

TECHNICAL SPECIFICATIONS
FOR THE
ONSITE WASTEWATER SYSTEM REPAIRS
AT THE
NC DOT MAINTENANCE FACILITY IN CRESWELL
WASHINGTON COUNTY, NORTH CAROLINA
FOR THE
NORTH CAROLINA DIV. OF TRANSPORTATION

May 2023



- Prepared By -

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TECHNICAL SPECIFICATIONS

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SECTION 01 01 00 - SUMMARY OF THE WORK

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and NCDOT Specification sections, apply to work of this section.

CONTRACT DOCUMENTS:

The work shall be executed in accordance with the specifications, addenda, and the drawings.

PROJECT DESCRIPTION:

The project consists of installing a new on-site wastewater system and decommissioning the existing on-site system. The new on-site wastewater system shall include a new septic tank, pump dosing tank, a dual low pressure drainfield system on fill, miscellaneous improvements to the existing grinder pump station, installation of new force mains and pumps, installation of gravity sewer line, associated electrical work, and miscellaneous other sewer appurtenances.

GENERAL:

1. Construction work shall be conducted without interrupting sewer service to the current office operations unless otherwise approved by the Owner. No bypassing of the existing treatment/conveyance system will be permitted during the construction, unless it's part of scheduled work and authorized by the Owner. Contractor will be responsible for any fines, remedial work and other items which may result if such bypasses occur or for violations of sewer system permit which result from actions of the Contractor.
2. The Contractor shall take time to familiarize himself with the location of existing wastewater, water, and other utility lines prior to construction.
3. The Contractor shall provide (at no additional cost to the Owner) all temporary piping and electrical systems that may be noted on the Drawings or as deemed necessary to accomplish the scope of work depicted and noted in this Contract. Relocation of the temporary lines shall be done in a way not to interfere with other work performed at the site. Alternate routes of the temporary lines will be considered as requested by the Contractor. Temporary lines can be located above or below ground provided they remain operational and operate satisfactory.
4. Bypass pumping may be considered and utilized by the Contractor for this project.
5. The Contractor shall be responsible for removing some existing components, such as piping inside the wet-well of LS No. 1, removal of check valves, isolation valves, removal of pump and control panel at existing grinder LS No. 2, and other items as shown on the

plans. Where items are noted to be returned/salvaged to the Owner, the Contractor shall take special care and pre-caution in removing such items. All other items shall be removed and disposed by the Contractor.

6. Following construction of the new units and associated components, provisions shall be made to direct the wastewater flow into the new system in a manner acceptable to the Engineer/Owner. Temporary lines where used shall be removed.
7. The Contractor shall construct and make operational all equipment, tanks, piping, and controls as shown on plans and included in specifications.
8. Items not specifically mentioned above but shown on the construction drawings shall be part of this work as well.
9. The Contractor shall be responsible for the following services:
 - Development, enforcement, and compliance with a Soil Erosion and Slope Protection Plan as required by the DEQ and the local authority.
 - The Contractor shall be responsible for all the temporary utilities required during construction unless specifically noted elsewhere.
 - Where existing sufficient electrical service is available for general construction, the GC or subcontractors may use the electrical service at no cost to the GC.
 - Obtain and submit certification (from the source of the material) that the fill material utilized for the drainfield system meets or exceeds the soil specifications noted in these contract documents. Alternatively, hire the services of a soil scientist to visit the site and verify/test the fill material utilized meets the soil technical specification.
10. Contractor shall comply with requirements and recommendations in the soil report attached.
11. Construction waste and surplus material removed from the project site shall be loaded by the Contractor onto trucks and hauled away for final disposal. Excavated material shall be disposed/stored on site per DOT's authorization/direction.
12. Due to the complexity and nature of this project, the Contractor is required to produce and submit a sequence of construction schedule for approval (prior to beginning any construction work) to the Engineer/Owner.

The sequence of construction shall be such that allows construction to begin without compromising sewer service operations at the existing DOT facilities. Temporary piping or modified operations may be utilized during those instances.
13. Water supply for all hydrostatic tests shall be provided by the Owner. Contractor shall coordinate and verify source location.

SURVEY CONTROL:

The Owner shall provide horizontal and vertical control staking where needed prior to the beginning of construction. The Contractor shall be responsible for maintaining and replacing the control staking and staking actual lines, tanks, basins, etc.

Where field elevations do not match elevations on the drawings, the Contractor shall notify the Owner/Engineer upon discovery. Special consideration shall be provided in verifying the invert elevation of the existing 6" gravity line leading into the existing LS No.2. Such elevation (at the proposed point of connection, new wye and cleanout) shall be collected prior to any shop drawing submittal for the proposed septic and pump tanks.

PROTECTION OF PROPERTY AND PERSONS:

The Contractor is cautioned that in many areas, limited working room is available. Therefore, special precautions must be taken by the Contractor in order to comply with the General Conditions.

The Contractor shall thoroughly document the existing condition of all structures, landscaping, and improvements located in all locations where the construction work may result in actual damage or in damage claims. The method of providing this documentation of existing conditions shall be acceptable to the Engineer, and a complete set of the documentation shall be available to the Owner and the Engineer to help settle any disputes which may arise concerning that work is required to return property to its original condition or concerning property damage. This documentation shall be submitted to the Owner prior to the first payment estimate. Use of colored pictures, video recordings and other such means shall be utilized.

NAMES OF MANUFACTURERS:

Names of manufacturers, catalog numbers, etc. when used in these specifications are used for general descriptive reference and to indicate the basis of the design. Equipment and products of equal or better quality and performance will be considered. Contractors and manufacturers are advised that a manufacturer named as an approved supplier is not excused from meeting all of the technical and performance requirements covered under these specifications.

SINGLE SOURCE ENTITY:

Where a specified system involves multiple integrated components that involve coordination in terms of; fabrication, installation, manufacturing, alignment, performance, control integration, or any other such requirement, these specifications may require that such a system be furnished by a "single source entity". The term shall refer to an equipment representative or equipment manufacturer. The single source entity shall be required to furnish the major equipment specified under such a package, and by doing so shall take responsibility of the design, fabrication, installation, and ultimate performance, of such an integrated system. Other supporting equipment may be substituted at the major manufacturer's discretion, as noted in the specifications, and as approved by the Owner/Engineer.

DAMAGE TO VEGETATION:

Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be rimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing. All disturbed areas shall be restored to their original condition.

VISITING THE PREMISES:

The Contractor, before submitting his bid on the work must visit the site and familiarize himself with all existing conditions.

As a result of having visited the premises, the Contractor shall be responsible for the installation of the work as it relates to such existing conditions.

The submission of a bid will be considered an acknowledgment on the part of the bidder of his visitation to the site.

PERMITS AND INSPECTIONS:

Unless otherwise distinctly hereinafter specified, this Contractor shall apply and pay for all necessary permits, fees and inspections required by any public authority having jurisdiction. The cost of these permits and fees shall be added to the Contractor's scope and price of work. Acreage charges, bonds, property assessments and facilities charges shall not be construed to be a part of this contract.

SUBSTITUTIONS:

Where materials or equipment are specified by patent, proprietary name or name of the manufacturer, such specifications shall be deemed to be used for the purpose of establishing a standard for that particular item. The Contractor may recommend the substitution of any material, equipment, or article which he thinks is equal in every respect to that indicated or specified, and if, in the opinion of the Engineer, such material, article or piece of equipment is of equal substance and function of that specified, the Engineer may approve its substitution and use by the Contractor. If the proposed equipment by the contractor, does not meet the specifications based on the Engineer's opinion, the Contractor shall furnish and install the equipment specified as the basis of design, at no additional cost to the Owner.

The selection of such substituted equipment shall be at the expense of the installing Contractor. Redesign of structures, pipe relocation, electrical and site modifications, and all other design and operational requirements brought about by the substitution shall be addressed by, and at the expense of the Contractor and submitted for approval, along with any other information requested by the Engineer. The Engineer has the right to request engineering drawings that are stamped by a certified engineer, and as deemed necessary.

The number of units, performance, reliability, and all other design criteria need to be met or exceeded in order for the proposed equipment to be considered equal. Contractors and

manufacturers are advised that a manufacturer named as an approved substitute supplier is not excused from meeting all of the technical and performance requirements of these specifications.

SPACE LIMITATION:

The Contractor's attention is called to the space available for all proposed equipment and special care shall be taken in selecting equipment to fit the space available if other than specified equipment shall be proposed. Approval by the Engineer of alternate equipment shall be tested only on capacities, general construction and merit of manufacturer and it shall remain the responsibility of the Contractor to select equipment that will fit space provided and which can be installed to provide satisfactory operation and maintenance conditions.

Similarly, any yard piping work shall be accomplished as such to minimize downtime of operations and allow normal traffic around the facility grounds. Equipment and material staging areas shall be coordinated with DOT personnel

SHOP DRAWINGS:

Shop Drawings, Product Data, and Sample Requirements shall be submitted for review and approval prior to placing an order or installation.

OPERATION AND MAINTENANCE (O&M) MANUALS:

All O&M Manuals to be provided as part of this Contract shall be provided in an electronic format (suitable to the Owner's preferences) for the Owner to use. Three (3) hard copy versions shall also be provided along with the electronic format. One hard copy shall be retained by the Engineer and the other two copies will be provided to the Owner. Additional copies may be provided as needed or requested by the Contractor.

SIGNS:

Construction identification signs shall be constructed as required by the Owner, shown on the Drawings, and as included in these Contract Documents and directed by Engineer. One sign is required and shall note all funding agencies. It shall be erected prior to the first pay estimate and removed upon project completion.

PART 3- EXECUTION: Not Used

PART 4 - PAYMENT:

Payment for the work included in these contract documents shall be based on the bid schedule and itemized breakdown.

END OF SECTION 01 01 00

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SECTION 13 46 01 SEPTIC SYSTEM

PART -1 GENERAL

1.01 DEFINITIONS

- A. Wherever used in these specifications and printed with initial bold capital letters, the terms listed below will have the meanings indicated which are applicable to both the singular and plural thereof.
1. *Bid* – The offer or proposal of a Bidder submitted on the prescribed form setting forth the prices for the work to be performed.
 2. *Bidder* – The individual or entity who submits a Bid directly to the Owner.
 3. *Contractor* – The individual or entity with whom Owner has entered into the agreement. Contractor shall be registered to install systems in the County of the installation. The contractor shall coordinate the installation with the designer and the local (Washington County) health department.
 4. *Engineer* – The individual or entity named as such in the construction plans.
 5. *Inspector* - The specific individual designated by the Owner, Engineer/Architect, Contractor, and Manufacturer to ensure quality control by inspecting and certifying that all septic system components are following the Manufacturer's recommendations and requirements.
 6. *Manufacturer* – A supplier, fabricator, distributor, materialman, or vendor having a direct contract with Contractor or Owner to furnish materials or equipment to be incorporated in the work by contractor. Manufacturers will need to have their components reviewed and approved by the NC Onsite Water Protection Branch, to be used in this project.
 7. *Owner* – The individual or entity with whom Contractor has entered into the agreement and for whom the work is to be performed.

1.02 GENERAL DESCRIPTION

- A. The **Contractor** shall furnish and install a complete, operational, and tested septic package system consisting of, but not limited to; pre-engineered pre-cast concrete septic and pump tanks, effluent submersible pumps, effluent screen, concrete riser kits, discharge assemblies, ball valves, check valves, electrical junction box, force mains, low pressure drain field system, associated controls, and all other sewer appurtenances to serve the wastewater needs of the existing buildings at the Creswell DOT Maintenance yard.

1.03 SUBMITTALS

- A. The **MANUFACTURER** of each component shall furnish six (6) sets of shop drawings and technical data sheets for review and approval. The submittals shall clearly specify the materials of construction, equipment compatibility and approval from the State of North Carolina, along with drawings for each unique

package being supplied.

- B. Submittals shall be submitted in accordance with the Front End Documents and Specification 01 01 00 Summary of Work.

1.04 *OR-EQUAL EVALUATIONS*

- A. Throughout the equipment specifications you will find the term “or approved equal.” For this project, this term “approved equal” shall mean equal in the judgment of the **ENGINEER**. Should the **CONTRACTOR** seek approval of a product other than the brand or models named in the specifications, it shall furnish written evidence that such product conforms in all respects to the specified requirements, it is an approved product by the NC on-site wastewater section, and that it has been used successfully elsewhere under similar conditions. It will not be the responsibility of the **ENGINEER** to research, review, or determine equality, nor the responsibility of the **MANUFACTURER** specified within these specifications to provide research, documentation, or data supporting the difference between the “or equal” and the specified product. This will be the sole responsibility of the **CONTRACTOR** seeking the approval.
- B. Where the specified requirements involve conformance to recognized codes or standards, the **BIDDER** shall furnish evidence of such conformance in the form of test or inspection reports, prepared by a recognized agency, and bearing an authorized signature. Manufacturer’s standard data and catalog cut sheets will not be considered enough in themselves, and the **ENGINEER** will not be responsible for seeking further data from the manufacturer, or for otherwise researching the product. Failure to provide complete data will be cause for rejection of the product. The submission shall include any impacts that could be expected from the alternative product and shall also indicate any product that would require a license or royalty, the actual fees, and a note that these fees would be handled by the **BIDDER**.
- C. Substitutions shall be completed in accordance with the Front-End Documents and Specification 01 01 00 Summary of Work.

1.05 *EXPERIENCE CLAUSE*

The equipment furnished shall be manufactured and supplied by a company experienced in the design and manufacture of on-site sewer systems in North Carolina. **MANUFACTURERS** shall have at minimum ten (10) years-experience in the design and manufacture of sewer treatment and disposal systems of similar size and equipment specified.

1.06 *SEPTIC SYSTEM PERMITTING/COMPLIANCE*

The proposed onsite system repairs shall be completed and installed in accordance with the contract documents, the NC Dept. of Health and Human Services approval, and authorization to construct permit from Washington County. These forms are attached at the end of this section. Requirements noted on the referenced permits/forms shall become part of the contract document requirements.

1.07 *MANUFACTURERS*

The septic system **MANUFACTURERS** shall be Orenco Systems Inc. (AQWA Inc. 252-243-7693), Carolina Pump Works LLC (Scott Hale, 803-917-9798), Polylok, Shoaf Precast Septic Inc. (Phillip Shoaf, 336-787-5826), or other approved equal. The **MANUFACTURER(s)** shall furnish a complete factory-built system, consisting of septic and pump tank accessories, effluent pumps, effluent screen, discharge assembly, ball valves, check valves, and controls, along with other miscellaneous items. The **MANUFACTURER** shall supply detailed installation and O&M manuals for all equipment along with the following support personnel:

- i. Personnel dedicated to supporting the project through design, construction, and O&M.
- ii. Asset Management Department dedicated to assisting operators with operational and maintenance activities.

1.08 *WARRANTY*

All equipment **MANUFACTURERS** shall provide a warranty of at least one (1) year. Warranty term shall ensue after **OWNER'S** acceptance and system startup procedures are complete. The **MANUFACTURER** shall submit detailed exclusions from the warranty or additional cost items required to maintain the equipment in warrantable condition. The warranty shall be documented in product literature.

1.09 *SERVICABILITY*

The system shall be completely serviceable, with easy access to any pumps, effluent screen, and floats. The pump shall be designed for removal without removing the floats.

1.10 *EFFLUENT PUMPS*

The pump must be approved for use as described in these specifications. Pumps shall be 1hp, 208 VAC, three phase, 60 Hz, submersible motor, with 20-foot-long extra heavy duty (SOOW) electrical cord with ground. The pumps must be effluent type, submersible Myers Model WHR10H or equal. Pumps shall be UL and CSA listed for use with treated effluent. The motor must be rated for continuous use and frequent cycling, at least 100 cycles per day. The motor cable must be suitable for Class 1, Division 1 and 2 applications. The pumps shall be lightweight for easy removal and maintenance. The pump shall have internal thermal overload protection. All pumps shall undergo 3-point (Dead head, Design Flow, and Design Flow + 30%) wet testing at the factory to confirm performance.

1.11 *BUILDING SEWERS*

Building sewers shall be watertight and installed by a Contractor licensed to such work as per the local and state licensing requirements. Building sewer materials, installation and testing shall be per the current local plumbing code and as noted on the plans.

PART 2- SEPTIC AND DOSING TANKS

2.01 GENERAL REQUIREMENTS

- A. The tank **MANUFACTURER** shall provide structural design calculations and engineering certification to the **ENGINEER** for review and approval. The design shall be in accordance with accepted engineering practices, the design criteria noted below, and the State of North Carolina applicable design guidelines. In case there is a conflict between the noted design criteria and the State requirements, the worst-case scenario (stricter) of the two requirements shall apply. Precast concrete tanks shall be designed by a licensed registered engineer and approved by the NC On-site Wastewater Branch and the local regulatory agency.
- B. Loading Criteria:
- a. There shall be 140 lbs./cu.ft. for minimum weight of saturated backfill, or 127 lbs./cu.ft. for unsaturated backfill (500 lbs./sq.ft. minimum).
 - b. Minimum lateral loading shall be 62.4 lbs./cu.ft. Lateral loading shall be determined from ground surface.
 - c. The tanks shall also support a concentrated wheel load of 2500 lbs.
- C. There are four (4) typical loading conditions that should be analyzed:
1. 4 ft. Bury + Full Exterior Hydrostatic Load
 2. 4 ft. Bury + Full Exterior Hydrostatic Load + 2500 lb. Wheel Load.
 3. 1 ft. Bury + 2500 lb. Wheel Load.
 4. Tank Full, Interior Hydrostatic Load and Unsupported by Soil.
- Load Case 4 represents the tank full of liquid at 62.4 lbs/cu.ft. This condition addresses seam and haunch stress-strain relationships that occur during watertightness testing, as well as poor soil bedding conditions that provide inadequate support.*
- D. Tanks requiring deep burial (>48") or subject to truck or heavy traffic loading shall require special consideration.
- E. All tanks shall be structurally sound and watertight and pass applicable testing as described herein. The tank shall be capable of withstanding long-term hydrostatic loading, in addition to the soil loading, due to a water table maintained at ground surface.
- F. Tanks shall be manufactured and furnished with pipe penetrations, access openings, and of the configuration shown on the construction drawings. Modification of completed tanks will not be permitted.
- G. Inlet and outlet plumbing shall include a watertight rubber boot on the tank walls. The inlet plumbing shall allow for natural ventilation back through the building sewer and vent stack.
- H. Tanks shall be capable of withstanding a below ground hydraulic test and shall be individually tested.

- I. All tanks shall be installed in strict accordance with the **MANUFACTURER'S** recommended installation instructions
- J. Septic tanks shall have an interior partition wall to satisfy requirements noted on the plans and as required by the State of North Carolina.

2.02 CONCRETE TANKS

- A. All concrete tanks will be pre-approved by the ENGINEER and the NC on-site wastewater section. Walls, bottom and top of reinforced concrete tanks shall be designed across the shortest dimension using one-way slab analysis. Stresses in each face of monolithically constructed tanks may be determined by analyzing the tank cross-section as a continuous fixed frame.
- B. The walls and bottom slab shall be poured monolithically; alternatively, water stops may be provided.
- C. Reinforcing steel shall be ASTM A-615 Grade 60, $f_y = 60,000$ psi. Details and placement shall be in accordance with ACI 315 and ACI 318.
- D. Concrete shall be ready-mix with cement conforming to ASTM C150, Type II. It shall have a cement content of not less than six (6) sacks per cubic yard and maximum aggregate size of 3/4". Water/cement ratio shall be kept low ($0.42 \pm$), and concrete shall achieve a minimum compressive strength of 4000 psi in 28 days. The Contractor shall submit a concrete mix design to the **ENGINEER** for review and approval. Three (3) concrete sample cylinders shall be taken and tested for each tank manufactured until the **MANUFACTURER** and **ENGINEER** are satisfied that the minimum compression strength is being obtained. If the minimum compressive strength is not being obtained, the **MANUFACTURER** shall be required to make and test sample cylinders for each tank manufactured. Calcium chloride will not be allowed in the mix design. The cost of testing cylinders shall be the tank **MANUFACTURER'S** responsibility. The tank manufacturer may supply a Swiss hammer for compressive testing in the field in lieu of sample cylinders.
- E. Tanks may be protected by applying a heavy cement-base waterproof coating, on both inside and outside surfaces, in compliance with Council of American Building Officials (CABO) report #NRB-168; 6181; however, the tank should be watertight without the addition of seal coatings.
- F. Form release used on tank molds shall be Nox Crete™ or approved equal. Diesel or other petroleum products are not acceptable.
- G. Tanks shall not be moved from the manufacturing site to the job site until the tank has cured for seven (7) days or has reached two-thirds of the design strength.
- H. Tanks shall be manufactured and furnished with access openings of the size and configuration to accommodate individual packaged pump systems. Flanged tank adapter or equivalent shall be furnished to facilitate the bonding of the access riser to the tank.
- I. The septic tank and the top slab shall be sealed with a preformed flexible plastic gasket. The flexible plastic gasket shall be equal to the flexible butyl resin sealant congeal CS-102 or CS-202 as manufactured by Concrete Sealants, Inc. of New Carlisle, Ohio, and shall conform to federal specification SS-S-00210(2iOA) and AASHTO M-198. A mechanical fastening method shall be

- used if the seasonal groundwater level may reach the top slab seam of the tank.
- J. To demonstrate watertightness shall be tested on-site prior to acceptance by the Owner and local health department. Inlets to the tank will be watertight pipe seal Cast-A-Seal™ (Manufactured by Press-Seal Gasket Corporation) or approved equal. After installation is completed, air vacuum testing shall be completed in accordance with State guidelines for all tanks, excluding risers. After it has been determined that there is no leakage based on the air vacuum testing, test the access riser seam. Backfill to a minimum depth of 2" above the riser seam to prevent damage from hydrostatic uplift. Fill the tank to a point 2" above the riser seam (the field test period may be reduced to not less than two (2) hours). No tank will be accepted if there is any leakage over the two (2) hour period.

PART 3 TANK ACCESS EQUIPMENT

3.01 RISERS

Risers shall be required for access to internal tank components. All risers shall be traffic rated, made of precast reinforced concrete pipe, constructed watertight, and accompanied with a cast iron standard manhole lid. The risers shall be attached to the tanks using sealant such that a secure and watertight seal is provided. Risers shall extend 6" above original grade to allow for settlement and to ensure positive drainage away from the access. Risers for inspection ports shall be a minimum of 24" in nominal inside diameter. To ensure product compatibility, a single supplier shall supply risers, lids, and attachment components. Concrete risers for pump vaults shall be square or rectangular in shape as noted on the plans.

3.02 *Not used.*

3.03 *Not Used.*

3.04 *Not Used.*

3.05 LIDS

One cast-iron heavy-duty lid shall be furnished with each access concrete riser. Lids shall be as specified on the construction drawings.

3.06 RISER INSTALLATION

Risers shall be watertight, fastened, level/plumbed and backfilled with 3/8" pea gravel or other similar granular material.

PART 4 SEPTIC TANK EFFLUENT GRAVITY ASSEMBLIES

The effluent filter system shall be supplied by a reputable **MANUFACTURER** (Polylok Inc. or other approved equal) with at least ten (10) years of experience in supplying equipment for effluent sewers. Effluent filter(s) shall prevent particles larger than 1/32-inch in diameter from leaving the tank. Effluent filter(s) shall have a solid bottom or

deflecting device that prevents vertically rising solids from reaching the filtering surface area during ebullition (sludge bulking) and contain an automatic shut-off ball valve for preventing solids/flow during filter removal. The filter shall have an effective filter area of no less than 625 linear feet. A PVC slide rail for easy removal of vault housing shall be provided, along with a bottom support bracket. The filter outlet size shall include an adapter for connection to either a 4" or a 6" pipe. One unit shall be provided as noted on the plans. A PVC floor support system shall be provided under each filter for stability and to accommodate safe removal and re-installation of the removable filter unit.

4.01 *RISERS AND LIDS*

See PART 3.

4.02 *NOT USED*

4.04 *ALARM FLOAT ASSEMBLY:*

Furnish one float switch for local alarm notification. Float switch shall be mercury free Orenco Systems®, Inc. Model MFP-Y mounted on a PVC stem attached to the tank or riser. The float must be adjustable and removable for field adjustments. The high-level alarm shall be preset as shown in the **ENGINEER'S** plans. The float lead shall be secured with a nylon strain relief bushing inside the tank. Alarm floats shall be connected to the Alarm panel wiring per electrical plans.

4.05 *Not Used.*

4.06 *ALARM PANEL:*

An alarm panel shall be provided for the septic tank operations. The panel shall be located near the septic tank. Alarm panel shall be listed by a third party nationally recognized testing laboratory (NEC Art. 110.2), per UL 508, and rated for indoor/outdoor use. The alarm panel shall also meet the following:

- a. Enclosure Type and Size: Minimum 6" high x 6" wide x 4" deep. Type 4X (IP 66).
- b. Audio Alarm: 95 dB at 24", warble-tone sound, gasketed, UL Type 4X (IP 66).
- c. Visual Alarm: 7/8" diameter red lens, "Push-to-silence." NEMA 4, 1-watt bulb, 120 VAC
- d. Audible Alarm Silence Relay: 120VAC, automatic reset

PART 5 TANK EFFLUENT PUMPING ASSEMBLIES

The pump package system shall be composed of:

5.01. *RISERS AND LIDS*

See PART 3.

5.02 PUMP VAULT

A precast concrete riser with a floor mounted aluminum access door shall be installed on top of the dosing tank to serve as the pump vault. One set of duplex submersible pumps will be installed inside the tank and accessible through the concrete vault as shown on the plans. The pump discharge will be sent in a flow-controlled manner to the new on-site drain field system for effluent treatment and disposal, via a new PVC force main.

5.03 DISCHARGE PIPE AND VALVE ASSEMBLY

Discharge assembly from each pump shall be 3-inch diameter and include 150 psi PVC ball valve, check valve, and Schedule 40 PVC pipe with cam coupler adapter for quick disconnect. A 3-inch pipe shall leave the vault and extend into the yard piping. All pipe penetrations through concrete walls shall be watertight.

5.04 FLOAT SWITCH ASSEMBLY

Float switch shall be mercury free Orenco Systems®, Inc. Model MFPBN with four (4) switch floats mounted on a rack and attached to the tank walls. The floats must be adjustable and must be removable without removing the pump. Minimum cord length shall be 30' per float. The high- and low-level alarms and on/off function shall be preset as shown in the **ENGINEER'S** plans. Each float lead shall be secured with a nylon strain relief bushing. The on/off float shall be rated for a minimum of 5.0A @ 120 VAC. A junction/splice box shall be furnished outside the vault for connecting to the electrical control wiring to the pump control panel.

5.05 EFFLUENT DOSING PUMP

All pumps shall comply with general requirements set forth in Part I (above). Each pump shall be capable of providing 80 gpm against a head of 32 feet. A duplex pump system shall be utilized.

5.06 ELECTRICAL SPLICE/JUNCTION BOX

NEMA 4X corrosion resistant junction boxes shall be furnished. The junction boxes shall be sized per the electrical contractor and be mounted with stainless steel anchors and hardware. Conduit seals shall be installed on all conduits entering or leaving the junction box. The box shall have a locking mechanism or furnished with captive cover screws to prevent unauthorized access.

5.07 CONTROLS AND ALARMS

Controls and alarms shall be listed by a third party nationally recognized testing laboratory, (NEC Art 110.2), per UL 508, and be approved for IWWS 2004.01 by the NC on-site wastewater section. Panels shall be repairable in the field without the use of soldering irons or substantial disassembly. They can be custom made, or pre-engineered units with the minimum components/capability listed below. One outdoor NEMA 4X duplex pump control panel shall be furnished and installed.

The control panel shall include the following components at a minimum:

- a. Motor-Start Contactor: 3 Phase, 208 VAC, 1hp, 25 FLA, 60 Hz; 2.5 million cycles at FLA (10 million at 50% of FLA).
- b. Toggle Switch for each pump: HOA switch. 25 amps, 1 hp.
- c. Load Center Circuit Breaker: 50 amps, OFF/ON switch. 3 phase, 208 VAC. DIN rail mounting with thermal magnetic tripping characteristics.
- d. Miscellaneous Circuit Breakers: 20 amps, OFF/ON switch. Single-pole 120 VAC. DIN rail mounting with thermal magnetic tripping characteristics.
- e. Pump Circuit Breaker for each pump: 25 amps, OFF/ON switch. 208 VAC, three phases. DIN rail mounting with thermal magnetic tripping characteristics.
- f. NEMA 4X Audio Alarm/Horn: 95 dB at 36", warble-tone sound, with auto reset.
- g. Visual Alarm/Beacon: 7/8" diameter red lens, "Push-to-silence." NEMA 4X, 1-watt bulb, 120 VAC
- h. Panel Enclosure: NEMA 4X rated with 208V, Three phase incoming service entrance circuit breaker. Constructed of Stainless Steel (14-gauge) with hinges and latch made of stainless steel, padlock hasp and padlock
- i. Panel Rating: 208 VAC, 3 hp, 50 amps, Three phase, 60 Hz.
- j. Internal components shall be mounted on a heavy-duty back plate.
- k. Provide pump alternation after each pump cycle.
- l. Redundant Off Relay: 120 VAC, provides a secondary off. Sounds alarm on low-level condition. DIN rail mount.
- m. Pump Run Light: 7/8" green lens. NEMA 4, 1-watt bulb, 120 VAC.
- n. Pump Combination Elapsed Time Meter and Cycle Counter for each pump: 120 VAC, 7-digit, non-resettable.
- o. Voltage Monitor
- p. Timer over-ride counter
- q. Include 120 VAC field adjustable timer switches for operating and resting the two pumps as described in Parts 6 and 7 of this Section. Each timer switch shall be capable of multiple timer settings.
- r. Provide intrinsically safe control relays.
- s. Provide float switch terminal block and timed delays on float inputs.
- t. Provide dual mode operation: Adjustable for timed and demand dosing.
- u. NEMA 4X Exterior Horn Test/Normal/Silence Switch
- v. Provide Ground lug

- w. 2 lockable hasps or one lockable hasp and 2 captive screws opposite the hinges of the NEMA 4X enclosure shall be furnished. Doors over 20" in height shall provide a lockable, 3-point latch system.
- x. Provide Anti-condensation heater.
- y. Phase loss monitor.
- z. Externally mounted lightning arrestor.
- aa. Comply with marking criterion of NEC Art.409.110

5.08 *Not Used.*

5.09 *INSTALLATION*

All pumping system components shall be installed in accordance with the **MANUFACTURER'S** recommendations, the **ENGINEER'S** plans, and all state and local regulations.

5.10 *LOCATION*

The pump control panel shall be mounted outdoors on a stand near the tank and pumps. The control panel shall be located within 40 feet from the pump vault and in sight of the pump motor and shall be provided with a lockable outdoor disconnect switch. The panel, when possible, should be mounted in the shade and protected from the weather. The panel should be located at a convenient height (usually about three to four feet above the ground depending on its actual size) and where it will be accessible for maintenance.

PART 6 MODE OF OPERATION

Raw sewage will flow from the existing maintenance "shop" building and the two office buildings into the proposed septic tank. This tank will serve to settle/separate the solids and floating scum from the "clear" water part. An effluent filter and a high-water level alarm/float switch will be installed inside the septic tank. The "clear" water from the septic tank will overflow into the EQ/Pump tank. The EQ/Pump tank will serve as a dosing tank to the new on-site treatment system and as a temporary storage basin during peak flow conditions. The dual effluent pumps will convey a controlled/steady flow to the new on-site treatment system. One (1) pump will normally be operating at a time. The second pump will be a standby unit, unless is used in a lead/lag scenario under high flows. The pumps will alternate after each use, so both pumps will see equal usage. Electronic timers and adjustable switches installed in the pump controls will control how much volume is sent into the new on-site treatment system, so the treatment system capacity is not exceeded. Local alarm notification will be provided via alarm horns/beacons from both the proposed septic and pump tanks.

PART 7 EQ/PUMP TANK – WATER LEVEL OPERATION

A low water level alarm will be provided at the elevation noted on the plans to protect the pump against running dry. Alarm notification will be provided locally.

A second float switch will be provided at the elevation noted on the plans to turn the pump(s) off and alternate pumps in the duplex pump control system. This elevation will be slightly higher than the minimum pump submergence elevation.

A redundant third float switch will be installed to activate/enable each lead pump to be used. When the PUMP H-O-A switch is turned in the AUTO position, the pump will **only** start based on the adjustable timer control settings, or unless the timer override float is tripped.

Initial Timer Control Settings:

Pump ON: 3 Minute Cycle
Pump OFF: 237 Minute Rest

Six pump cycles per day are expected during the system startup. The pump cycle and rest durations periodically may be field adjusted by the system operator to match system needs.

Depending on the incoming volume rate, water may accumulate inside the EQ/Pump tank. When the water level in the tank exceeds the lead pump elevation, the lead pump will be enabled. The lead pump will only come on based on the timer settings in the pump control panel.

If the water level in the tank rises to a pre-determined high-water elevation (4th float switch), the lag pump will come on to pump the tank water level down. An alarm notification shall be provided also. A timer override will enable both the lead and lag pumps to pump the water down in the tank.

When the pump H-O-A switch is turned into HAND, the operator shall be able to run on each pump manually.

PART 8 HYDROSTATIC TESTING

- A. The **CONTRACTOR** shall adhere rigorously to all hydrostatic testing procedures and requirements. Allowable AWWA leakages for yard piping shall not to be exceeded. Refer to DOT and AWWA standards, and these specifications for more details on hydrostatic testing. Zero leakage should be the goal. Refer to Part 2, Section 2.02 J. for precast concrete tank hydrostatic requirements. All new sewer lines (gravity and force mains), including the proposed drain field, shall be tested under this contract.
- B. Portions of the line that are critical should be left exposed throughout the hydrostatic test to allow visual inspection. Leaks detected visually should be repaired regardless of test results. The use of dye during initial filling and testing of a mainline section makes isolating leaks much easier especially in areas having high ground water.

- C. Check valve failure in service lines is difficult to diagnose and may misrepresent mainline integrity. Therefore, service line connections should remain closed until mainline testing has been completed. Accurate records must be kept assuring all service line connections have been opened after the mainline system has been approved.
- D. Testing long segments of line should be avoided whenever possible. A lengthy segment of line may pass the leakage test, yet still have an isolated leak that is excessive, and which could prove to be a problem later. Testing shorter segments of line reduces this possibility and more readily isolates any leaks. The most common recommendation is to limit the test length to $12,000/D$, where D is the diameter in inches and the length of the segment is in feet.
- E. Because air escapes from pipelines more rapidly than does liquid, it is important that all air is purged from a section of line prior to hydrostatic testing. Failure to do so may give misleading test results, possibly causing the section of line to appear to fail the test.
- F. All hydrostatic testing shall be field verified/approved by Owner's representative or as otherwise directed by DOT standards.

PART 9 SUPPORT, TRAINING, TESTING, AND OVERSIGHT

9.01 PRECONSTRUCTION CONFERENCE

Before any work at the site is started, a conference attended by the **OWNER, CONTRACTOR, ENGINEER, LOCAL HEALTH DEPARTMENT, and MANUFACTURERS (or their agents)** and others as appropriate will be held to establish a working understanding among the parties as to the work involved for installing each unit. At this conference, the **OWNER, CONTRACTOR, ENGINEER, and MANUFACTURER** shall designate, in writing, a specific individual to act as **INSPECTOR** for the installation of each unit. An approved sequence of construction shall also be established to accommodate contract and any local jurisdictional requirements during construction.

9.02 INSTALLATION AND FIELD-TESTING TRAINING

- A. The **MANUFACTURER** shall provide the services of a trained representative to instruct the installing **CONTRACTOR'S** crew and **INSPECTOR** regarding the proper installation and field testing of each unit per the **MANUFACTURER'S** recommendations and requirements. The **MANUFACTURER** shall have a trained representative provide installation and field-testing training services for a minimum of one (1) visit of a minimum of one (1) eight-hour day at the beginning of construction.

9.03 QUALITY CONTROL

- A. To ensure quality control, the **INSPECTOR** shall inspect and certify that an initial

installation of each unit is following the **MANUFACTURER'S** recommendations and requirements.

- B. Upon completion of the inspection, the **INSPECTOR**, in coordination with the **ENGINEER**, shall perform or direct the **CONTRACTOR** to perform any required adjustments to the equipment and place into operation under the supervision of the **ENGINEER**. All equipment and materials required to perform the testing shall be the responsibility of the **CONTRACTOR**. The completed inspection checklist shall be signed by the **INSPECTOR** and copies emailed or mailed to the **ENGINEER** and **MANUFACTURER** within one (1) week of the corresponding unit being installed and prior to System Commissioning.
- C. The **MANUFACTURER** shall provide the services of a trained representative for a minimum of one (1) visit of a minimum of one (1) eight-hour day for the purpose of quality control during construction.

9.04 *SYSTEM COMMISSIONING*

- A. The **MANUFACTURER** shall provide the services of a trained representative for training the **OWNER'S** service provider, and, when directed, randomly inspecting installations throughout the project. The inspection will include items described by manufacturer, as well as the effluent package, wiring, and control panel placement. Upon system commissioning, the **MANUFACTURER'S** trained representative shall provide the **ENGINEER** a written report of findings. The **ENGINEER** should then perform or direct the **CONTRACTOR** to perform any required adjustments to the equipment and place into operation. All equipment and materials required to perform additional testing shall be the responsibility of the **CONTRACTOR**.
- B. The **MANUFACTURER** shall provide the services of a trained representative for a minimum of one (1) visit of a minimum of one (1) eight-hour day for the purpose of system commissioning and training. Training for the new pump control panel, effluent filter, and septic tank alarm panel shall be provided and scheduled with the Owner.

9.05 *MANUFACTURER SITE VISITS*

- A. The **MANUFACTURER** shall provide the services of a **MANUFACTURER'S** agent for a minimum of three (3) visits of a minimum of one (1) eight-hour day each. The visits shall be for the following:
 - 1. INSTALLATION AND FIELD-TESTING TRAINING
 - 2. QUALITY CONTROL
 - 3. SYSTEM COMMISSIONING

9.06 *SPARE PARTS*

The **MANUFACTURER** shall provide spare parts for servicing the two (2) submersible pumps, a spare float switch, and spare components/fuses for servicing the pump control panel.

9.07 OPERATION AND MAINTENANCE

The **MANUFACTURER** shall provide five (5) operation and maintenance manuals, four (4) to be sent to the **OWNER**, and one (1) sent to the **ENGINEER**. Operation and Maintenance manuals shall include a signed copy by the **INSPECTOR'S INSTALLATION CHECKLIST** and Warranty Information.

PART 10 - PAYMENT

Payment pertaining to the items included in this section shall be paid based on the bid schedule and itemized breakdown.

Refer to Attachment 1: Authorization to Construct from Martin-Tyrell-Washington Counties



Martin-Tyrrell-Washington
DISTRICT HEALTH



Public Health
SAFER • HEALTHIER • PEOPLE

Wes Gray, MPA, MPH, Health Director

252.793.8029 (p) • 252.791.0108 (f) • mtwdistricthealth.org

CONSTRUCTION AUTHORIZATION
(Required for Building Permit)

The construction and installation requirements of Rules .1950, .1952, .1954, .1955, .1956, .1957, .1958, and .1959 are incorporated by reference into this permit and shall be met. Systems shall be installed in accordance with the attached system layout.

ISSUED TO: NCDOT **PROPERTY LOCATION:** NCDOT Creswell Maintenance Yard
ADDRESS: 112 Airport Dr., Suite 100 14193 NE Hwy 94 N.
 Edenton, NC 27932 Creswell, NC 27928

Facility Type: **Maintenance Facility** New Expansion Repair
 Basement? Yes No Basement Fixtures? Yes No
 Type of Wastewater System: Low Pressure Pipe Wastewater Flow: **1,075 GPD**

Installation Requirements/Conditions

Septic Tank Size: **Reference Engineered Plans, V & M Project No. 32120-05**
 Pump Tank Size: **Reference Plans.** Pump requirements: **Reference Plans** TDH vs. _____
 GPM(Reference Plans)

Total Trench Length: **2146 feet** Maximum Trench Depth of: **24-Inches Mound System**
 Trench Spacing: **9 Feet on Center.** Soil Cover: **6 inches minimum.**
 Aggregate Depth: **6 inches above pipe, 6 inches below pipe, 12 inches total**
Trench bottoms shall be level to +/- 1/4" in all directions. Maximum soil cover shall not exceed
 36" above trench bottom.

Conditions: See Page 2

****If applicable:**
I understand the system type specified is different from the type specified on the application. I accept the specifications of this permit.

Owner/Legal Representative Signature: _____ Date: _____

This Construction Authorization is subject to revocation if the site plan, plat, or the intended use changes. The Construction Authorization shall not be transferred when there is a change in ownership of the site. This Construction Authorization is subject to compliance with the provisions of the Laws and Rules for Sewage Treatment and Disposal and to the conditions of this permit.

Authorized State Agent: Michele C. Antwine, AHS Date of Issuance: 11-24-2021
 See Attached site sketch

Construction Authorization Expiration Date: 11-24-2026
 PAGE 1 OF 2

Martin County
 210 W. Liberty St.
 Williamston, NC 27982
 252.793.1816

Tyrrell County
 408 Bridge St
 Columbia, NC 27925
 252.763.1750

Washington County
 180 Hwy. 45 North
 Plymouth, NC 27662
 252.783.8026

END OF SECTION 13 46 01

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SECTION 14 00 00 MISCELLANEOUS WORK

PART -1 GENERAL

Modify Existing Grinder Pump Station #1;

The contractor shall remove existing piping, valves from Existing Grinder Pump Station #1 and replace the new piping and valves. Install a new 4' diameter, 12" tall fiber glass riser with top flange and cover by Associated Fiberglass Enterprises (AFE) or approved equal on the existing wet well.

Abandon Existing Lift Station #2;

Remove existing pump and control panel from existing pump station #2 and return to Owner. Remove existing lid and fill wet well with excavated soil material.

Drain field System;

The contractor shall install the dual zone low pressure drain field on fill as noted on the plans, per the requirements of the soil report, and in compliance with the local health department. All underground components on the drain field system shall be left exposed for field observation and testing prior to burial. Contractor to coordinate inspections with the Owner and the local health department. Fill material to meet the contract specifications shall be the Contractor's responsibility to locate and provide.

Electrical Work at the Shop Maintenance Building:

Contractor shall carefully access the existing electrical panel board in the shop maintenance building to disconnect power to the existing LS No.2 and to provide power to the new septic system. Commissioning the new systems and decommissioning existing units shall be the responsibility of the contractor to address and coordinate in a timely manner so that sewer service is not interrupted to the facility.

Soil Erosion Control:

Silt fencing and other soil erosion control measures (stone, hardware cloth, coir fiber wattle, seeding/mulching, etc.) shall be utilized by the contractor around the proposed tank excavation areas and the drain field area. Upon backfill of these areas, the site shall be seeded to establish a vegetative cover.

Traffic Control:

Contractor shall coordinate work with DOT traffic inside the DOT facility. All new sewer lines shall be promptly tested and covered to minimize traffic interference.

PART 2- PAYMENT

Associated work shall be paid per bid schedule and itemized breakdown.

END OF SECTION 14 00 00

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SECTION 26 00 00 - BASIC ELECTRICAL REQUIREMENTS

PART 1 GENERAL

0.1 SECTION INCLUDES

- A. Basic Electrical Requirements, specifically applicable to Division 26 Sections, in addition to Division 1 - General Requirements.

0.2 SUMMARY OF WORK

- A. General: The intent of this contract is to provide necessary electrical equipment, wiring, and related services for the installation of a new duplex effluent pump station in the new dosing pump tank, installation of a float and alarm panel in the new septic tank, decommissioning the existing grinder LS No. 2, and connection to the existing electrical service panel in the existing maintenance building.

- B. General Summary of Work: The work of the Contract includes, but not limited to the following:

Installation of service breakers and equipment control panels.

Grounding system.

Raceways, conductors, boxes, fittings, conduit seals and accessories.

Wiring to control panels and equipment.

Control wiring: Level sensor, floats, dry contacts, etc.

Incidental items required to provide a complete and useable project.

Permits and Utility coordination.

- C. Definition: Definition and terms used in this Division are essential to the Designer and the Contractor's relationship. Therefore, the following references are given:

NEC-2014.

North Carolina Code Requirements (latest version).

0.3 ALTERNATES

- A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted Alternates will be identified in Owner-Contractor Agreement.
- B. Coordinate related work and modify surrounding work as required by alternates.
- C. No alternates have been established for this project.

0.4 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code 2014.
- B. IEEE - Standard Electrical and Electronic Terms.

0.5 SUBMITTALS

- A. Submit under provisions of the General Conditions.
- B. Proposed Products List: Include Products specified in the following:
 - 1. Raceway and conductors
 - 2. Disconnects and transmissions
 - 3. Breakers
 - 4. Fixtures and devices
 - 5. Pump control panels
- C. Submit shop drawings and product data grouped to include complete submittals of related systems, products, and accessories in a single submittal.
- D. Mark dimensions and values in units to match those specified.

0.6 REGULATORY REQUIREMENTS

- A. Conform to International Building Code for electrical installations.
- B. Electrical: Conform to NFPA 70 - 2014.
- C. General: Conform to National Electrical Code and local electric system.
- D. Obtain permits, and request inspections from authority having jurisdiction.

0.7 PROJECT/SITE CONDITIONS

- A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

- B. Prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Engineer before proceeding.

PART 2- PRODUCTS

Not used.

PART 3- EXECUTION

3.1 CONTRACTOR'S USE OF PREMISES

- A. General: The Contractor shall limit his use of the premises to the work indicated so as to allow for Owner's occupancy.

Use of the Site: Confine operations at the site to the areas permitted under the Contract. Portions of the site beyond areas on which work is indicated are not to be disturbed. Conform to site rules and regulations affecting the work while engaged in project construction.

Do not unreasonably encumber the site with materials or equipment. Confine stockpiling of materials and location of storage sheds to the job site. If off-site storage is necessary, the contractor shall obtain any pay for such storage.

- B. Rough In:

Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected.

- C. Electrical Installations:

Coordinate electrical equipment and materials installation with other components.

Verify all dimensions by field measurements.

Arrange for chases, slots, and openings in other components to allow for electrical installations.

Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

Coordinate the cutting and patching of components to accommodate the installation of electrical equipment and materials.

Coordinate the installation of electrical materials and equipment above

ceilings with suspension system, mechanical equipment and systems, and structural components.

D. Cutting and Patching:

This Article specifies the cutting and patching of electrical equipment, components, and materials to include removal and legal disposal of selected materials, components, and equipment.

No additional compensation will be authorized for cutting and patching work that is necessitated by ill-timed, defective, or non-conforming installations.

Perform cutting, fitting, and patching of electrical equipment and materials required to:

uncover Work to provide for installation of ill-timed work;

remove and replace defective work;

remove and replace work not conforming to requirements of the Contract Documents;

remove samples of installed work as specified for testing;

install equipment and materials in existing structures;

upon written instructions from the Engineer uncover and restore work to provide for observation of concealed work.

Cut, remove, and legally dispose of selected electrical equipment, components, and materials as indicated, including, but not limited to removal of electrical items indicated to be removed and items made obsolete by the new Work.

E. Construction Record Documents:

Mark Drawings to indicate revisions to conduit size and location both exterior and interior; actual equipment locations, dimensioned for column lines; concealed equipment, dimensioned to column lines; distribution and branch electrical circuitry; fuse and circuit breaker size and arrangements; support and hanger details; Change Orders; concealed control system devices.

Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

F. Codes, Permits, & Fees:

The Contractor shall give all necessary notices, including electric and

telephone utilities, obtain all permits, and pay all government taxes, fees, and other costs, including utility connection with his work; file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Engineer before request for acceptance and final payment for the work.

Work and materials shall conform to the latest rules of the National Board of Fire Underwriters' Code, Regulations of the State Fire Marshal, and with applicable local codes and with all prevailing rules and regulations pertaining to adequate protection and/or guarding of any moving parts, or otherwise hazardous conditions. Nothing in these Specifications shall be construed to permit work not conforming to the most stringent of applicable codes.

The National Electrical Code, the local electric code, and the electrical requirements as established by the State and Local Fire Marshal, and rules and regulations of the power company serving the project, are hereby made part of this Specification. Should any changes be necessary in the Drawings or Specifications to make the work comply with these requirements, the Contractor shall notify the Engineer before proceeding with the work.

Compile and assemble the warranties specified into a separated set of vinyl covered, three ring binders, tabulated, and indexed for easy reference.

PART 4 - PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 00 00

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SECTION 26 05 00 ELECTRICAL DEMOLITION

PART 1- GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removal of existing electrical equipment, wiring, and conduit in areas required, removal of designated construction; dismantling, cutting and alterations for completion of the Work.
 - 2. Disposal of materials.
 - 3. Storage of removed materials.
 - 4. Identification of utilities.
 - 5. Salvaged items.
 - 6. Protection of items to remain as indicated on Drawings.
 - 7. Relocate existing equipment to accommodate construction.

PART 2- PRODUCTS

Not used.

PART 3- EXECUTION

3.1 SEQUENCING

- A. Summary: Requirements for sequencing.
- B. Sequence and schedule work as indicated on Drawings and approved by Owner:

3.2 COORDINATION

- A. Administrative Requirements: Requirements for coordination.
- B. Conduct demolition to minimize interference with adjacent building areas.
- C. Coordinate demolition work with other trades.
- D. Coordinate and sequence demolition so as not to cause shutdown of operation of surrounding areas.
- E. Shut-down Periods:
 - 1. Arrange shut-down of existing panels a minimum of 72 hours in advance with Owner. Do not shut down any utility without prior written approval.

2. Keep shut-down period to minimum or use intermittent period as directed.
3. Maintain life-safety systems in full operation in occupied facilities.
4. Identify salvage items in cooperation with Owner.

3.3 EXAMINATION

A. Administrative Requirements:

1. Verification of existing conditions before starting work.
2. Verify wiring and equipment indicated to be demolished serve only abandoned facilities.
3. Verify termination points for demolished services.

3.4 PREPARATION

- A. Erect, and maintain temporary safeguards, including warning signs and lights, barricades, and similar measures, for protection of the public, Owner, Contractor's employees, and existing improvements to remain.
- B. Arrange for temporary egress signage and emergency lighting where necessary.

3.5 DEMOLITION

- A. Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- B. Remove conduit, wire, boxes, and fastening devices back to new connection.
- C. Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- D. Reconnect any equipment being disturbed by renovation work and required for continued service.
- E. Disconnect or shut off service to areas where electrical work is to be removed. Remove electrical fixtures, equipment, and related switches, outlets, conduit and wiring which are not part of final project.

- F. Install temporary wiring and connections to maintain existing systems in service during construction if required.
- G. Perform work on energized equipment or circuits with experienced and trained personnel.
- H. Remove, relocate, and extend existing installations to accommodate new construction.
- I. Repair adjacent construction and finishes damaged during demolition and extension work.
- J. Remove exposed abandoned grounding and bonding components, fasteners and supports, and electrical identification components. Cut embedded support elements flush with walls and floors.
- K. Clean and repair existing equipment to remain or to be reinstalled.
- L. Protect and retain power to existing active equipment remaining.
- M. Cap abandoned empty conduit at both ends.
- N. If circuitry within the area of demolition serves equipment located outside the boundaries of the demolition, the continuity of the circuits shall be maintained as required to keep the equipment operational. Provide backfeed to panel as necessary.

3.6 EXISTING PANELBOARDS

- A. Ring out circuits in existing panel affected by the Work. Where additional circuits are needed, reuse circuits available for reuse. Install new breakers where necessary.
- B. Tag unused circuits as spare.
- C. Where existing circuits are indicated to be reused, use sensing measuring devices to verify circuits feeding Project area or are not in use.
- D. Remove existing wire no longer in use from panel to equipment.
- E. Provide new updated directories where more than three circuits have been modified or rewired.

3.7 SALVAGE ITEMS

- A. Remove and protect items to be salvaged and turn over to Owner for right of first refusal. Any materials rejected by owner shall be removed from the premises by contractor.
- B. Items of salvageable value may be removed as work progresses. Transport salvaged items from site as they are removed.

3.8 REUSABLE ELECTRICAL EQUIPMENT

- A. Carefully remove equipment, materials, or fixtures which are to be reused.
- B. Disconnect, remove, or relocate existing electrical material and equipment interfering with new installation.
- C. Relocate existing lighting fixtures as indicated on Drawings. Clean fixtures and re-lamp. Test fixture to see if it is in good working condition before installation at new location.
- D. The contractor may reuse existing concealed conduit and recessed device boxes where appropriately located. Verify the equipment is in satisfactory condition, and properly supported. Existing devices, wiring and faceplates shall not be re-used.

3.9 CLEANING

- A. Execution Requirements: Requirements for cleaning.
- B. Remove demolished materials as work progresses. Legally dispose.
- C. Keep workplace neat.

3.10 PROTECTION OF FINISHED WORK

- A. Execution Requirements: Requirements for protecting finished Work.
- B. Do not permit traffic over unprotected floor surface.

PART 4 - PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 05 00

SECTION 26 10 10 - CONDUIT

PART 1 - GENERAL

A. SECTION INCLUDES

1. Metal conduit, galvanized.
2. Flexible metal conduit.
3. Liquidtight flexible metal conduit.
4. Nonmetal conduit.
5. Fittings and conduit bodies.

B. REFERENCES

1. ANSI C80.1 - Rigid Steel Conduit, Zinc Coated.
2. ANSI C80.5 - Rigid Aluminum Conduit.
3. ANSI/NEMA FB 1 - Fittings, Cast Metal Boxes, and Conduit Bodies for Conduit and Cable Assemblies.
4. ANSI/NFPA 70 - National Electrical Code.
5. NECA "Standard of Installation."
6. NEMA RN 1 - Polyvinyl Chloride (PVC) Externally Coated Galvanized Rigid Steel Conduit and Intermediate Metal Conduit.
7. NEMA TC 3 - PVC Fittings for Use with Rigid PVC Conduit and Tubing.

C. DELIVERY, STORAGE, AND HANDLING

1. Deliver, store, protect, and handle Products to site.
2. Accept conduit on site. Inspect for damage.
3. Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
4. Protect PVC conduit from sunlight.

PART 2 - PRODUCTS

A. CONDUIT REQUIREMENTS

1. Minimum Size: 3/4 inch (19 mm) unless otherwise specified.
2. Underground Installations:
 - a. Use rigid steel galvanized conduit.
 - b. In or Under Slab on Grade: Use rigid steel galvanized conduit or thick wall nonmetallic conduit.
 - c. Minimum Size: 3/4 inch (19 mm).
3. Outdoor Locations, Above Grade: Use rigid steel galvanized.
4. In Slab Above Grade:
 - a. Use rigid steel galvanized conduit or intermediate metal conduit.
5. Wet and Damp Locations: Use rigid, thick wall nonmetallic conduit.
6. Conduit Seals: Use listed seal fittings and materials for hazardous locations as required and as specifically noted on the drawings.

B. METAL CONDUIT

1. Manufacturers:
 - a. Allied Tube.
 - b. LTV Steel.
 - c. Wheatland Tube.
 - d. Substitutions:
2. Rigid Steel Galvanized Conduit: ANSI C80.1.
3. Intermediate Metal Conduit (IMC): Rigid steel.
4. Fittings and Conduit Bodies: ANSI/NEMA FB 1; material to match conduit, aluminum fittings may be used with steel galvanized conduit.

C. PVC COATED METAL CONDUIT

1. Manufacturers:
 - a. Anamet.
 - b. Bay State Wire & Cable.
 - c. Robroy.
2. Description: NEMA RN 1; rigid steel galvanized conduit with

- external PVC coating, 40 mil (0.1 mm) thick.
3. Fittings and Conduit Bodies: ANSI/NEMA FB 1; steel fittings with external PVC coating to match conduit.

D. LIQUIDTIGHT FLEXIBLE METAL CONDUIT

1. Manufacturers:
 - a. Alflex.
 - b. AFC.
 - c. Hubbell.
2. Description: Interlocked steel construction with PVC jacket.
3. Fittings: ANSI/NEMA FB 1.

E. NONMETALLIC CONDUIT

1. Manufacturers:
 - a. Carlon.
 - b. Bay State Wire & Steel.
 - c. Thomas & Betts.
2. Description: NEMA TC 2; Schedule 80 PVC.
3. Fittings and Conduit Bodies: NEMA TC 3.

PART 3 - EXECUTION

A. INSTALLATION

1. Install conduit in accordance with NECA "Standard of Installation."
2. Install nonmetallic conduit in accordance with manufacturer's instructions.
3. Arrange supports to prevent misalignment during wiring installation.
4. Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
5. Fasten conduit supports to structure and surfaces.
6. Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports
7. Arrange conduit to maintain neat appearance.
8. Route conduit parallel and perpendicular.

9. Route conduit in and under slab from point-to-point.
10. Do not cross conduits.
11. Maintain adequate clearance between conduit and piping.
12. Maintain 12-inch (300 mm) clearance between conduit and surfaces with temperatures exceeding 104°F (40°C).
13. Cut conduit square using saw or pipecutter; de-burr cut ends.
14. Bring conduit to shoulder of fittings; fasten securely.
15. Join nonmetallic conduit using cement as recommended by manufacturer. Wipe nonmetallic conduit dry and clean before joining. Apply full even coat of cement to entire area inserted in fitting. Allow joint to cure for 20 minutes, minimum.
16. Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
17. Install no more than equivalent of three 90-degree bends between boxes. Use conduit bodies to make sharp changes in direction, as around beams. Use hydraulic one-shot bender to fabricate factory elbows for bends in metal conduit larger than 2 inch (50 mm) size.
18. Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
19. Provide suitable pull string in each empty conduit except sleeves and nipples.
20. Use suitable caps to protect installed conduit against entrance of dirt and moisture.
21. Ground and bond conduit under provisions of NEC.
22. Identify conduit.
23. Conduit Seals (Hazardous Locations): Install duct sealing fittings at accessible locations in accordance with NFPA 70 and fill them with listed sealing compound. For concealed duct raceways, install fitting in flush steel box with blank cover plate having finish similar to that of adjacent plates or surfaces. Install duct sealing fittings in accordance with NFPA 70, Article 500, Class and Division as noted on the drawings.

PART 4 - PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 10 10

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SECTION 26 10 23 - WIRES AND CABLES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Wire and cable.
- B. Metal clad cable.
- C. Wiring connectors and connections.

1.2 RELATED SECTIONS

- A. Section 16111 - Conduit.
- B. Section 16130 - Boxes.
- C. Section 16195 - Identification.

1.3 REFERENCES

- A. ANSI/NFPA 70 - National Electrical Code.

1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years experience.

PART 2 - PRODUCTS

2.1 MANUFACTURERS - WIRE AND CABLE

- A. Southwire.
- B. Carol Cable Co.
- C. Houston.

2.2 WIRE AND CABLE

- A. Description: Multi (stranded) conductor insulated wire.
- B. Conductor: Copper
- C. Insulation Voltage Rating: 600 volts.
- D. Insulation: ANSI/NFPA 70, Type THHN/THWN rated 90 degrees C.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify that interior of panels has been protected from weather.
- B. Verify that work likely to damage wire and cable has been completed.

3.2 PREPARATION

- A. Completely and thoroughly swab raceway before installing wire.

3.3 INSTALLATION

- A. Install products in accordance with manufacturer's instructions.
- B. Use stranded conductor for feeders and branch circuits.
- C. Use stranded conductors for control circuits.
- D. Use conductor not smaller than 12 AWG for power and lighting circuits.
- E. Use conductor not smaller than 12 AWG for control circuits.
- F. Use 10 AWG conductors for 20 ampere, 120-volt branch circuits longer than 75 feet (23 m).
- G. Pull all conductors into raceway at same time.
- H. Use suitable wire pulling lubricant for wire 4 AWG and larger.
- I. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- J. Clean conductor surfaces before installing lugs and connectors.
- K. Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.
- L. Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- M. Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- N. Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.

3.4 INTERFACE WITH OTHER PRODUCTS

- A. Identify each conductor with its circuit number or other designation indicated on Drawings.

3.5 FIELD QUALITY CONTROL

- A. Inspect wire for physical damage and proper connection.
- B. Measure tightness of bolted connections and compare torque measurements with manufacturer's recommended values.
- C. Verify continuity of each branch circuit conductor.
- D. Verify continuity of grounded conductor.

PART 4 - PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 10 23

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SECTION 26 10 30 – ELECTRICAL BOXES

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Outlet boxes.
- B. Pull and junction boxes.

1.2 REFERENCES

- A. ANSI/NEMA FB 1 - Fittings and Supports for Conduit and Cable Assemblies.
- B. ANSI/NEMA OS 1 - Sheet-steel Outlet Boxes, Device Boxes, Covers, and Box Supports.
- C. ANSI/NEMA OS 2 - Nonmetallic Outlet Boxes, Device Boxes, Covers and Box Supports.
- D. ANSI/NFPA 70 - National Electrical Code.
- E. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

PART 2 - PRODUCTS

2.1 OUTLET BOXES

- A. Sheet Metal Outlet Boxes: ANSI/NEMA OS 1, galvanized steel.
 - 1. Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 2 inch (13 mm) male fixture studs where required.
 - 2. Concrete Ceiling Boxes: Concrete type.
- B. Nonmetallic Outlet Boxes: ANSI/NEMA OS 2.
- C. Cast Boxes: NEMA FB 1, Type FD, aluminum, cast ferrous alloy. Provide gasketed cover by box manufacturer.

2.2 PULL AND JUNCTION BOXES

- A. Sheet Metal Boxes: NEMA OS 1, galvanized steel.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install electrical boxes as shown on Drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- B. Install electrical boxes to present neat mechanical appearance.
- C. Support boxes independently of conduit, except cast box that is connected to two rigid metal conduits both supported within 12 inches (300 mm) of box.
- D. Use gang box where more than one device is mounted together. Do not use sectional box.
- E. Use cast outlet box in exterior locations exposed to the weather and wet locations.
- F. Large Pull Boxes: Boxes larger than 100 cubic inches (1 600 cubic centimeters) in volume or 12 inches (300 mm) in any dimension.
 - 1. Use surface-mounted cast metal box.

3.2 INTERFACE WITH OTHER PRODUCTS

- A. Coordinate installation of outlet box.
- B. Coordinate locations and sizes of required access doors with other Divisions.

PART 4 - PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 10 30

SECTION 26 10 40 - ELECTRICAL CONNECTIONS

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of electrical connections for equipment is indicated by drawings and schedules. Electric connections are hereby defined to include, but not necessarily limited to, connections for providing electrical power to equipment, control wiring connections, communication connections.
- B. Types of electrical power and electrical system connections specified in this section includes, but is not limited to the following:
 - 1. To motors.
 - 2. To equipment.
 - 3. To resistance heaters.
 - 4. To HVAC equipment.
 - 5. To motor starters.
 - 6. To motor control equipment.
 - 7. From motor starters to motors.
 - 8. To plumbing equipment.
 - 9. To lighting fixtures.
 - 10. To transformers, inverters, rheostats, and similar current adjustment features of equipment.
 - 11. To ground.
 - 12. To master units of communication, signal, and alarm.
- C. Motor starters and controls not furnished integrally with equipment are specified in applicable Electrical work sections along with installation specifications.

- D. Refer to other specification sections for motor starters and controls furnished with equipment; not work of this section.
- E. Junction boxes and disconnect switches required for motors and other electrical units of equipment are specified in applicable Electrical work sections.
- F. Refer to other specifications sections and the drawings for control system wiring work described and installed under Electrical work.
- G. Refer to specification sections and plans of other work Divisions for specific individual equipment power requirements.
- H. Furnish all labor and material and making power connections to all electric equipment furnished under the Architectural, Plumbing, Heating, Air Conditioning, and Equipment sections of the specifications and plans.
- I. Provide the electrical installation of all control devices, mount all electrical equipment not furnished as an integral part of the equipment, all control and power conduit, wiring, disconnect switches, etc., to make the installation functional and per latest NEC requirements.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. AMP Products Corp.
 - 2. Appleton Electric Co.
 - 3. Burndy Corp.
 - 4. Ideal Industries, Inc.
 - 5. T and B/Thomas and Betts Corp.

2.2 MATERIALS AND COMPONENTS

- A. General: For each electrical connection indicated, provide complete assembly of materials, including but not necessarily limited to, pressure connectors, terminals (lugs), electrical insulating tape,

electrical solder, electrical soldering flux, heat-shrinkable insulating tubing, cable ties, solderless wire nuts, and other items and accessories as needed to complete splices and terminations of types indicated.

- B. Metal Conduit, Tubing and Fittings: Provide metal conduit, tubing and fittings of types, grades, sizes and weights (wall thicknesses) indicated for each type service. Where types and grades are not indicated, provide proper selection as determined by Installer to fulfill wiring requirements; comply with NEC requirements for raceways. Provide products complying with Electrical Work basic materials and methods section "Raceways", and in accordance with the raceway material required for the project.
- C. Wire, Cable, and Connectors: Provide wires, cables, and connectors complying with Electrical Work basic materials and methods section "Wires and Cables".
- D. Wire: Unless otherwise indicated, provide wires/conductors for electrical connections which match wires/conductors of wiring supplying power.
- E. Connectors and Terminals: Provide electrical connectors and terminals as recommended by connector and terminal manufacturer for intended applications.
- F. Electrical Connection Accessories: Provide electrical insulating tape, heat-shrinkable insulating tubing and boots, solder, electrical soldering flux, wire nuts and cable ties as recommended for use by accessories manufacturers for type services indicated. Only twist-on type wire nuts will be permitted for branch circuit wiring.

PART 3 - EXECUTION

3.1 INSTALLATION OF ELECTRICAL CONNECTIONS

- A. Install electrical connections as indicated; in accordance with connector manufacturer's written instructions and with recognized industry practices and complying with requirements of NEC and NECA's "Standard of Installation" to ensure that products fulfill requirements.
- B. Connect electrical power supply conductors to equipment conductors in accordance with equipment manufacturer's written instructions and wiring diagrams. Wherever possible, mate and

match conductors of electrical connections for proper interface between electrical power supplies and installed equipment.

- C. Coordinate installation of electrical connections for equipment with equipment installation work.
- D. Cover splices with electrical insulation equivalent to, or of higher rating, than insulation on conductors being spliced.
- E. Prepare cables and wires by cutting and stripping covering armor, jacket, and insulation properly to ensure uniform and neat appearance where cables and wires are terminated.
- F. Trim cables and wires as short as practicable and arrange routing to facilitate inspection, testing and maintenance. G. Tighten wire-binding connector screws firmly.
- G. Provide flexible conduit for motor connections, and for other electrical equipment connections where subject to movement and vibration.
- H. Provide liquid-tight metallic flexible conduit for connection of motors and for other electrical equipment where subject to movement and vibration, and also where subjected to one or more of the following conditions:
 - 1. Exterior location.
 - 2. Moist or humid atmosphere where condensate can be expected to accumulate.
 - 3. Corrosive atmosphere.
 - 4. Subjected to water spray.
 - 5. Subjected to dripping oil, grease, or water.
- I. Refer to basic materials and methods section for identification of electrical power supply conductor terminations with markers approved as to types, colors, letter and marker sizes, by Engineer. Affix markers at each point of termination, as close as possible to each point of connection.

PART 4 - PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 10 40.

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SECTION 26 10 70 - GROUNDING AND BONDING

PART 1 - GENERAL

- A. SECTION INCLUDES
 - 1. Grounding electrodes and conductors.
 - 2. Equipment grounding conductors.
 - 3. Bonding.
- B. REFERENCES
 - 1. ANSI/NFPA 70 - National Electrical Code.
- C. GROUNDING ELECTRODE SYSTEM
 - 1. Metal underground water pipe, if available.
 - 2. Metal frame of the building/pump station.
 - 3. Concrete-encased electrode.
 - 4. Rod electrodes.
- D. PERFORMANCE REQUIREMENTS
 - 1. Grounding System Resistance: 5 ohms.

PART 2 - PRODUCTS

- A. WIRE
 - 1. Material: Stranded Copper.
 - 2. Grounding Electrode Conductor: Size to meet NFPA 70 requirements.

PART 3 - EXECUTION

A. EXAMINATION

1. Verify that final backfill and compaction has been completed before driving rod electrodes.

B. INSTALLATION

1. Install Products in accordance with manufacturer's instructions.
2. Install rod electrodes at locations indicated. Install additional rod electrodes as required to achieve specified resistance to ground.
3. Provide grounding well pipe with cover at rod locations where indicated. Install well pipe top flush with finished grade.
4. Provide grounding electrode conductor and connect to reinforcing steel in foundation footing.
5. Provide bonding to meet Regulatory Requirements and NEC.
6. Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.

C. INTERFACE WITH OTHER PRODUCTS

1. Interface with site grounding system.
2. Interface with lightning protection system.

D. FIELD QUALITY CONTROL

1. Inspect grounding and bonding system conductors and connections for tightness and proper installation.
2. Use suitable test instrument to measure resistance to ground of system. Perform testing in accordance with test instrument manufacturer's recommendations using the fall-of-potential method.

PART 4 - PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 10 70

SECTION 26 10 80 - OVERCURRENT PROTECTIVE DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. Extent of overcurrent protective device work is indicated by drawings, schedules, and code requirements.
- B. Types of overcurrent protective devices in this section include the following:
 - 1. Circuit breakers.
 - 2. Fuses.
- C. Provide overcurrent protection for all electrical work.
- D. Maintenance Stock, Fuses: For types and ratings required, furnish additional fuses, amounting to one unit for every 5 installed units, but not less than one unit of each.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work include, but are not limited to, the following:
 - 1. Circuit Breakers:
 - a. General Electric Co.
 - b. Siemens
 - c. Square D Co.
 - d. Cutler-Hammer
 - 2. Fuses:
 - a. Bussmann Mfg Co.
 - b. Littelfuse Co.

2.2 CIRCUIT BREAKERS

- A. General: Except as otherwise indicated, provide circuit breakers and ancillary components, of types, sizes, ratings and electrical characteristics indicated or required, which comply with manufacturer's standard design, materials, components, and construction in accordance with published product information, and as required for a complete installation.
- B. Molded-Case Circuit Breakers: Provide factory-assembled, molded-case circuit breakers amperes rated as indicated on the drawings, 600-Volts for 480-Volt system and 240-Volts for 208-Volt system, 60 HZ, 3-pole or single-pole as indicated with RMS symmetrical interrupting ratings as required by the application and location within the distribution system. Provide breakers with permanent thermal and instantaneous magnetic trips in each pole, ampere ratings as indicated. Construct with overcenter, trip-free, toggle type operating mechanisms with quick-make, quick-break action and positive handle indication. Provide push-to-trip button on cover for mechanically tripping circuit breakers. Construct breakers for mounting and operating in any physical position and in an ambient temperature of 40 C. Provide with mechanical screw type removable connector lugs, AL/CU rated.

2.3 FUSES

- A. General: Except as otherwise indicated, provide fuses of types, sizes and ratings and electrical characteristics indicated or required, which comply with manufacturer's standard design, materials, and construction in accordance with published product information, and with industry standards and configurations.
- B. Class L Fuses: Provide NEMA Class L fuses in current ratings indicated or required, for service entrances and main and feeder circuits.
- C. Class J (K-5) Fuses: Provide NEMA Class J (K-5), dual-element types, with time delay of 10 seconds at 500% of rating, for use with switches.
- D. Where equipment nameplate requires a specific fuse, the required fuse shall be furnished.

PART 3 - EXECUTION

3.1 INSTALLATION OF OVERCURRENT PROTECTIVE DEVICES

- A. Install overcurrent protective devices as indicated or required, in accordance with the manufacturer's written instructions and with recognized industry practices to ensure that protective devices comply with requirements. Comply with NEC and NEMA standards for installation and application of overcurrent protective devices.
- B. Coordinate with other work, including electrical wiring work, as necessary to interface installation of overcurrent protective devices with other work.
- C. Fasten circuit breakers without mechanical stresses, twisting or misalignment being exerted by clamps, supports, or cables.
- D. Set field-adjustable circuit breakers for trip settings as indicated, subsequent to installation of devices.
- E. Install fuses, if any, in fused circuit breakers and fused disconnect switches.

3.2 ADJUST AND CLEAN

- A. Inspect circuit-breaker operating mechanisms for malfunctioning and, where necessary, adjust units for free mechanical movement.

3.3 FIELD QUALITY CONTROL

- B. Prior to energization of overcurrent protective devices, test devices for continuity of circuitry and for short-circuits. Correct malfunctioning units, and then demonstrate compliance with requirements.

PART 4- PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 10 80

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SECTION 26 10 90 - SUPPORTING DEVICES

PART 1- GENERAL

General: Provide supporting devices which comply with manufacturer's standard materials, design and construction in accordance with published product information, and as required for complete installation; and as herein specified.

PART 2- PRODUCTS

Supports: Provide supporting devices of types, sizes and materials indicated; and having the following construction features:

Clevis Hangers: For supporting 2" rigid metal conduit; galvanized steel; with 2" diameter hole for round steel rod; approx. 54 pounds per 100 units.

C-Clamps: Black malleable iron; 2" rod size; approx. 70 pounds per 100 units.

Anchors: Provide anchors of types, sizes and materials indicated; and having the following construction features:

Lead Expansion Anchors: 2"; approx. 38 pounds per 100 units.

Toggle Bolts: Springhead; 3/16" x 4"; approx. 5 pounds per 100 units.

PART 3- EXECUTION

Install hangers, supports, clamps and attachments to support piping properly from structure. Arrange for grouping of parallel runs of horizontal conduits to be supported together. Install supports with spacings indicated and in compliance with NEC requirements.

PART 4- PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 10 90

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SECTION 26 10 95 - ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

- A. WORK INCLUDED
 - 1. Nameplates and tape labels.
 - 2. Wire and cable markers.
 - 3. Conduit color coding.

PART 2 - PRODUCTS

- A. MATERIALS
 - 1. Nameplates: Engraved three-layer laminated plastic, black letters on a white background.
 - 2. Pre-printed plastic tape labels.
 - 3. Wire and Cable Markers: Cloth markers, split sleeve or tubing type.

PART 3 - EXECUTION

- A. INSTALLATION
 - 1. Degrease and clean surfaces to receive nameplates and tape labels.
 - 2. Install nameplates and tape labels parallel to equipment lines.
 - 3. Secure nameplates to equipment fronts using screws, rivets, or adhesive. Secure nameplate to inside face of recessed panelboard doors in finished locations.
 - 4. Embossed tape will not be permitted for any application.
- B. WIRE IDENTIFICATION
 - 1. Provide wire markers on each conductor in panelboard gutters, pull boxes, outlet and junction boxes, and at load connection. Identify with branch circuit or feeder number for power and lighting circuits, and with control wire number as indicated on equipment manufacturer's shop drawings for control wiring.

C. NAMEPLATE ENGRAVING SCHEDULE

1. Provide nameplates to identify all electrical distribution and control equipment, and loads served. Letter Height: 1/4 inch (6 mm) for individual switches and loads served, 1/4 inch (6 mm) for distribution and control equipment identification.
2. Provide nameplates of minimum letter height as scheduled below.
3. Panelboards, Switchboards and Motor Control Centers: 1/4 inch (6 mm); identify equipment designation. 1/4 inch (6 mm); identify voltage rating and source.
4. Individual Circuit Breakers, Switches, and Motor Starters In Panelboards, Switchboards, and Motor Control Centers: 1/8 inch (3 mm); identify circuit and load served, including location.
5. Individual Circuit Breakers, Enclosed Switches, and Motor Starters: 1/8 inch (3 mm); identify load served.
6. Transformers: 1/4 inch (6 mm); identify equipment designation. 1/8 inch (3 mm); identify primary and secondary voltages, primary source, and secondary load and location.

D. CONDUIT COLOR CODING SCHEDULE

1. Use colored tape to identifying conduit by system.
2. 208 Volt, Single and Three Phase System: Yellow.

Wiring Color Code:

120/208 Volt

| | | | | |
|-------|---------|------------|-----------|------------|
| Black | Phase A | | | |
| Red | | Phase B | | |
| Blue | | Phase C | | |
| White | | Neutral | (Grounded | |
| | | Conductor) | | |
| Green | | Equipment | Ground | (Grounding |
| | | Conductor) | | |

PART 4 -PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 10 95

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SECTION 26 11 40 - WIRING DEVICES

PART 1 - GENERAL

1.1 DESCRIPTION OF WORK

- A. The extent of wiring device work is indicated by drawings and schedules. Wiring devices are defined as single discrete units of electrical distribution systems which are intended to carry but not utilize electric energy.
- B. Types of electrical wiring devices in this section include the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Twist-locking receptacles.
 - 3. Isolated-ground receptacles.
 - 4. Tamper-resistant receptacles.
 - 5. Weather-resistant receptacles.
 - 6. Snap switches.
 - 7. Wall-switch and exterior occupancy sensors.
 - 8. Communications outlets.
 - 9. Pendant cord-connector devices.
 - 10. Cord and plug sets.
 - 11. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.2 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - A. Cord and Plug Sets: Match equipment requirements.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.

- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 ADMINISTRATIVE REQUIREMENTS

- A. Coordination:
 - 1. Receptacles for Owner-Furnished Equipment: Match plug configurations.
 - 2. Cord and Plug Sets: Match equipment requirements.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Samples: One for each type of device and wall plate specified, in each color specified.

1.6 INFORMATIONAL SUBMITTALS

- A. Field quality-control reports.

1.7 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing-label warnings and instruction manuals that include labeling conditions.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; Division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Pass & Seymour/Legrand (Pass & Seymour).
- B. Source Limitations: Obtain each type of wiring device and associated wall plate from single source from single manufacturer.

2.2 GENERAL WIRING-DEVICE REQUIREMENTS

- A. Wiring Devices, Components, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.
- C. Devices that are manufactured for use with modular plug-in connectors may be substituted under the following conditions:
 - 1. Connectors shall comply with UL 2459 and shall be made with stranding building wire.
 - 2. Devices shall comply with the requirements in this Section.

2.3 STRAIGHT-BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 5351 (single), CR5362 (duplex).
 - b. Hubbell; HBL5351 (single), HBL5352 (duplex).
 - c. Leviton: 5891 (single), 5352 (duplex).
 - d. Pass & Seymour; 5361 (single), 5362 (duplex).
- B. Hospital-Grade, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 8310 (single), 8300 (duplex).
 - b. Hubbell; HBL8310 (single), HBL8300 (duplex).
 - c. Pass & Seymour; 8301 (single), 8300H (duplex).
 - 2. Description: Single-piece, rivetless, nickel-plated, all-brass grounding system. Nickel-plated, brass mounting strap.

- C. Isolated-Ground, Duplex Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; IG5362RN.
 - b. Hubbell; IG5362.
 - c. Pass & Seymour; IG5362.
 - 2. Description: Straight blade; equipment grounding contacts shall be connected only to the green grounding screw terminal of the device and with inherent electrical isolation from mounting strap. Isolation shall be integral to receptacle construction and not dependent on removable parts.
- D. Tamper-Resistant Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; TR8300.
 - b. Hubbell; HBL8300SGA.
 - c. Pass & Seymour; TR63H.
 - 2. Description: Labeled shall comply with NFPA 70, "Health Care Facilities" Article, "Pediatric Locations" Section.
- E. Weather-Resistant GFCI Convenience Receptacles, 125V, 20A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; WRVGF20.
 - b. Hubbell; GFTR20.
 - c. Pass & Seymour; 2095TRWR.

2.4 GFCI RECEPTACLES

A. General Description:

1. Straight blade, feed-through type.
2. Comply with NEMA WD 1, NEMA WD 6, UL 498, UL 943 Class A, and FS W-C-596.
3. Include indicator light that shows when the GFCI has malfunctioned and no longer provides proper GFCI protection.

B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; VGF20.
 - b. Hubbell; GFR5352L.
 - c. Pass & Seymour; 2095.

C. Tamper-Resistant GFCI Convenience Receptacles, 125 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Hubbell; GFTR20.
 - b. Pass & Seymour; 2095TR.

D. Hospital-Grade, Duplex GFCI Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement sd, and FS W-C-596.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; VGFB20.
 - b. Hubbell; HFR8300HL.
 - c. Pass & Seymour; 2095HG.

2.5 TWIST-LOCKING RECEPTACLES

- ### A. Single Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 Configuration L5-20R, and UL 498.

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; CWL520R.
 - b. Hubbell; HBL2310.
 - c. Pass & Seymour; L520-R.

2.6 PENDANT CORD-CONNECTOR DEVICES

A. Description:

1. Matching, locking-type plug and receptacle body connector.
2. NEMA WD 6 Configurations L5-20P and L5-20R, heavy-duty grade, and FS W-C-596.
3. Body: Nylon, with screw-open, cable-gripping jaws and provision for attaching external cable grip.
4. External Cable Grip: Woven wire-mesh type made of high-strength, galvanized-steel wire strand, matched to cable diameter, and with attachment provision designed for corresponding connector.

2.7 CORD AND PLUG SETS

A. Description:

1. Match voltage and current ratings and number of conductors to requirements of equipment being connected.
2. Cord: Rubber-insulated, stranded-copper conductors, with Type SOW-A jacket; with green-insulated grounding conductor and ampacity of at least 130 percent of the equipment rating.
3. Plug: Nylon body and integral cable-clamping jaws. Match cord and receptacle type for connection.

2.08 TOGGLE SWITCHES

A. Comply with NEMA WD 1, UL 20, and FS W-S-896.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Single Pole:1
Cooper; AH1221.

- (1) Hubbell; HBL1221.
- (2) Leviton; 1221-2.
- (3) Pass & Seymour; CSB20AC1.

- b. Two Pole:1
Cooper; AH1222.
 - (1) Hubbell; HBL1222.
 - (2) Leviton; 1222-2.
 - (3) Pass & Seymour; CSB20AC2.

- c. Three Way:1
Cooper; AH1223.
 - (1) Hubbell; HBL1223.
 - (2) Leviton; 1223-2.
 - (3) Pass & Seymour; CSB20AC3.

- d. Four Way:1
Cooper; AH1224.
 - (1) Hubbell; HBL1224.
 - (2) Leviton; 1224-2.
 - (3) Pass & Seymour; CSB20AC4.

C. Pilot-Light Switches, 20 A:

- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; AH1221PL for 120 and 277 V.
 - b. Hubbell; HBL1201PL for 120 and 277 V.
 - c. Leviton; 1221-LH1.
 - d. Pass & Seymour; PS20AC1RPL for 120 V, PS20AC1RPL7 for 277 V.
- 2. Description: Single pole, with neon-lighted handle, illuminated when switch is "off."

D. Key-Operated Switches, 120/277 V, 20 A:

- 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; AH1221L.
 - b. Hubbell; HBL1221L.
 - c. Leviton; 1221-2L.

- d. Pass & Seymour; PS20AC1-L.
- 2. Description: Single pole, with factory-supplied key in lieu of switch handle.
- E. Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 1995.
 - b. Hubbell; HBL1557.
 - c. Leviton; 1257.
 - d. Pass & Seymour; 1251.
- F. Key-Operated, Single-Pole, Double-Throw, Momentary-Contact, Center-off Switches: 120/277 V, 20 A; for use with mechanically held lighting contactors, with factory-supplied key in lieu of switch handle.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Cooper; 1995L.
 - b. Hubbell; HBL1557L.
 - c. Leviton; 1257L.
 - d. Pass & Seymour; 1251L.

2.9 WALL PLATES

- A. Single and combination types shall match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic, 0.035-inch-thick, satin-finished, Type 302 stainless steel.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Cast aluminum with spring-loaded lift cover and listed and labeled for use in wet and damp locations.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with Type 3R, weather-resistant, die-cast aluminum with lockable cover.

2.10 FLOOR SERVICE FITTINGS

- A. Floor Service Outlets: Provide floor service outlets and fittings of types and ratings indicated. Floor box shall be constructed of 14 ga. galvanized steel with 5/32" steel reinforced hinged floor plate. Floor box shall have 90 cu. in. total capacity with two 24 cu. in. wiring compartments. Floor box shall be easily leveled and provide concealed service for power receptacles and communication connections. Hinged floor plate shall have a decorator top which may be covered with carpet or tile. Decorator top shall be painted color as selected by the Architect/Engineer. Floor boxes shall be equal to Steel City Cat. No. 664. Concealed service top shall be equal to Steel City Cat. No. 664 CST.

2.11 POKE-THROUGH ASSEMBLIES

- A. Description: Factory-fabricated and-wired assembly of below-floor junction box with multichanneled, through-floor raceway/firestop unit and detachable matching floor service outlet assembly.
 - 1. Service-Outlet Assembly: Flush type with four simplex receptacles and space for four RJ-45 jacks.
 - 2. Size: Selected to fit nominal 4-inch cored holes in floor and matched to floor thickness.
 - 3. Fire Rating: Unit is listed and labeled for fire rating of floor-ceiling assembly.
 - 4. Closure Plug: Arranged to close unused 4-inch cored openings and reestablished fire rating of floor.
 - 5. Wiring Raceways and Compartments: For a minimum of four No. 12 AWG conductors; and a minimum of four, 4-pair, Category 5 voice and data communication cables.

2.12 MULTIOUTLET ASSEMBLIES

- A. Components of Assemblies: Products from a single manufacturer designed for use as a complete, matching assembly of raceways and receptacles.
- B. Raceway Material: Metal, with manufacturer's standard finish.
- C. Wire: No. 12 AWG.

2.13 SERVICE POLES

- A. Description: Factory-assembled and-wired units to extend power and voice data communication from distribution wiring concealed in ceiling to devices or outlets in pole near floor.
1. Poles: Nominal 2.5-inch square cross section, with height adequate to extend from floor to at least 6-inches above ceiling, and with separate channels for power wiring and voice and datacommunication cabling.
 2. Mounting: Ceiling trim flange with concealed bracing arranged for positive connection to ceiling supports; with pole foot and carpet pad attachment.
 3. Finishes: Manufacturer's standard painted finish and trim combination Satin anodized-aluminum.
 4. Wiring: Sized for minimum of five No. 12 AWG power and groundconductors; and a minimum of four, 4-pair, Category 3 or 5 voiceand data communication cables.
 5. Power Receptacles: Two duplex, 20-A, heavy-duty, NEMA WD 6, Configuration 5-20R units.
 6. Voice and Data Communication Outlets: Blank insert with bushedcable opening. Four RJ-45 Category 3 jacks; Four RJ-45 Category 5 jacks.

2.14 FINISHES

- A. Device Color:
1. Wring Devices Connected to Normal Power System: Almond, Black, Brown, Gray, Ivory, White, As selected by Architect unless otherwise indicated or required by NFPA 70 or device listing.
 2. Wiring Devices Connected to Emergency Power System: Red.
 3. TVSS Devices: Blue.
 4. Isolated-Ground Receptacles: Orange As specified above, withorange triangle on face.
- B. Wall Plate Color: For plastic covers, match device color.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with NECA 1, including mounting heights listed in that standard, unless otherwise indicated.

B. Coordination with Other Trades:

1. Protect installed devices and their boxes. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of boxes.
2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
4. Install wiring devices after all wall preparation, including painting, is complete.

C. Conductors:

1. Do not strip insulation from conductors until right before they are spliced or terminated on devices.
2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
4. Existing Conductors:
 - a. Cut back and pigtail or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailling existing conductors is permitted, provided the outlet box is large enough.

D. Device Installation:

1. Replace devices that have been in temporary use during construction and that were installed before building finishing operations were complete.
2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, two-thirds to three-fourths of the way around terminal screw.

6. Use a torque screwdriver when a torque is recommended or required by manufacturer.
 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 8. Tighten unused terminal screws on the device.
 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device-mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
1. Install ground pin of vertically mounted receptacles up.
 2. Install hospital-grade receptacles in patient-care areas with the ground pin or neutral blade at the top.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.
1. Adjust locations of floor service outlets and service poles to suit arrangement of partitions and furnishings.

3.2 GFCI RECEPTACLES

- A. Install non-feed-through-type GFCI receptacles where protection of downstream receptacles is not required.

3.3 IDENTIFICATION

- A. Comply with Section 260553 "Electrical Identification."
- B. Identify each receptacle with panelboard identification and circuit number. Use hot, stamped, or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.4 FIELD QUALITY CONTROL

- A. Tests for Convenience Receptacles:
1. Line Voltage: Acceptable range is 105 to 132 V.

2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is unacceptable.
 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 6. Tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.
- B. Test straight-blade hospital-grade convenience outlets for the retentionforce of the grounding blade according to NFPA 99. Retention force shall be not less than 4 oz.
- C. Wiring device will be considered defective if it does not pass tests and inspections.

PART 4- PAYMENT

All electrical work shall be part of the electrical lump sum amount as noted on the bid schedule and the itemized breakdown.

END OF SECTION 26 11 40

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SOIL REPORT

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SEPTIC SYSTEM LAYOUT

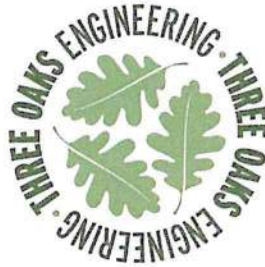
14183 NC Hwy 94 N
Creswell, Washington County, NC
Three Oaks Job # 21-744

Prepared For:

North Carolina Department of Transportation
112 Airport Drive, Suite 100
Edenton, NC 27932

Cc: Vaughn & Melton Consulting Engineers

Prepared By:

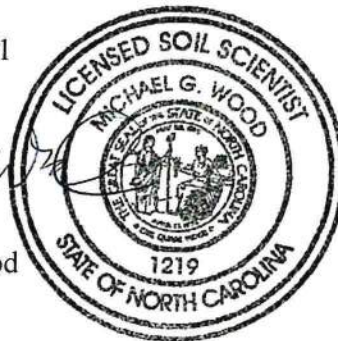


324 Blackwell Street, Suite 1200
Durham, NC 27701
(919) 732-1300

August 18, 2021



Michael G. Wood



INTRODUCTION & SITE DESCRIPTION

A septic system layout was performed on an approximately 1-acre portion in the rear of an approximately 17-acre parcel located at 14183 NC Hwy 94 N, Creswell, Washington County, NC (NCPIN: 7749779487). Three Oaks Engineering (Three Oaks) was retained to determine if there is adequate available space to support a repair subsurface septic system. The property was evaluated in accordance with Washington County and North Carolina statutes for waste disposal “Laws and Rules for Sewage Treatment and Disposal Systems”, amended December 6, 2018).

A NCDOT maintenance yard with a design daily flow of 1,000 gallons per day (GPD) currently has a failing off-site septic system. There is no dedicated repair area for the existing system. Through discussions with Washington County Environmental Health (WCEH), this replacement system is considered a repair system for the failing existing system.

Per discussion with system design engineers, Vaughn & Melton, and the WCEH, based upon previous borings by WCEH, the repair system is expected to be a fill system utilizing LPP dispersal.

INVESTIGATION METHODOLOGY

The field survey was conducted on May 4, 2021, by Michael G. Wood, LSS and Evan T. Morgan, LSS. Soil borings were advanced throughout the lot with a hand-auger and soil color was determined with a Munsell Soil Color Chart. Observations of the landscape (slope, drainage patterns, etc.) as well as soil properties (depth, texture, structure, soil wetness, restrictive horizons, etc.) were recorded. Soil borings were described per the USDA-NRCS, *Field Book for Describing and Sampling Soils, Version 3.0*. Proposed septic system drainlines were marked, off-contour, on 9-foot centers with various colored pin flags.

FINDINGS

Soils

Nine soil borings were advanced throughout the parcel, and the locations of the pertinent borings in relation to the drainfield layout are noted on Figure 1. Detailed soil boring descriptions are attached.

Provisionally Suitable Soil. One area of soil rated as Provisionally Suitable for Fill Systems that encompasses approximately 18,700 sq-ft was identified throughout the proposed demonstrated drainfield (Figure 2) and was the focus of the investigation. Based on the soil physical properties (texture, structure, consistence), usable soil depth, uniformity, and landscape position of the soil unit, a fill system with a not to exceed long-term acceptance rate (LTAR) of 0.117 GPD/sq-ft is proposed.

The following items will need to be incorporated into the system design and maintenance:

- The fill material shall be comprised of a material no finer than a medium sandy loam texture as identified in the USDA Textural Soil Classification. Technically, 99% of the fill must be 0.25mm or larger.
- The first approximately 6” of fill material shall be disced into the existing soil surface at a depth of approximately 6”
- There shall be a minimum of 2-feet of fill material placed over the drainage area and with outside fill slopes a minimum of 5% beginning 1.5-feet from the center of the most outer LPP line.

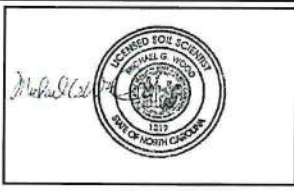
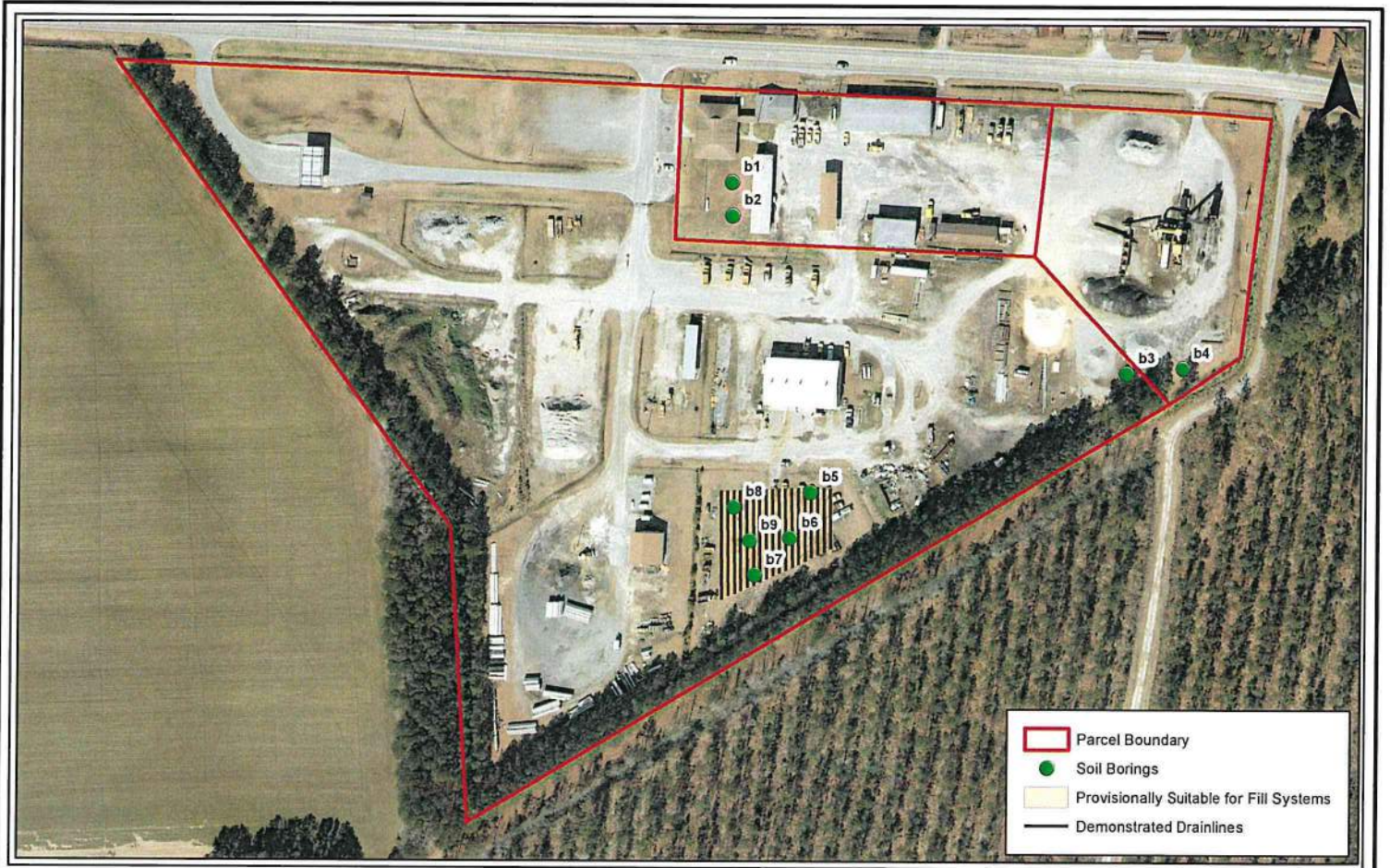
PROPOSED SEPTIC SYSTEM

A septic system layout was completed and eighteen drainlines, L1-L18 totaling 2,146 linear feet, were demonstrated (Table 1). Based upon the recommended LTAR and the design flow of 1,000 GPD design flow, 2,146 linear feet of “Accepted Systems” drainline is required for the repair system. A 2-zone alternating field dosing distribution method is proposed. Drainlines L1-L8 are proposed for Zone 1 and drainlines L9-L18 are proposed for Zone 2. Additional drainline details are appended. *The drainfield should be blocked from parking and vehicle traffic in perpetuity.*

CONCLUSIONS

The findings presented herein represent Three Oaks’ professional opinion based on our Soil Evaluation and knowledge of the current laws and rules governing on-site wastewater systems in Washington County and North Carolina. Sufficient drainline was field demonstrated to support the repair system for the 1,000 GPD facility utilizing a LTAR of 0.117 GPD/sq-ft. The repair system will be a fill system with LPP pressure dose distribution. A 2-zone system is proposed.

Soils naturally change across a landscape and contain many inclusions. As such, attempts to quantify them are not always precise and exact. Due to this inherent variability of soils and the subjectivity when determining limiting factors, there is no guarantee that a regulating authority will agree with the findings of this report. Any concurrence with the findings of this report will be made by WCEH at the time of their evaluation and/or issuance of the Improvement Permit.



Septic System Layout
 NCDOT Creswell Maintenance Yard
 Washington County, North Carolina

| | |
|-------------|---------------|
| Date: | August 2021 |
| Scale: | 0 60 120 Feet |
| Job No.: | 21-792 |
| Drawn By: | ETM |
| Checked By: | MGW |

Figure
1

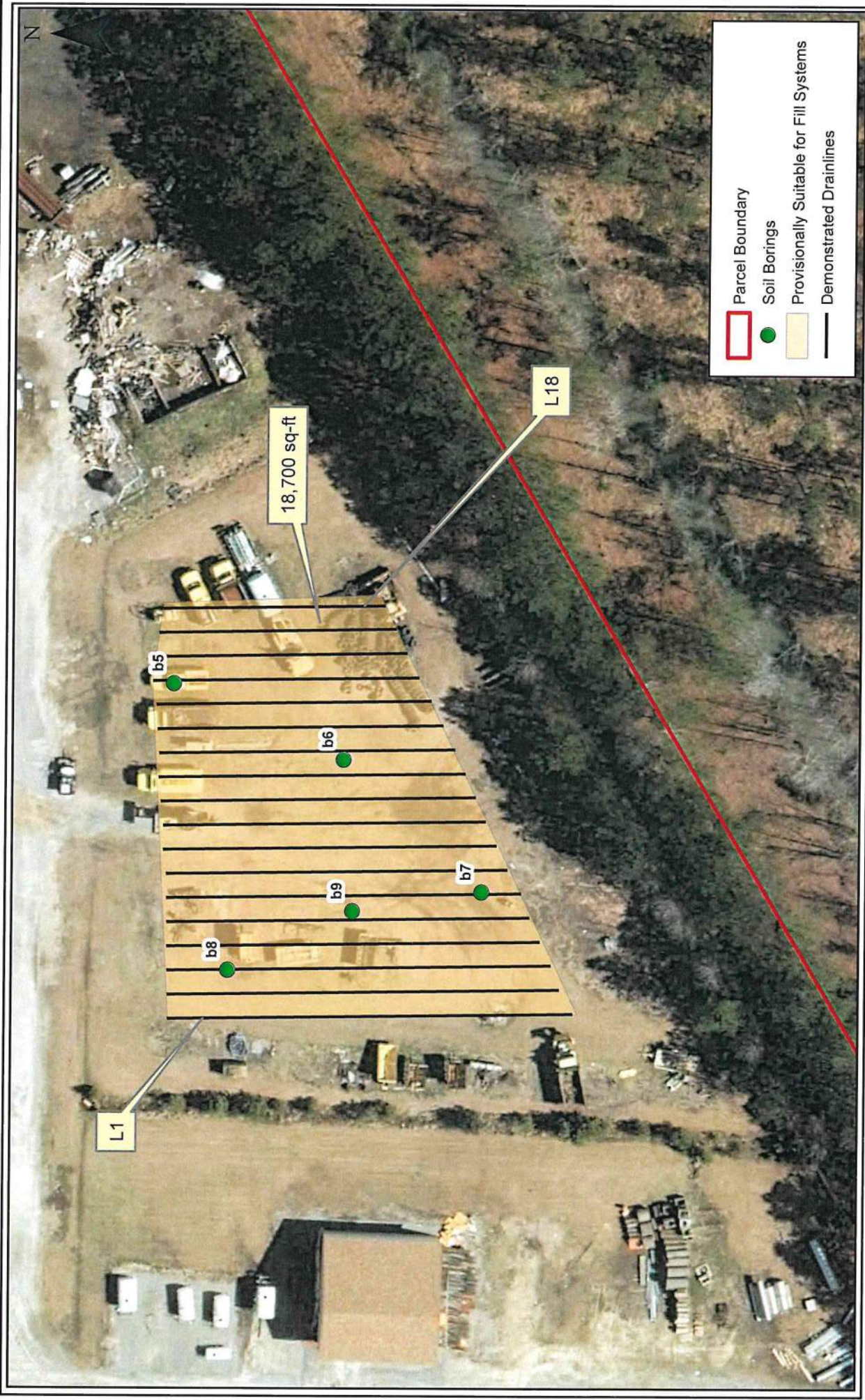


Figure
2

| | |
|-------------|--------------|
| Date: | August 2021 |
| Scale: | 0 10 20 Feet |
| Job No.: | 21-792 |
| Drawn By: | ETM |
| Checked By: | MGW |

Septic System Layout

NCDOT Creswell Maintenance Yard

Washington County, North Carolina



Michael G. Hood





- Parcel Boundary
- Soil Borings
- Provisionally Suitable for Fill Systems
- Demonstrated Drainlines

Figure
1

| | |
|-------------|---------------|
| Date: | August 2021 |
| Scale: | 0 60 120 Feet |
| Job No.: | 21-792 |
| Drawn By: | ETM |
| Checked By: | MGW |

Septic System Layout

NCDOT Creswell Maintenance Yard

Washington County, North Carolina



Matthew S. Caldwell



Soil Evaluation Form

Three Oaks Engineering
 324 Blackwell Street, Suite 1200
 Durham, NC 27701
 919.732.1300

Sheet 1 of 1
 Job: 21-792 Cresswell NCDOT
 County: WASHINGTON
 Date: 5-4-21

Soil Borings

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|-----------------------------|-----------|-----------|--------------|-----------|--------------|-------|------------|------------|------------|
| Landscape Position | T | T | T | T | T | T | T | T | T |
| Slope (%) | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Horizon 1 Depth | 0-11 | 0-11 | 0-7 | 0-21 | 0-6 | 0-9 | 0-10 | 0-6 | 0-7 |
| Texture | SL (FILL) | SP (FILL) | SL (FILL) | SL (FILL) | SP (FILL) | SP | SC/CL FILL | SL (FILL) | SP (FILL) |
| Consistence | VFR | VFR | VFR | VFR | VFR | FR | FR | VFR | FR |
| Structure | GR | GR | GR | SBY | GR | FBK-M | SBK | GR | GR |
| Clay Mineralogy | N | N | N | N | N | N | S | N | N |
| Horizon 2 Depth | 11-20 | 11-15 | 7-13 | 21-30 | 6-17 | 9-26 | 10-25 | 6-15 | 7-15 |
| Texture | CL (FILL) | SL | SL/CL (FILL) | SL | CL (DISTURB) | CL | SL-L | SL/CL FILL | SL/CL FILL |
| Consistence | VFR | VFR | VFR | VFR | FR | FI | FR | FR-FI | FI-FR |
| Structure | GR | SBY | SBY | SBY | SBY | SBY | SBY | SBY | SBY |
| Clay Mineralogy | N | N | N/S | N | N | S | S | N/S | N/S |
| Horizon 3 Depth | 20-31 | 15-24 | 13-25 | 30+ | 17-22 | 26+ | 25+ | 15-22 | 15-26 |
| Texture | SL | SL | L | C | L/SL | C | C | SC | SL |
| Consistence | FR | FI | FR | VFI | FR/FI | VFI | VFI | FR | FR |
| Structure | GR-M | SBY | SBY | ABY | SBY | ABY | S-ABY | SBY | SBY |
| Clay Mineralogy | N | S | S | EXP | N/S | E | E | S | S |
| Horizon 4 Depth | 31+ | 24+ | 25 | | 22 | | | 22 | 26+ |
| Texture | C | C | C | | C | | | C | C |
| Consistence | VFI | VFI | VFI | | VFI | | | VFI | VFI |
| Structure | M | ABY | ABY | | ABY | | | ABY | ABY |
| Clay Mineralogy | EXP | EXP | EXP | | EXP | | | EXP | EXP |
| Horizon 5 Depth | | | | | | | | | |
| Texture | | | | | | | | | |
| Consistence | | | | | | | | | |
| Structure | | | | | | | | | |
| Clay Mineralogy | | | | | | | | | |
| Soil Wetness | 20 | 15 | 13 | 21 | 17 | | | 15 | 15 |
| Restrictive Horizon | 31 | 24 | 25 | 30 | 22 | 26 | 25 | 22 | 26 |
| Saprolite | | | | | | | | | |
| Other | | | | | | | | | |
| CLASSIFICATION | | | | | | | | | |
| LTAR (gpd/ft ²) | | | | | | | | | |

Comments:
 PS FOR FILL SYSTEM. LTAR TBD

Evaluated by: M Wood, E. MORGAN

Repair Septic System Layout

| <u>Field Line #</u> | <u>Color</u> | <u>Zone</u> | <u>Field/System Length</u> |
|---------------------|--------------|--------------|----------------------------|
| 1 | R | 1 | 152 |
| 2 | B | 1 | 147 |
| 3 | Y | 1 | 144 |
| 4 | R | 1 | 140 |
| 5 | B | 1 | 136 |
| 6 | Y | 1 | 133 |
| 7 | R | 1 | 128 |
| 8 | B | 1 | 125 |
| 9 | Y | 2 | 121 |
| 10 | R | 2 | 118 |
| 11 | B | 2 | 115 |
| 12 | Y | 2 | 111 |
| 13 | R | 2 | 107 |
| 14 | B | 2 | 103 |
| 15 | Y | 2 | 100 |
| 16 | R | 2 | 94 |
| 17 | B | 2 | 88 |
| 18 | Y | 2 | 84 |
| | | Zone 1 | 1105 |
| | | Zone 2 | 1041 |
| | | Total | <u>2146</u> |