18		

Refusal at 8.3 feet.
 Bottom of borehole at 8.3 feet.

NOTES:

PROJECT NAME City of Fort Oglethorpe - Tennis Courts
 DATE 9/16/22
 DRILLING CONTRACTOR Tri-State Drilling
 DRILLING METHOD Hollow Stem Auger
 GROUND ELEVATION --- PROPOSED FFE ---
 REFUSAL Depth 6.8 ft
 TOP OF ROCK Depth 6.8 ft
 BEGAN CORING ---
 FOOTAGE CORED (LF) ---
 BOTTOM OF HOLE Depth 6.8 ft

GEOservices PROJECT# 41-22615
 PROJECT LOCATION Fort Oglethorpe, Georgia
 LOGGED BY J. Haley ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---
 GROUND WATER LEVELS:
 AT END OF DRILLING ---
 AFTER 1 HOUR ---
 AFTER 24 HOURS ---



DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0			TOPSOIL (3 inches)						
			FAT CLAY (CH) with trace organics - dark brown and dark gray; firm; moist (FILL)	SS 1		1-2-4 (6)	37		
			LEAN CLAY (CL) with rock fragments - brown and gray; firm to very hard; moist (RESIDUUM)	SS 2		2-3-5 (8)			
5				SS 3		3-50/2"	21		

Refusal at 6.8 feet.
 Bottom of borehole at 6.8 feet.

NOTES:

PROJECT NAME City of Fort Oglethorpe - Tennis Courts
 DATE 9/16/22
 DRILLING CONTRACTOR Tri-State Drilling
 DRILLING METHOD Hollow Stem Auger
 GROUND ELEVATION --- PROPOSED FFE ---
 REFUSAL Depth 5.6 ft
 TOP OF ROCK Depth 5.6 ft
 BEGAN CORING ---
 FOOTAGE CORED (LF) ---
 BOTTOM OF HOLE Depth 5.6 ft

GEOservices PROJECT# 41-22615
 PROJECT LOCATION Fort Oglethorpe, Georgia
 LOGGED BY J. Haley ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---
 GROUND WATER LEVELS:
 AT END OF DRILLING ---
 AFTER 1 HOUR ---
 AFTER 24 HOURS ---

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0			TOPSOIL (6 inches)						
			LEAN CLAY (CL) with rock fragments - gray and brown; firm; moist (RESIDUUM)	SS 1		2-3-5 (8)	21		
				SS 2		2-2-3 (5)	28		
5									


Refusal at 5.6 feet.
Bottom of borehole at 5.6 feet.

NOTES:

PROJECT NAME City of Fort Oglethorpe - Tennis Courts
 DATE 9/16/22
 DRILLING CONTRACTOR Tri-State Drilling
 DRILLING METHOD Hollow Stem Auger
 GROUND ELEVATION --- PROPOSED FFE ---
 REFUSAL Depth 5.8 ft
 TOP OF ROCK Depth 5.8 ft
 BEGAN CORING ---
 FOOTAGE CORED (LF) ---
 BOTTOM OF HOLE Depth 5.8 ft

GEOservices PROJECT# 41-22615
 PROJECT LOCATION Fort Oglethorpe, Georgia
 LOGGED BY J. Haley ON-SITE REP. ---
 LATITUDE / LONGITUDE ---
 NORTHING / EASTING ---


GROUND WATER LEVELS:
 AT END OF DRILLING ---
 AFTER 1 HOUR ---
 AFTER 24 HOURS ---

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0			TOPSOIL (4 inches)						
			LEAN CLAY (CL) with rock fragments - brown and gray; firm; moist (RESIDUUM)	SS 1		2-3-4 (7)	19	35	18
				SS 2		1-2-5 (7)	19		
5									

Refusal at 5.8 feet.
 Bottom of borehole at 5.8 feet.

NOTES:

PROJECT NAME City of Fort Oglethorpe - Tennis Courts GEOServices PROJECT# 41-22615
 DATE 9/16/22 PROJECT LOCATION Fort Oglethorpe, Georgia
 DRILLING CONTRACTOR Tri-State Drilling LOGGED BY J. Haley ON-SITE REP. ---
 DRILLING METHOD Hollow Stem Auger LATITUDE / LONGITUDE ---
 GROUND ELEVATION --- PROPOSED FFE --- NORTHING / EASTING ---
 REFUSAL Depth 7.6 ft
 TOP OF ROCK Depth 7.6 ft GROUND WATER LEVELS:
 BEGAN CORING --- AT END OF DRILLING ---
 FOOTAGE CORED (LF) --- AFTER 1 HOUR ---
 BOTTOM OF HOLE Depth 7.6 ft AFTER 24 HOURS ---

DEPTH (ft)	ELEVATION (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY % (RQD)	BLOW COUNTS (N VALUE)	MOISTURE CONTENT (%)	ATTERBERG LIMITS	
								LIQUID LIMIT	PLASTICITY INDEX
0			TOPSOIL (4 inches)						
			LEAN CLAY (CL) with rock fragments - gray and brown; firm; moist (RESIDUUM)	SS 1		1-2-3 (5)	20		
			LEAN CLAY (CL) with trace rock fragments - brown, light brown, and gray; soft to very hard; moist (RESIDUUM)	2		2-2-2 (4)	21		
5					3		2-3-50/1"	18	

Refusal at 7.6 feet.
 Bottom of borehole at 7.6 feet.

NOTES:

APPENDIX B

Soil Laboratory Data

SOIL DATA SUMMARY
City of Fort Oglethorpe Tennis Courts - Fort Oglethorpe, GA
GEOServices Project No. 41-22615
September 21, 2022

Boring Number	Sample Number	Depth (feet)	Natural Moisture Content	Atterberg Limits			Soil Type
				LL	PL	PI	
B-1	1	1.0-2.5	17.7%	32	15	17	CL
	2	3.5-5.0	17.1%				
	3	6.0-7.5	25.4%				
B-2	1	1.0-2.5	29.5%				
	2	3.5-5.0	18.0%				
	3	6.0-7.5	18.4%				
B-3	1	1.0-2.5	37.3%				
	2	3.5-5.0	-				
	3	6.0-7.5	21.1%				
B-4	1	1.0-2.5	20.9%				
	2	3.5-5.0	28.3%				
B-5	1	1.0-2.5	19.0%	35	17	18	CL
	2	3.5-5.0	19.4%				
B-6	1	1.0-2.5	20.1%				
	2	3.5-5.0	21.2%				
	3	6.0-7.5	18.2%				