BGJWSC 2016 SPLOST NORTH MAINLAND PH III FORCEMAIN IMPROVEMENTS

TECHNICAL SPECIFICATIONS
(FOUR WATERS ENGINEERING, INC.)

DIVISION 1 – GENERAL REQUIREMENTS

DIVISION 2 – SITE WORK

DIVISION 15 - MECHANICAL

ATTACHMENTS

A - August 23, 2019, Terracon Geotechnical Engineering Investigation, Glynco Linear Force Water Main, Brunswick, Glynn County, Georgia, Terracon Project No. ES195146.

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B- US Army Corps of Engineers Wetland Delineation Evaluation Letter (June 1, 2018): Regulatory Branch #SAS-2017-00989, Wetlands Exhibit – Sanitary Sewer Force Main Improvements Harry Driggers Boulevard (SPLOST III) 1356th GMD, Glynn County, Georgia.

C - Georgia Environmental Protection Division NPDES Permit – Wastewater PS and Forcemain EPD#2019-200 (Not selected for review by EPD)

D- Georgia Environmental Protection Division, GAR248C3C-V1, Notice of Intent to Discharge Storm Water Associated with Construction Activity (will be transferred to Contractor)

E- CSX Utility Encroachment Permit, CSX898886 / 1033416, Draft Agreement – Pending

F- Georgia Environmental Protection Division Drinking Water Project – Plan Approval for 2016 SPLOST North Mainland Ph III Force Main Improvements (WSID#1270000)

INDEX TO

SECTION 01010 - SUMMARY OF WORK

SECTION 01010

SUMMARY OF WORK

PART 1 - GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. This Contract comprises the construction of the 2016 SPLOST North Mainland Phase III Forcemain Improvements as shown on the Construction Drawings and specified in the Contract Documents including the General Conditions, Special Conditions, and Technical Specifications. The work consists of furnishing all labor, equipment and materials, including but not limited to, the following:

1. Approximately 13,500 Linear Feet (LF) of 20-inch HDPE (DR11) forcemain via horizontal directional drill, and all necessary appurtenances.

2. Approximately 6,300 LF of 18-inch PVC (DR18) forcemain, 450 LF of 20-inch PVC (DR18) forcemain, and 20 LF of 24-inch PVC (DR18) forcemain by open cut construction, stub-outs for future connections, and all necessary appurtenances.

3. Approximately 140 LF of 36-inch steel casing pipe installed through CSX railroad right-of-way by Jack-and-Bore with 20-inch PVC carrier piping.

4. 8-inch forcemain tie-in from new 18-inch forcemain near PS4110 to existing 8-inch PS4110 discharge forcemain downstream of flow metering assembly, including 8-inch linestop and all necessary appurtenances.

5. 20-inch forcemain tie-in from new 20-inch forcemain to existing 20-inch forcemain at the intersection of Canal Road and Gateway Center Blvd, including all necessary appurtenances.

6. 20-inch forcemain tie-in from new 20-inch forcemain on Old Jesup Road near Ogden Road to existing 20-inch forcemain in the intersection of Old Jesup Road and Ogden Road, including all necessary appurtenances. Installation of 20-inch plug valve on existing 20-inch forcemain on Ogden Road, including all necessary appurtenances.

7. Tie-in and discharge of 20-inch forcemain to existing gravity sewer system upstream of PS4036 on B&W Grade Road, including new 8-feet diameter manhole with tie-in to existing 30-inch gravity sewer piping and new 24-inch forcemain, including 20 LF of 30-inch PVC (SDR26) gravity sewer pipe around manhole, temporary bypassing operations, and all necessary appurtenances.

   a. Temporary bypassing operations include but are not limited to all pumps, piping and hoses, valves, fittings, accessories, power and fuel, controls and monitoring to bypass gravity sewer flow upstream of PS4036 to construct new manhole and gravity sewer and forcemain tie-ins.

8. Approximately 2,200 LF of 12-inch PVC (DR18) water main by open cut construction, fire hydrants, water services, and all necessary appurtenances.

9. Approximately 150 (LF of 14-inch HDPE (DR11) water main via horizontal directional drill, and all necessary appurtenances.

10. Two (2) 12-inch water main tie-ins from new 12-inch water main to existing 12-inch water mains on Canal Road, including all necessary appurtenances.

11. All associated mobilization/demobilization, demolition, tree removal, proper disposal of drilling mud and other fluids and materials, required staging and work areas, removal, disposal and replacement of unsuitable soils, dewatering, all joint materials, fittings, gaskets, adapters, and coatings, all testing, soil erosion and sedimentation control, maintenance of traffic (vehicular, pedestrian, and bicycle), complete project area restoration, adherence to all permit requirements including sampling and monitoring, project photographs and videos, as-builts and record documents, and all other work and appurtenances shown on the Construction Drawings and indicated or implied in the Contract Documents and Specifications, or required for the forcemain and water main systems complete and ready for use.

12. Bid Alternates are included for evaluation of alternative piping material and size for the forcemain system.

B. The Contractor shall furnish all labor, equipment, tools, services and incidentals to complete all Work required by these Specifications and as shown on the Construction Drawings.

C. The Contractor shall perform the Work complete, in place, and ready for continuous service, and shall include repairs, testing, permits, cleanup, replacements and restoration required as a result of damages caused during this construction.

D. All materials, equipment, skills, tools and labor which is reasonably and properly inferable and necessary for the proper completion of the Work in a substantial manner and in compliance with the requirements stated or implied by these Specification or Drawings shall be furnished and installed by the Contractor without additional compensation, whether specifically indicated in the Contract Documents or not.

E. The Contractor shall comply with all Municipal, County, State, Federal, and other codes which are applicable to this Project.

1.02 CONTRACTOR'S USE OF PREMISES

A. The Contractor shall assume full responsibility for the protection and safekeeping of products and materials at the job site. If additional storage or work areas are required, they shall be obtained by the Contractor at no additional cost to the Owner.

1.03 WORK SEQUENCE

A. The Contractor shall establish his work sequence based on the use of necessary

crews to facilitate completion of construction within the allotted Contract Time and in the sequence noted.

B. The project does not have a specific sequence of construction, however, the following requirements are intended to limit impacts to the community.

a. The contractor may mobilize to only one following HDD drill rig site for pipe installation prior to completing required testing, tie-ins (between HDD segments), inline valve, and ARV installation.
b. A HDD pipe segment location is considered complete for terms of sequence of construction when the drill and pullback disturbed areas are, at a minimum, temporarily stabilized. Final tie-ins, stabilization and restoration shall be completed by the final completion date, stated in the Special Conditions.
c. Maintenance of Traffic operations shall consider the schedules of nearby schools and other facilities as indicated in the contract drawings.
d. Open cut excavation areas shall be limited to work which can be completed within one work day.
e. The Jack-and-Bore installation through the CSX railroad right-of-way shall not commence until encroachment agreement between CSX and BGJWSC is executed and all required notification has been made to CSX.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

INDEX TO

SECTION 01025 – MEASUREMENT AND PAYMENT

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. This Section specifies administrative and procedural requirements to define pay items and determine payable amounts, and includes but is not limited to:
   1. General Provisions
   2. Cash Allowances
   3. Work Not Paid for Separately
   4. Measurement for Payment

B. Related Sections:

   1. General and Special Conditions

   2. JWSC Standards for Water and Sewer Design and Construction

1.02 GENERAL PROVISIONS

A. This specification includes standard descriptions for all bid items. This Contract's specific bid items are listed in the Bid Form which will be used to develop an approved Schedule of Values.

B. The total Contract Amount shall cover the Work required by the Contract Documents. All costs in connection with the successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.

C. If used, all estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) for the purpose of comparing the bids submitted for the Work, and (b) as a basis for determining an initial Contract Amount. The actual amounts of Work completed and materials furnished under unit price items may differ from the estimated quantities. The Owner does not expressly or by implication represent that the actual quantities involved will correspond exactly to the quantities stated in the Bid Form; nor shall the Contractor plead misunderstanding or deception because of such estimate or quantities or of the character, location or other conditions pertaining to the Work. Payment to the Contractor will be made only for the actual quantities of work performed or material furnished in accordance with the Drawings, Specifications, and other Contract Documents, and it is understood that the quantities may be increased or decreased as provided in the General Conditions.

D. If used, the unit prices listed in the Bid Form shall include all services, obligations,

responsibilities, labor, materials, devices, equipment, royalties and license fees, supervision, temporary facilities, construction equipment, bonds, insurance, taxes, clean up, traffic control, control surveys, field offices, close out, overhead and profit and all connections, appurtenances and any other incidental items of any kind or nature, as are necessary to complete the Work in accordance with the Contract Documents, unless otherwise noted.

E. Payment for Lump Sum Work will be based on the percent of completed work of each item in the Schedule of Values, including stored materials, as determined by the Owner. Progress of work in each item of the Schedule of Values will be determined separately by the Owner. However, the Owner will issue a single payment certificate for progress on the Contract.

F. The Contractor agrees that it will make no claim for damages, anticipated profits, or otherwise because of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefore.

G. Where payment by scale weight is specified under certain items, the Contractor shall provide suitable weighing equipment which shall be kept in accurate adjustment at all times and certified. The weighing of all material shall be performed by the Contractor in the presence and under the supervision of the Owner.

H. All schedules included in the Contract Documents are given for convenience and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in Work to be done under this Contract.

I. Where pipe fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve the Contractor from laying and jointing different or additional items where required.

1.03 CASH ALLOWANCES

A. The Contractor shall include in the Total Bid Amount, all cash allowances stated in the Contract Documents and listed in the Bid Form. Items covered by these allowances shall be supplied for such amounts and by such persons as the Owner may direct.

B. The Contractor will obtain the Owner's written acceptance before providing equipment, materials or other Work under a cash allowance. Payments under a cash allowance will be made based on actual costs, excluding costs of general conditions, handling, unloading, storage, installation, etc., which will be considered to be included within the Contract Price. Payments within the limits of any allowance will exclude overhead and profit and bond and insurance premiums, since those costs will be considered to be included within the Contract Amount. The Contractor shall submit appropriate documentation to validate the actual cost of the item.

C. The amount of the allowance shall be adjusted accordingly by Change Order to recognize the allowable cost incurred by the Contractor.

1.04 WORK NOT PAID FOR SEPARATELY

A. Delivery: Payment for equipment delivery, storage or freight shall be included in the pay items including their installation and no other separate payment will be made therefore.

B. Bonds: Payment for bonds required by the Contract shall be included in the pay items for the Work covered by the required bonds and no separate payment will be made.

C. Preparation of Site: Unless otherwise noted, payment for preparation of site shall be included in pay items proposed for the various items of Work and no separate payment will be made therefore. Preparation of site includes setting up construction plant, offices, shops, storage areas, sanitary and other facilities required by the specifications or state law or regulations; providing access to the site; obtaining necessary permits and licenses; payments of fees; general protection, temporary heat and utilities including electrical power, water and sewer; providing shop and working drawings, certificates and schedules; providing required insurance; pre-construction and construction progress photographs and videos; demolition, site clearing, clearing and grubbing; trench excavation, sheeting, shoring and bracing; dewatering and disposal of surplus water, backfill, compaction and grading; testing materials and apparatus; maintenance of drainage systems; appurtenant work; and close-out documentation; cleaning up; and all other work regardless of its nature which may not be specifically referred to in a Bid Item but is necessary for the complete construction of the project set forth by the Contract.

D. Permitting & Permit Fees. Section 01065: Permits and Fees identifies all permits which the Owner has obtained or submitted applications for. All other permits and fees necessary for the project are the responsibility of the Contractor, shall be included in the pay items for the Work requiring the permits, and will not be paid for separately. Any fees associated with the CSX Railroad Encroachment Agreement and work within CSX right-of-way will be paid for by the Owner.

E. The Owner reserves the right to delete any item included in the Bid Form/Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

F. As-Built Documents and Drawings. Special Conditions identifies the requirements of as-built record documents. This work is considered incidental to the project and no separate payment will be made; cost of as-built documents and drawings shall be included in other relevant project pay items.

1.05 MEASUREMENT FOR PAYMENT

A. Methods of Measurement - Generally:

1. Units of measurement shall be defined in general terms as follows:
   a. Linear Feet (LF)
   b. Square Feet (SF)
   c. Square Yards (SY)
   d. Cubic Yards (CY)
   e. Each (EA)
   f. Lump Sum (LS)

2. Unit Price Items:

   a. Linear Feet (LF) shall be measured along the horizontal length of the centerline of the installed material, unless otherwise specified. Pipe shall be measured along the length of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves or fittings. Pipe included within the limits of lump sum items will not be measured.

   b. Square Feet (SF), Square Yards (SY), Cubic Yards (CY), and Each (EA) shall be measured as the amount of the unit of measure installed and accepted as complete within the limits specified and shown in the Specifications and Drawings. Slope angles and elevations shall be measured using land-surveying equipment. Contractor shall provide supporting documentation (i.e. drawings, delivery tickets, invoices, survey calculations, etc.) to verify actual installed quantities.

3. Lump Sum Items:

   a. Payment will be made for each individual lump sum item on a percentage of completion basis as estimated by the Contractor and approved by the Owner.

4. Adjustments to costs provided in the accepted Schedule of Values may be made only by Change Order.

5. The Owner reserves the right to delete any item included in the Bid Form/Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

1.06 PAYMENT ITEMS

A. Mobilization and Demobilization

1. Measurement: Measurement of various items for Mobilization and Demobilization shall not be made for payment and all items shall be included in the lump sum price. This lump sum price shall not exceed 5% of the total of all bid items.

2. Payment: Payment of 75 percent of the applicable lump sum price for the item shall be full compensation for the Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplies and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations. The costs of General Requirements, bonds, permits, and any required insurance, and any other preconstruction expense necessary for the start of the Work, excluding the cost of construction materials, shall also be included. This Work also consist of the general project management of the Work including, but not limited to, field supervision and office management,

as well as other incidental cost for management of the Work during the duration of the Contract. This Work also includes maintenance of the field office for the duration of the Contract.

3. Payment of the remaining 25 percent of the applicable lump sum price for this item shall be full compensation for the Work consisting of demobilization or the operations normally involved in ending Work on the project including, but not limited to, termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of Contractor storage areas; disposal of trash and rubbish, removal of equipment from the site, and any other post-construction work necessary for the proper conclusion of the Work.

B. Maintenance of Traffic

1. Measurement: Measurement shall be based on satisfactory Control and Maintenance of Traffic in accordance with the Construction Drawings, Glynn County requirements and associated permit requirements.

2. Payment: Payment of the applicable Contract lump sum price will be full compensation for furnishing all labor, materials, and equipment necessary to maintain public roadway and pedestrian/bicycle traffic including flag men, uniformed police officers, barricades, warning lights/flashers, lighted sign boards, portable variable message boards, signs, and orange safety fencing. Also included is furnishing, installing, maintaining, and removal of a Traffic Control Plan, control and safety devices, control of dust, temporary crossing structures over trenches, any necessary detour facilities, and other special requirements for the safe and expeditious movements of traffic, including vehicular, bicycle, and pedestrian. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the Owner.

C. Erosion, Sedimentation and Pollution Control

1. Measurement: Measurement shall be based on satisfactory Erosion, Sedimentation and Pollution Control in accordance with the Construction Drawings, Contract Documents and all Federal, State and local requirements and associated permit requirements.

2. Payment: Payment of the applicable Contract lump sum price will be full compensation for furnishing all labor, materials, and equipment to control and prevent erosion and sediment transportation from the Work area to adjacent properties and waterways, including installation, maintenance, monitoring and water quality sampling and testing, inspection and reporting, and removal of temporary erosion, sedimentation and pollution controls. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the Owner.

D. Pressure Piping (Forcemain; Water Main) – (Varies by Size and Material; by Horizontal Directional Drill)

1. Measurement: Pressure Piping (Forcemain; Water Main) – Horizontal Directional Drill installation shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the

centerline of the completed directionally drilled pressure piping in accordance with the Construction Drawings and Contract Documents. The Contractor shall include in the Contract unit price its allowance for horizontal deflection, vertical deflection, and all wastage.

2. Payment: Payment will be made at the Contract unit price per linear foot for Pressure Piping (Forcemain; Water Main) – Horizontal Directional Drill. Payment shall be full compensation for all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, clearing, filling/leveling and stabilizing drill rig site and work areas, removal or relocation of items within the work area as noted on Construction Drawings including but not limited to signs, guardrails, fencing, etc., necessary temporary sewer bypassing operations, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, project planning, submittals, and calculations, horizontal directional drilling and related systems, mud recycling, entry/back reaming pits, laying and fusing/joining pipe, locate wire system, testing, swabbing, flushing, disinfection, cutting back and removing excess pipe installed by directional drill, clean-up, proper disposal of all remaining drilling mud, other fluids, and solids, and bore logs and reports. This item also includes all necessary restraining devices; identification markers; and all necessary adapters, stiffeners, and fittings not specifically called out in other line items. Any temporary water service lines the Contractor installs to provide water for the Horizontal Directional Drill operations shall be included in this item and shall include cost of piping, installation and abandonment. Contractor shall be responsible for removal, clean-up, and disposal of drill fluid breakouts.

E. Pressure Piping (Forcemain; Water Main) (Varies by Size and Material, by Open Cut)

1. Measurement: Pressure Piping (Forcemain; Water Main) – Open Cut installation regardless of size shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed open cut pressure piping in accordance with the Construction Drawings and Contract Documents, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item. Piping installed by horizontal directional drill has a separate description.

2. Payment: Payment will be made at the Contract unit price per linear foot for Pressure Piping (Forcemain; Water Main) – Open Cut. Payment shall be full compensation for all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, clearing, filling/leveling and stabilizing work areas, removal or relocation of items within the work area as noted on Construction Drawings including but not limited to signs, guardrails, fencing, etc., necessary temporary sewer bypassing operations, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, joining piping, all testing, flushing, disinfection, and clean-up. This item also includes all necessary restraining devices (except for within any jack-and-bore installations), locate wire system, detection tape, and

identification markers. Carrier pipe within any jack-and-bore installations is included in this Pressure Piping (Forcemain/Water Main) pay item; any required casing spacers or joint restraints are included in the Steel Casing Pipe by Jack-and-Bore pay item.

G. Steel Casing Pipe by Jack-and-Bore (Forcemain)

1. Measurement: Steel Casing Pipe by Jack-and-Bore (Forcemain) installation shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed casing piping in accordance with the Construction Drawings and Contract Documents. Carrier Piping to be installed within the casing pipe will be measured for payment under the Pressure Piping (Forcemain; Water Main) (Varies by Size and Material, by Open Cut) pay item.

2. Payment: Payment will be made at the Contract unit price per linear foot for Steel Casing Pipe by Jack-and-Bore (Forcemain). Payment shall be full compensation for all labor, materials, and equipment to construct the respective pipeline system including coordination with existing utilities, protection of existing utilities including service connections, tree protection, clearing, filling/leveling and stabilizing work areas, removal or relocation of items within the work area as noted on Construction Drawings including but not limited to signs, guardrails, fencing, etc., necessary temporary sewer bypassing operations, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, all testing, flushing, and clean-up. This item shall also include casing spacers, pipe joint restraints and total restraining system on carrier pipe, end seals, locate wire system, and identification markers. Carrier pipe within any jack-and-bore installations is included in the Pressure Piping (Forcemain/Water Main) pay item.

H. Fittings and Piping Accessories (Varies by Material, Type, Size)

1. Measurement: Fittings and Piping Accessories installation regardless of material, type, and size shall be measured by the actual number satisfactorily furnished and installed in accordance with the Contract Drawings and Contract Documents.

2. Payment: Payment will be made at the Contract unit price for each Fitting or Piping Accessory of each material, type, and size. Payment shall be full compensation for all labor, materials, and equipment to furnish and install Fittings and Piping Accessories, including any necessary mechanical restraints, tie rods, or supports, with all required excavation, backfill, and compaction, and all necessary incidentals required to complete, disinfect, and test the work.

H. Valves (Varies by Type and Size)

1. Measurement: Valves regardless of type and size shall be measured by the actual number satisfactorily furnished and installed in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment will be made at the Contract unit price for each Valve of each type and size. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install the Valve with

noted operator, complete, with all required excavation and backfill, necessary jointing, adapter/extension pieces, supports (if applicable), mechanical restraints at valve, nuts, bolts, socket clamps, sleeves; valve box and cover, valve tags, electronic ball markers; valve box extension (if applicable); debris shield; flushing; testing; and all incidental and related work required to complete, disinfect, and test the Valve. Air Release Valves shall have separate descriptions.

I. Air Release Valve Assembly in Pedestal

1. Measurement: Air Release Valve Assembly in Pedestal installation shall be measured by the actual number satisfactorily furnished and installed in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment will be made at the Contract unit price for each Air Release Valve Assembly in Pedestal. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install the Air Release Valve Assembly in Pedestal including all excavation, backfill, and compaction; drilling installation of tubing, tapping or cutting pipelines; all piping, fittings and valves between air release valve and main, saddle, sleeve or tee fitting in main; pedestal box and support; and all incidental and related work to complete the Air Release Valve Assembly in Pedestal.

J. Fire Hydrant Assembly

1. Measurement: Fire Hydrant Assembly installation shall be measured by the actual number satisfactorily furnished and installed in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment for the work will be made at the Contract Unit Price for each Fire Hydrant Assembly. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install Fire Hydrant Assembly including hydrant, hydrant lateral pipe, fittings and valve, complete, including all required excavation and backfill; furnishing and installing the hydrant assembly components (regardless of “bury depth”) and hydrant extension (if required); restraint rods; blue pavement reflector (if required); all nuts, bolts, glands, and socket clamps; construction of the hydrant sump including selected stone fill; performing hydrostatic and leakage testing; and all incidental and related work required to complete the Fire Hydrant Assembly. Separate payment will be made for tee on main.

K. LineStop

1. Measurement: LineStop installation and operation shall be measured by the actual number of each LineStops satisfactorily installed in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment for the work will be made at the Contract Lump Sum Price for each LineStop. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install and maintain LineStop in place (including daily charge) as necessary to complete related construction including but not limited to plugging of the existing main utilizing the“line stop” method; furnish and install fabricated steel line stop

fittings; epoxy coated, w/304 SS nuts and bolts; closure completion plugs (sized as required); 150 lb blind flange (sized as required) w/304 SS nuts and bolts; 2-inch equalization/purge fittings; subsequent removal and disposal of line stop; excavation; concrete work (support for line stop fittings); concrete thrust collar; restrained joint plug and tie rods as required; lifting and rigging equipment; dewatering; backfill; furnishing and placing steel decking over excavations (as necessary); all sheeting, shoring, and bracing required to maintain excavations in a safe condition; flushing, protecting existing structures, utilities and property both public and private; cleaning up the site; and all incidental and related work to complete the LineStop installation and operation.

L. Tie-In to Existing Main (Varies by Size, Type, Material and Location)

1. Measurement: Tie-In to Existing Main (Varies by Size, Type, Material, and Location) shall be measured by satisfactory installation of the tie-in complete and operational in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment of the Tie-In to Existing Main (Varies by Size, Type, Material and Location) will be made at the Contract unit price which shall be full compensation for furnishing all labor, materials, and equipment to identify the location of the existing main piping; excavation, backfilling, and compacting; sheeting, shoring and bracing, protection of surrounding structures and piping; necessary temporary sewer bypassing operations, cutting of existing main; tie-in of proposed and existing mains including any piping accessories or incidentals not otherwise identified on Construction Drawings; dewatering; testing; disinfection; cleanup; and related work to complete the installation. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the Owner. LineStops and Fittings associated with Tie-In to Existing Mains are provided under separate pay items.

M. Temporary Sample Tap

1. Measurement: Temporary Sample Tap installation shall be measured by the actual number of each Temporary Sample Tap satisfactorily installed and removed in accordance with the requirements of the Contract Documents.

2. Payment: Payment for the work will be made at the Contract Unit Price for each Temporary Sample Tap. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install and remove Temporary Sample Tap including all necessary piping; service saddle; corporation stop; plug; bushings; bends; tees; smooth hose, hose bib; gate valve, and all incidental and related work required to complete the installation and removal of the Temporary Sample Tap.

N. Single Water Service and Meter Box (Varies by size)

1. Measurement: Single Water Service and Meter Box (Varies by size) installation shall be measured by the actual number of each Single Water Service and Meter Box installed and completed in accordance with the requirements of the Construction Drawings and Contract Documents.

2. Payment: Payment for Single Water Service and Meter Box will be made at the Contract Unit Price for each. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install each size of Single Water Service and Meter Box including the service piping, connection to water main and plugging the new service termination in meter box, corporation stop, curb stop, all required fittings, meter box, locate wiring, boring (if required), flushing and disinfection, excavation, dewatering, backfill and compaction, all sheeting, shoring and bracing required to maintain excavations in a safe condition, protecting existing structures and utilities – both public and private, cleaning up the site, and all other items required to complete the installation.

O. Concrete Manhole with Protective Coating (Diameter and Depth)

1. Measurement: Measurement of Concrete Manhole with Protective Coating shall be measured by the complete and satisfactory installation of each Concrete Manhole with Protective Coating in accordance with the Construction Drawings and Contract Documents. The depth of the manhole will be measured vertically from the top of the manhole frame to the invert at the center of the manhole bottom.

2. Payment: Payment for the work will be made at the Contract Lump Sum Price for each Concrete Manhole with Protective Coating by diameter and depth. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install the manhole and protective coating, manhole frame, cover, pipe connections and boots, and inside or outside drops including all required excavation; dewatering; backfilling; all sheeting, shoring and bracing required to maintain excavation in a safe condition; necessary temporary sewer bypassing operations; protecting existing structures, utilities and property; cleaning up the site; testing; and all incidental and related work to complete the Concrete Manhole and Protective Coating installation and operation. Payment will also include the required 10-year warranty on the materials and labor associated with the protective coating. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the Owner.

P. Removal and Replacement of Gravity Sewer Piping (Varies by Size, Dept, Material)

1. Measurement: Measurement for Removal and Replacement of Gravity Sewer Piping shall be measured in actual linear feet of pipe satisfactorily removed and replaced, as measured along the length of the centerline of the piping from the inside face of upstream structure or connection to inside face of downstream structure or connection, in accordance with the Construction Drawings and Contract Documents. The depth of cut of gravity sewer piping will be measured from existing grade elevations along the center line of the pipe, taken on 50-foot stations, down to the gravity sewer pipe invert elevation.

2. Payment: Payment will be made at the Contract Unit price per linear foot by size, type, and depth of existing gravity sewer pipe removed and new gravity sewer pipe installed. Payment shall be full compensation for all labor, materials, and equipment necessary for excavation; backfilling and compaction; dewatering; sheeting and shoring driven and pulled and drag

shields for trenches of all depths; necessary temporary sewer bypassing operations, removing existing gravity sewer piping, laying, jointing and testing the new gravity sewer pipe and connection to existing gravity sewer piping; removal and disposal of the existing wastewater pipe; stoppers for all ends of pipe and fittings (as necessary); transition couplings; and all incidental and related work to complete the gravity sewer pipe removal and replacement.

Q. Restoration (Varies by Location)

1. Measurement: Measurement for Restoration shall be based on satisfactory restoration of all areas disturbed by construction activities in accordance with the Owner's requirements, Construction Drawings, and Contract Documents.

2. Payment: Payment of Restoration shall be made at the Contract lump sum price. Payment shall be full compensation for furnishing all labor, materials, and equipment to restore the areas disturbed by construction to equal or better than pre-construction condition. Areas covered by this pay item are highly established and landscaped. Satisfactory restoration of these areas includes restoration of all concrete curb and gutter, pavement restoration (roadway and driveway), pavement milling and resurfacing (roadway and driveway), pavement markers and paint striping, ditches and swales, stormwater infrastructure, landscaping, mailboxes, trees, fences, signs, guardrails, concrete trail (Harry Driggers Blvd) and other concrete sidewalk, lawn/grass and right-of-way areas with sod or seed as required per Erosion Control Drawings, mulch/straw, foundations, irrigation systems, and other structures and items disturbed by construction, complete, tested and accepted by Owner and Glynn County. Quantities of curb and gutter and pavement removal and restoration, and asphalt milling and resurfacing are estimated quantities necessary for construction or required by Glynn County; contractor shall restore any additional curb and gutter or pavement disturbed beyond these limits at no additional cost to Owner. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the project Owner and Glynn County.

R. Tree Removal (In Easement Area near Old Jesup Road and Brunswick Altamaha Canal)

1. Measurement: Tree Removal (In Easement Area near Old Jesup Road and Brunswick Altamaha Canal) shall be measured for the complete and satisfactory removal of each noted tree as identified on the Construction Drawings and in accordance with the Contract Documents, and Glynn County Tree Advisory Board requirements.

2. Payment: Payment of Tree Removal (In Easement Area near Old Jesup Road and Brunswick Altamaha Canal) shall be made at the Contract Unit Price for each which shall be full compensation for furnishing all labor, materials, and equipment to remove and properly dispose of each tree and grind the stump as identified on the Construction Drawings in accordance with Glynn County Tree Advisory Board guidelines. Only the noted trees are included, any other tree removal or clearing operations shall be included as

part of the pay item to which it is related.

S. Disposal and Replacement (with A-3 Sand) of Unsuitable Soils

1. Measurement: Disposal and Replacement (with A-3 Sand) of Unsuitable Soils shall be measured in actual cubic yards of unsuitable soil material to be disposed of and replaced in accordance with the Contract Documents.

2. Payment: Payment for Disposal and Replacement (with A-3 Sand) of Unsuitable Soils shall be made at the Contract unit price per cubic yard and shall constitute full payment for all labor, materials, equipment, and transportation to remove from the job site and dispose of all unsuitable material and furnish, place and compact suitable backfill as specified in the Contract Documents. The cost of excavation of unsuitable backfill and dewatering shall be included with the cost of the related piping or structure installation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

INDEX TO

SECTION 01065 – PERMITS AND FEES

SECTION 01065

PERMITS AND FEES

PART 1 - GENERAL

A. The Contractor shall obtain and pay for all permits and licenses related to his work, as relevant to the project, at no additional cost to Owner. Permits which Owner is acquiring are listed in this Section. All other permits are the responsibility of the Contractor and the Contractor is responsible for all associated permit fees. It is noted that permit fees associated with the CSX Railroad Encroachment Agreement which the Owner is acquiring will be paid by the Owner.

B. Permits by Owner: The Owner prior to the advertisement of the project has applied for permits with the following agencies:

Georgia Environmental Protection Division (GA EPD)

Georgia Department of Natural Resources (GA DNR)

Glynn County Engineering

Glynn County Tree Advisory Board

Georgia Soil and Water Conservation Commission (GSWCC)

CSX Transportation

Georgia Power

(Refer to Table 01065A for permit information.)

TABLE 01065A
PERMIT INFORMATION

The following permits have been obtained or are anticipated to be obtained by the Owner prior to construction:

Permit	Permit No.	Issue Date
Georgia Environmental Protection Division NPDES Permit – Wastewater PS and Forcemain (Not selected for review by EPD)	EPD#2019-200	12-16-2019
Georgia Environmental Protection Division Drinking Water Project	N/A (WSID#1270000)	1-22-2020
Georgia Environmental Protection Division Infrastructure Construction General Permit	NPDES Permit GAR 100002	Pending

Georgia Environmental Protection Division Notice of Intent to Discharge Storm Water Associated with Construction Activity (will be transferred to Contractor)	GAR248C3C-V1	12-17-2019
Glynn County Land Disturbing Activity Permit	Pending	Pending
Georgia Department of Natural Resources Coastal Resources Division Revocable License	Pending	Pending
Glynn County Tree Advisory Board	Pending	Pending Written Approval
CSX Utility Encroachment Permit	CSX898886 / 1033416	Pending
Georgia Power Encroachment Agreement	Pending	Pending

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

INDEX TO

SECTION 01380 – CONSTRUCTION PHOTOGRAPHS AND VIDEO

SECTION 01380

CONSTRUCTION PHOTOGRAPHS AND VIDEO

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Pre-construction photographs.
2. Periodic construction photographs.
3. Final Completion construction photographs.
4. Pre-construction videotapes.
5. Periodic construction videotapes.
6. Time-lapse sequence construction videotapes.

B. Related Sections include the following:

1. JWSC Standards for Water and Sewer Design and Construction.

2. Measurement and Payment: Section 01025.

3. Submittals: Special Conditions.

4. Project Closeout: Section 01700.

1.3 ALLOWANCE

A. Costs: Costs for photographs and video services shall be included in Contractor's bid price for the project. No additional payment will be made for these services.

1.4 SUBMITTALS

A. Construction Photographs: Digital or Print may be submitted in accordance with the following requirements:

1. Print Photographs:
   a. Format: 4- by 6-inch minimum smooth-surface matte prints on single-weight commercial-grade photographic paper mounted on linen or card stock to allow a 1-inch-wide margin and enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
2. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date

photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

3. Identification: With all photographs provide the following information either on the back of prints or as an electronic Word or PDF document corresponding to each digital image file name.

   a. Name of Project.
   b. Name of Contractor.
   c. Date photograph was taken if not date stamped by camera.
   d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   e. Unique sequential identifier.

B. Video: Submit two (2) copies of each video on CD or DVD with protective sleeve or case within seven days of recording.

1. Identification: On each copy, provide an applied label with the following information:

   a. Name of Project.
   b. Name of Contractor.
   c. Date video was recorded.
   d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   e. Weather conditions at time of recording.

2. Transcript: Provide two (2) copies, prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as corresponding videotape. Include name of Project and date of videotape on each page. Electronic Word or PDF document corresponding to the video file transcript can be provided in lieu of paper/binder copies.

1.5 COORDINATION

A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs and video without obscuring shadows.

1.6 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

1.7 EXTRA PRINTS

A. If requested by Owner/Engineer, photographer shall prepare extra prints of photographs. Photographer shall distribute these prints directly to designated parties who will pay the costs for extra prints.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified commercial photographer to take construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Film Images:

1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken such that stamp is integral to photograph.
2. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs same as for those submitted to Owner/Engineer.

D. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.
2. Field Office Images: Maintain one set of images on CD-ROM or DVD in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Owner/Engineer.

E. Preconstruction Photographs: Before commencement of clearing, excavation, demolition, or starting construction, take color/digital photographs of Project site, route, and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Owner/Engineer. Contractor shall maintain a copy of the pre-construction photographs for a period of two (2) years following the completion of the project. Pre-construction photographs shall be reviewed and approved by JWSC and Engineer prior to disturbing project site.

1. Flag excavation areas, construction limits before taking construction photographs.
2. Take photographs to show existing conditions adjacent to project site and right-of-way before starting the Work. Give particular attention to existing landscaping, trees, driveways, fences, and other such structures.
3. Take photographs of existing buildings either on or adjoining project site or right-of-way to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

F. Periodic Construction Photographs: Take photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

G. Engineer-Directed Construction Photographs: From time to time, Engineer will instruct photographer about number and frequency of color/digital photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

H. Time-Lapse Sequence Construction Photographs: Take as indicated, to show status of construction and progress since last photographs were taken.

1. Frequency: Take photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment.

I. Final Completion Construction Photographs: Take color photographs after date of Substantial Completion for submission as Project Record Documents. Owner/Engineer will direct photographer for desired vantage points.

1. Do not include date stamp.

3.2 CONSTRUCTION VIDEO

A. Video Photographer: Engage a qualified commercial videographer to record construction videos.

B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.

C. Narration: Describe scenes on video by audio narration by microphone or by dubbing audio narration off-site after video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.
2. Begin each video with name of Project, Contractor's name, videographer's name, and Project location.

D. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video opposite the corresponding narration segment.

E. Preconstruction Video: Before commencement of clearing, excavation, demolition, or starting construction, record video of Project site, route, and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Owner/Engineer. Contractor shall maintain a copy of the pre-construction video for a period of two (2) years following the completion of the project. Pre-construction videos shall be reviewed and approved by JWSC and Engineer prior to disturbing project site.

1. Flag excavation areas and construction limits before recording construction videotapes.
2. Record video to show existing conditions adjacent to project site and right-of-way before starting the Work. Give particular attention to existing landscaping, trees, driveways, fences, and other such structures.
3. Show existing buildings either on or adjoining project site or right-of-way to accurately record physical conditions at the start of construction.
4. Show protection efforts by Contractor.

END OF SECTION

INDEX TO

SECTION 01700 – PROJECT CLOSEOUT

SECTION 01700

PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final Completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Sections:

1. Project Record Documents: Special Conditions.

2. Construction Photographs and Video: Section 01380.

3. Operation and Maintenance Data: Section 01730.

4. JWSC Standards for Water and Sewer Design and Construction and other Sections of Specifications for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include operating certificates, and similar releases.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
7. Complete startup testing of systems.
8. Submit test/adjust/balance records.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Advise Owner of changeover in heat and other utilities.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, JWSC/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. JWSC/Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by JWSC/Engineer, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining Final Completion status, complete the following:

1. Submit a final Application for Payment according to Contract Requirements.
2. Submit certified copy of JWSC/Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by JWSC/Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
5. Submit consent of surety to final payment.
6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, JWSC/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. JWSC/Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order
2. Organize items applying to each space by major element.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Engineer.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in one of the following formats:

    a. PDF electronic file.
    b. Three (3) paper copies of punch list, unless otherwise indicated. JWSC/Engineer will return one (1) copy.

1.6 WARRANTIES

A. Submittal Time: Unless otherwise requested, submit warranty documentation prior to request for Final Completion inspection. Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Final Completion is indicated. Upon completion of successful final inspection, submit an original Letter of Warranty to the JWSC, signed by an authorized Officer of the Contracting company, on the Contractor's letterhead, guaranteeing workmanship, materials, and equipment for a period of 12 months from the date of the letter. Letter shall be dated within five (5) days following the successful final inspection.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Specifications.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. WARRANTY REQUIREMENTS

1. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
2. When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
3. Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
4. Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
5. The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
6. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
7. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.
8. Provide written certifications of compliance and other commitments and agreements for continuing services in a form which includes all pertinent information including:
    a. Quantities and dates of shipments.
    b. Attestment that materials incorporated into the Work comply with specified requirements. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials, if the material is later found to not meet specified requirements.
    c. Signature of officer of company.
    d. Laboratory test reports submitted with certificates of compliance shall show dates of testing, specification requirements under which testing was performed, and results of tests.
    e. Refer to Special Conditions and individual Specification Sections for specific content requirements, and particular requirements for submittal of special warranties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal, State, and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

2. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    g. Sweep concrete floors broom clean in unoccupied spaces.
    h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    i. Clean transparent materials, including glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish glass, taking care not to scratch surfaces.
    j. Remove labels that are not permanent.
    k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

        1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

m. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.

1) Clean HVAC system in compliance with NADCA's ACR Standard, latest version. Provide written report upon completion of cleaning.

q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

r. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

END OF SECTION

INDEX TO

SECTION 01730 – OPERATION AND MAINTENANCE

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.

a. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent Sections of Specifications.

2. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

B. Related Requirements Described Elsewhere:

1. Special Conditions

2. 01730: Project Closeout

3. Requirements as listed in various specification sections and in JWSC Standards for Water and Sewer Design and Construction.

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of described products.

2. Familiar with requirements of the relevant Specification Sections.

3. Skilled as technical writer to the extent required to communicate essential data.

4. Skilled as draftsman competent to prepare required drawings.

1.03 FORM OF SUBMITTALS

A. Prepare data in form of an instructional manual for use by Owner's personnel.

B. Format: Hard Copy Manuals

1. Size: 8-1/2 inches by 11 inches.

2. Paper: 20-pound minimum, white, for typed pages.

3. Test: Manufacturer's printed data, or neatly typewritten.

4. Drawings:

   a. Provide reinforced punched binder tab, bind in with text.

   b. Reduce larger drawings and fold to size of text pages but not larger than 14 inches by 17 inches.

5. Provide fly-leaf for each separate product, or each piece of operating equipment.

   a. Provide typed description of products and major component parts of equipment.

   b. Provide identified tabs.

6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:

   a. Title of Project.

   b. Identity of separate structure as applicable.

   c. Identity of general subject matter covered in the manual.

7. Binders:

   a. Commercial quality three-post binders with durable and cleanable plastic covers.

   b. Maximum post width: 2 inches.

   c. When multiple binders are used, correlate the data into related consistent groupings.

C. Format: Electronic Copy Manuals

1. All materials identified in 1.03 B. above shall also be provided in Adobe Acrobat© Portable Document Format (PDF) on CD, DVD, or USB Flash Drive.

1.04 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

1. Contractor, name of responsible principal, address and telephone number.

2. A list of each product required to be included, indexed to content of the volume.

3. List, with each product, the name, address and telephone number of:

   a. Subcontractor or installer.

   b. A list of each product required to be included, indexed to content of the volume.

   c. Identify area of responsibility of each.

   d. Local source of supply for parts and replacement.

4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

1. Include only those sheets which are pertinent to the specific product.

2. Annotate each sheet to:

   a. Clearly identify specific product or part installed.

   b. Clearly identify data applicable to installation.

   c. Delete references to inapplicable information

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:

   a. Relations of component parts of equipment and systems.

   b. Control and flow diagrams.

2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.

3. Do not use Project Record Documents as maintenance drawings.

D. Written text, as required to supplement product data for the particular installation:

1. Organize in consistent format under separate headings for different procedures.

2. Provide logical sequence of instructions of each procedure.

E. Copy of each warranty, bond and service contract issued.

1. Provide information sheet for Owner's personnel, give:

   a. Proper procedures in event of failure.

b. Instances which might affect validity of warranties or bonds.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Submit four (4) copies of complete manual in final form.

B. Content: for architectural products, applied materials and finishes:

1. Manufacturer's data, giving full information on products.

a. Catalog number, size, composition.

b. Color and texture designations.

c. Information required for reordering special manufacturing products.

2. Instructions for care and maintenance.

a. Manufacturer's recommendation for types of cleaning agents and methods.

b. Cautions against cleaning agents and methods which are detrimental to product.

c. Recommended schedule for cleaning and maintenance.

C. Content, for moisture protection on weather-exposed products:

1. Manufacturer's data, giving full information on products.

a. Applicable standards.

b. Chemical composition.

c. Details of installation.

2. Instructions for inspection, maintenance and repair.

D. Additional requirements for maintenance data: Refer to respective sections of Specifications and JWSC Standards for Water and Sewer Design and Construction.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit four (4) copies of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.

a. Function, normal operating characteristics, and limiting conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of replaceable parts.

2. Operating procedures:

a. Start-up, break-in, routine and normal operating instructions.

b. Regulation, control, stopping, shut-down and emergency instructions.

c. Summer and winter operating instructions.

d. Special operating instructions.

3. Maintenance procedures:

a. Routine operations.

b. Guide to "trouble-shooting".

c. Disassembly, repair and reassembly.

d. Alignment, adjusting and checking.

4. Servicing and lubrication required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

a. Predicted life of parts subject to wear.

b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.

9. Each contractor's coordination drawings.

a. As-installed color coded piping diagrams.

10. Charts of valve tag numbers, with location and function of each valve.

11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.

12. Other data as required under pertinent sections of specifications and JWSC Standards for Water and Sewer Design and Construction.

C. Content, for each electric and electronic systems, as appropriate:

1. Description of system and component parts.

a. Function, normal operating characteristics, and limited conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories and panelboards.

a. Electrical service.

b. Controls.

c. Communications.

3. As installed color coded wiring diagrams.

4. Operating procedures:

a. Routine and normal operating instructions.

b. Sequences required.

c. Special operating instructions.

5. Maintenance procedures:

a. Routine operations.

b. Guide to "trouble-shooting".

c. Disassembly, repair and reassembly.

d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

8. Other data as required under pertinent sections of specifications and JWSC Standards for Water and Sewer Design and Construction.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: Respective sections of Specifications and JWSC Standards for Water and Sewer Design and Construction.

1.07 SUBMITTAL SCHEDULE

A. Submit two (2) copies of preliminary draft of proposed formats and outlines of contents of Operating and Maintenance Manuals within 60 days after Notice to Proceed.

1. The Engineer and Owner will review the preliminary draft and return one (1) copy with comments.

B. Submit two (2) copies of completed data in final form no later than 30 days following the Engineer's and Owner's review of the last shop drawing and/or other submittal specified in the Special Conditions and other specification sections.

1. One (1) copy will be returned with comments to be incorporated into final copies.

C. Submit four (4) hard copies and two (2) CDs, DVDs, or USB Flash Drives with electronic PDF copies of approved manual in final form directly to the offices of the JWSC, within 30 calendar days of product shipment to the project site and preferably within 30 days after the reviewed copy is received.

D. Append four (4) hard copies and two (2) CDs, DVDs, or USB Flash Drives with electronic PDF copies of addendum to the operation and maintenance manuals as applicable and certificates as specified within 30 days after final inspection and equipment start-up test.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.

B. Review operating and maintenance manual with personnel in full detail to explain all aspects of operations and maintenance which shall constitute the basis of instruction.

1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

INDEX TO

SECTION 02050 – DEMOLITION

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This Section provides for the complete or partial removal and disposal of specified existing structures, foundations, slabs, piping, mechanical, electrical, existing (to be abandoned) piping and miscellaneous appurtenances encountered during construction operations.

2. Demolition includes:

a. Demolition, partial removal and cutting of existing masonry and metals as required for the new construction.

b. Distribution of salvageable and excess unacceptable material and equipment as specified below.

c. Off-site disposal of excess and unacceptable materials and equipment.

3. The Contractor shall examine the various Drawings regarding the existing site, visit the project site and determine for himself the extent of the work affected therein and all conditions under which he is required to perform the various operations.

1.02 PERMITS AND NOTICES

A. Permits and Licenses: Contractor shall obtain all necessary permits and licenses for performing the work and shall furnish a copy of same to the Owner and Engineer prior to commencing the work. The Contractor shall comply with the requirements of the permits.

B. Notices: Contractor shall issue written notices of planned demolition to companies or local authorities owning utility conduit, wires or pipes running to or through the project site. Copies of said notices shall be submitted to the Owner and Engineer.

C. Utility Services: Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone or sewer service to remove any equipment owned by them in structures to be demolished and to remove, disconnect, cap or plug their services to facilitate demolition.

1.03 CONDITIONS OF STRUCTURES

A. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.

1.04 REMOVAL OF EXISTING EQUIPMENT

A. Scope of work: Contractor shall furnish all labor, equipment, materials, and incidentals necessary to remove existing equipment, piping, fittings, valves, and/or appurtenances not required for the proper operation of the project improvements as indicated on the Drawings and Specifications. Removal shall be consistent with the final configuration of the new and modified systems as indicated on the Drawings, as specified herein, or as required by the Owner.

B. The Contractor shall not proceed with the removal of any equipment, piping, or appurtenances without specific approval of the Owner. Any equipment, piping, or appurtenances removed without proper authorization, which are necessary for the operation of the project improvements shall be replaced to the satisfaction of the Owner at the Contractor's expense.

C. All equipment removed shall remain the property of the Owner unless designated otherwise by the Owner.

E. If the Owner elects not to retain ownership of a certain item, the item shall become the property of the Contractor and shall be removed from the site at the Contractor's expense.

F. Concrete, concrete block and unsalvageable bricks shall be hauled to an appropriate waste disposal site by the Contractor.

G. All other material shall be hauled to an appropriate waste disposal site by the Contractor.

H. The storage of or sale of removed items on the site will not be allowed.

1.05 TRAFFIC AND ACCESS

A. Conduct demolition and modification operations, and the removal of equipment and debris to ensure minimum interference with roads, streets, walkways both on-site and off-site, and to ensure minimum interference with occupied or used facilities.

B. Special attention is directed towards maintaining safe and convenient access to the new and existing facilities by Owner's personnel and associated vehicles. Relocation of the Contractor's materials, labor, or equipment due to uncoordinated interruption will be at the Contractor's expense.

D. Do not close or obstruct streets, walkways or other occupied or used facilities without permission from the authorizing agency, Engineer and Owner. Provide approved alternate routes around closed or obstructed traffic in access ways.

1.06 DAMAGE

Promptly repair damage caused to adjacent facilities by demolition operations as directed by the Engineer and at no cost to the Owner.

1.07 UTILITIES

A. Maintain new and existing utilities to remain in service and protect against damage during demolition operations.

B. Do not interrupt existing or new utilities serving occupied or used facilities, except when authorized by the Owner or Engineer. Provide temporary services during interruptions to existing utilities as acceptable to the Owner and Engineer.

C. The Contractor shall cooperate and coordinate with the Owner to shut off utilities serving structures of the existing facilities as required by demolition operations.

E. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under this jurisdiction of the utility companies.

E. All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.08 POLLUTION CONTROL

A. For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. Comply with the governing regulations.

1.09 QUALITY CONTROL

A. Protect all existing materials and equipment to be salvaged or reused from damage.

B. Cap or plug all lines to be abandoned. Place covers and label all junction boxes, conduits and wire as abandoned.

C. Leave all exposed ends of all pipe and conduit or junction boxes covered and safe.

PART 2 - MATERIALS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

INDEX TO

SECTION 02110 – SITE CLEARING

SECTION 02110

SITE CLEARING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Removal of surface debris.

B. Removal of paving, curbs and other materials located within the project area.

C. Removal of trees, shrubs, and other plant life.

D. Topsoil excavation.

1.2 RELATED SECTIONS

A. Section 02200 – Earthwork

1.3 MEASUREMENT AND PAYMENT

A. Site Clearing: Clearing, grubbing and other items to be removed will be included in the contract price as noted in Section 01025 Measurement and Payment. Includes clearing site, removing trees and stumps, loading and removing waste materials from site. Specific trees may be called for removal separately.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable City, County, and State codes for environmental requirements, and disposal of debris.

B. Coordinate clearing Work with utility companies.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide tree protection materials as detailed on the construction drawings, within this Section, or as required by local codes.

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify existing plant life designated to remain is tagged or identified.

B. Identify a salvage area for placing removed materials. All non-salvageable materials and clearing debris shall be disposed off-site by Contractor, at his expense.

3.2 PROTECTION

A. All trees on site will be saved except those marked specifically by the Owner's representative or on the contract drawings for removal during construction. No trees, including those marked for removal on site or any other tree, may be removed prior to the preconstruction conference. All trees not to be removed will be protected from injury to their roots and to their top to a distance three feet beyond the drip–line and no grading, trenching, pruning, or storage of materials may go in this area except as provided by an Owner's representative stakeout. Contractor will pay a penalty for any tree removed from the site that has not been marked specifically for removal. Contractor also will pay for any tree that dies due to damage during construction. This applies to all trees on site whether or not they are shown on the plans.

B. Contractor shall not be held accountable for damages to trees resulting from placement of fill or removal of soils where such action is required by the contract documents. Any tree, the trunk of which is within 10 feet of any footing or trench, shall be exempt from these penalties except Contractor shall exercise all reasonable precautions to preserve even these trees. Contractor agrees to pay fines as established below in the event he or any of his subcontractors causes loss or removal of trees designated to be saved under provisions of this contract.

The fines are as follows:

Caliper	Fine
1" – 2"	$ 150.00
2" – 3"	200.00
3" – 4"	250.00
4" – 5"	400.00
5" – 6"	500.00
6" – 7"	600.00
7" – 8"	750.00
8" – 11"	1,500.00
12" – 20"	2,000.00
21" & larger	$ 2,500.00

C. Trees shall be graded by Owner's representative as to variety, condition, and site importance, with above figures acting as a maximum fine. Lowest assessment amount shall be no less than one–half of the above fine figures.

D. Protect bench marks, survey control points, and existing structures from damage or displacement.

E. Protect all remaining utilities.

F. Clearing operations shall be conducted to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and to provide for the safety of employees and others.

3.3 CLEARING

A. Clear areas required for access to site and execution of work. Clearing shall consist of felling and cutting trees into sections, and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be removed completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. **No burning will be allowed unless authorized in writing by Owner.** Trees designated to be left standing within cleared areas shall be trimmed of dead branches 1–1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the trunk of the tree or main branches. Cuts more than 1–1/2 inches in diameter shall be painted with accepted treewound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be checked by the OWNER before construction observations can proceed (See 3.2). Clearing shall also include removal and disposal of structures obtruding, encroaching upon, or otherwise obstructing the work.

3.4 REMOVAL

A. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. Work shall include felling of such trees and removal of their stumps and roots. Trees shall be disposed of as hereinafter specified.

B. Remove debris, rock, and other extracted plant life from site.

C. Partially remove paving, curbs, and driveways; as indicated. Neatly saw cut edges at right angle to surface.

3.5 DISPOSAL

A. Disposal of trees, branches, snags, brush, stumps, etc., resulting from clearing and grubbing shall be the Contractor's responsibility and shall be disposed of by removal from site. All costs in connection with disposing of materials will be at the Contractor's expense. Contractor shall be responsible for compliance with all local and State laws and regulations relative to the removal and disposal of material. **No material will be burned unless directed to do so in writing by the Owner.** Contractor shall obtain a permit to burn on site from local fire department, before beginning the work. All liability of any nature resulting from

disposal of cleared and grubbed material shall become the Contractor's responsibility. Disposal of all materials cleared and grubbed will be in accordance with rules and regulations of the State of Georgia.

3.6 GRUBBING

A. Grubbing shall consist of removal and disposal of stumps, roots larger than one-inch in diameter, and matted roots from designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for building of proposed construction, shall be excavated and removed to a depth of not less than 18-inches below original surface level of the ground in embankment areas and not less than 2 feet below finished earth surface in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform to original adjacent ground.

END OF SECTION

INDEX TO

SECTION 02140 – DEWATERING

SECTION 02140

DEWATERING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work to be performed under this section shall include furnishing all equipment and labor necessary to remove storm or subsurface waters from excavation areas in accordance with the requirements of this project.

B. Related Work Described Elsewhere:

1. JWSC Standards for Water and Sewer Design and Construction

2. Earthwork: Section 02200.

3. *August 23, 2019, Terracon Geotechnical Engineering Investigation, Glynco Linear Force Water Main, Brunswick, Glynn County, Georgia, Terracon Project No. ES195146*.

1.02 QUALITY ASSURANCE

A. The dewatering of any excavation area and the disposal of the water shall be in strict accordance with the latest revision of all local, state, and federal government rules and regulations.

B. Qualifications: The temporary dewatering system shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable and qualified in the design of such dewatering systems. The firm shall have a successful record of operation for a minimum of five (5) years prior to bid date.

1.03 SUBMITTALS

A. Contractor shall engage a Professional Geotechnical Engineer registered in the State of Georgia to prepare a signed and sealed Dewatering Plan for the project if either of the following should occur:

1. If Contractor anticipates dewatering activities will be necessary along the route of the forcemain or water main installed via open cut construction or for the Jack-and-Bore or Horizontal Directional Drill pits.

2. If Contractor anticipates dewatering activities will be necessary upstream of PS4036 on B&W Grade Road for the installation of the 30-inch gravity sewer and proposed manhole and pipeline tie-ins.

B. Materials and Shop Drawings: Shop drawings required to establish compliance with the specifications and any Dewatering Plan shall be submitted in accordance with

the provisions of the Special Conditions. Submittals shall include at minimum the following:

1. Design notes and drawings.

2. Descriptive literature of the temporary dewatering system.

3. Layout of all pumps and piping involved.

4. Bill of materials.

1.04 MEASUREMENT AND PAYMENT

A. Dewatering: Dewatering will be included in the contract price as noted in Section 01025 Measurement and Payment. Dewatering efforts do not have a separate line item and are included in the associated construction items as noted in Section 01025. Includes all equipment, power, fuel, labor, Professional Geotechnical Engineer (registered in State of Georgia) design of Dewatering Plan and temporary dewatering systems, and all other items necessary to satisfactorily dewater construction areas.

PART 2 – PRODUCTS

2.01 GENERAL

A. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate in the excavations. The equipment used for dewatering systems shall be standard dewatering equipment of proven ability as designed and manufactured by firms having experience in the design and production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with the best practices and methods.

B. The Contractor shall engage a Professional Geotechnical Engineer registered in the State of Georgia to design signed and sealed temporary dewatering systems for the project in compliance with the Dewatering Plan. The Contractor shall submit to JWSC (and CSX as necessary) for review, a conceptual plan for the dewatering systems prior to commencing work. The dewatering systems installed shall be in conformity with the overall construction plan, and certification of this shall be provided by the Geotechnical Professional Engineer. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be necessary to assure that the systems will perform satisfactorily. Dewatering systems shall be designed in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed structures and to preserve the integrity of adjacent structures.

PART 3 – EXECUTION

3.01 DEWATERING

A. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate in the excavation.

B. If subsurface water is encountered, the Contractor shall utilize suitable equipment to adequately dewater the excavation so that it will be dry for work and pipe laying. A wellpoint system or other Engineer approved dewatering method shall be utilized if necessary to maintain the excavation in a dry condition for preparation of the trench bottom and for pipe laying. The water table should be maintained at least 2 feet below the required depth of excavation. The dewatering system should not be decommissioned until sufficient deadweight exists on the structures to prevent uplift or an uplift protection system, if necessary, is in place.

C. Dewatering by trench pumping will not be permitted if migration of fine grained natural material from bottom, side walls, or bedding material will occur.

3.02 DISPOSAL

A. Water pumped from the trench or other excavation shall be disposed of in storm sewers having adequate capacity, canals, or suitable disposal pits.

B. Contractor is responsible for acquiring any permits required to discharge the water and shall protect waterways from turbidity during the operation by the use of Best Management Practices.

C. In areas where adequate disposal sites are not available, partially backfilled trenches may be used for water disposal only when the Contractor's plan for trench disposal is approved in writing by the Engineer. The Contractor's plan shall include temporary culverts, barricades and other protective measures to prevent damage to property or injury to any person or persons.

D. No flooding of streets, roadways, driveways, or private property will be permitted. Engines driving dewatering pumps shall be equipped with residential type mufflers. Where practical and feasible, electric "drops" should be used in lieu of portable generators.

END OF SECTION

INDEX TO

SECTION 02200 – EARTHWORK

SECTION 02200

EARTHWORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section includes materials, testing, and earthwork for excavations, fills, and embankments.

1.02 RELATED DOCUMENTS

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

B. *August 23, 2019, Terracon Geotechnical Engineering Investigation, Glynco Linear Force Water Main, Brunswick, Glynn County, Georgia, Terracon Project No. ES195146.*

C. JWSC Standards for Water and Sewer Design and Construction

D. Related Sections:

1. Dewatering: Section 02140.

2. Excavating, Backfilling, and Compacting: Section 02220.

3. Loaming, Seeding and Mulching: Section 02922.

4. Solid Sodding: Section 02934.

1.03 STATUTORY REQUIREMENTS

A. All excavation, trenching, sheeting, bracing, etc., shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and State of Georgia and local requirements. Where conflict between OSHA, State and local regulations exists, the most stringent requirements shall apply.

1.04 SUMMARY

A. Contractor shall furnish all labor, materials, equipment and incidentals required and perform all excavation work and grading; place and compact backfill and fill; and dispose of unsuitable, waste and surplus materials as shown on the Drawings and as specified herein.

B. Contractor shall provide the services of a Licensed Professional Engineer registered in the State of Georgia to prepare temporary excavation support system designs and submittals, as necessary.

C. Contractor shall furnish and install temporary excavation support systems, including sheeting, shoring and bracing, as necessary, to insure the safety of

personnel and protect adjacent structures, piping, etc., in accordance with Federal, State and local laws, regulations and requirements.

D. All work shall be performed in accordance with the geotechnical recommendations as listed in 1.02 B above. Where the requirements of this section conflict with the recommendations of the geotechnical recommendations, the more stringent requirements shall be employed.

1.05 SUBMITTALS

A. Excavation support system designs shall be prepared by a Licensed Professional Engineer, registered in the State of Georgia having a minimum of five (5) years of professional experience in the design and construction of excavation support systems. Contractor shall submit an original and electronic version in PDF format of the Licensed Professional Engineer's certification, stating that the excavation support systems designs have been prepared by the Professional Engineer and that the Professional Engineer will be responsible for their execution.

B. Submit two (2) copies of a report from an approved testing laboratory verifying that any off-site borrow material conforms to the gradation specified.

1.06 REFERENCE STANDARDS

A. Where reference is made to American Society for Testing and Materials (ASTM) standards, the revision in effect at the time of bid opening shall apply.

1.07 QUALITY ASSURANCE

A. At all structures, prior to the placement of bedding material, concrete work mats, structural fill or structural concrete, coordinate with the soils testing laboratory to verify the suitability of the existing subgrade soil and to perform in-place soil density tests as required to verify that the bearing capacity of the subgrade is sufficient.

B. Prior to and during the placement of backfill and fill, coordinate with the soils testing laboratory to perform in-place soil density tests to verify that the backfill/fill material has been compacted in accordance with the compaction requirements specified elsewhere. The Engineer may designate areas to be tested.

1.08 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined to mean a soil condition such that the in-place moisture content of the soil at that time is no more than two (2) percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction.

B. Where used in this Section, "structures" refers to all buildings, tanks, wet wells, manholes and below grade vaults or structures.

1.09 TESTING REQUIREMENTS

A. Determination of laboratory moisture-density relationship and maximum density

shall be by the Modified Proctor Method of ASTM D-1557. At least one (1) test per soil type shall be made.

B. In place soil density shall be determined either by use of a Nuclear Density Meter per ASTM D-2922 or by use of the Drive Sleeve Method per ASTM D-2937. In place field densities shall be taken at least one (1) every 2,500 square feet at not greater than one (1) foot vertical intervals for all areas of potential building construction. Field Density Tests are to be located no further than 300 feet apart on center with a minimum of one (1) per roadway and one (1) per 5,000 square feet of parking/maneuvering area. One (1) density test is required for each pad or isolated footing and for every 20 linear feet of strip/wall footing length. For each tank mat foundation at least four (4) in place field densities shall be taken. In place field densities shall be taken at least one (1) every 300 feet of utility trench and not further than one (1) foot vertically or per lift, whichever is less.

C. Fill material from offsite shall be tested using a minus 200 sieve wash to check grain size. At least one (1) such test shall be run per 500 cubic yards of material brought from offsite.

D. Compaction shall be deemed to comply with the Specifications if no tests fall below the specified relative compaction. The Contractor shall pay the costs of any retesting of work not conforming to the Specifications.

E. "Relative compaction" is the ratio, expressed as a percentage, of the in-place density to the laboratory maximum density.

F. Density tests will be made for determination of specified compaction by an independent testing laboratory provided by the Contractor as approved by the Engineer. Tests will be made in locations reviewed and approved by the Engineer. If any tests are unsatisfactory, the Contractor shall re-excavate and re-compact the fill or backfill until the desired compaction is obtained. Additional compaction tests will be taken to each side of an unsatisfactory test at locations approved by the Engineer to determine the extent of re-excavation and re-compaction necessary.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION

A. Test Pits

1. Perform exploratory excavation work (test pits) for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.

2. Test pits shall be backfilled as soon as the desired information has been obtained. Backfilled surfaces shall be stabilized in accordance with approved erosion and sedimentation control plans and specifications.

B. Dewatering and Drainage Systems

1. Temporary dewatering and drainage systems shall be in place and operational prior to beginning excavation work. All dewatering systems shall be in accordance with Section 02140: Dewatering.

3.02 EXCAVATION SUPPORT

A. Furnish, install, monitor and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc.) as required by Federal, State or local laws, ordinances, regulations and safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and to protect adjacent structures from undermining, settlement or other damage. Take care to prevent the formation of voids outside of sheeting. If voids occur behind sheeting, immediately backfill and compact the voids with common fill material. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete.

B. Install excavation supports outside the neat lines of foundations. Supports shall be plumb and securely braced and tied in position. Excavation support shall be adequate to withstand all pressures to which the supports will be subjected. Any movement or bulging of supports shall be corrected to provide the necessary clearances, dimensions and structural integrity.

C. Excavation Supports Left in Place

1. Excavation supports that are required to remain in place, if applicable, are indicated on the Drawings.

2. The Owner or Engineer may direct that certain excavation supports remain in place, or be cut off at any specific elevation. Supports directed by the Owner or Engineer to be left in place and not so designated on the Drawings or otherwise specified herein to remain in place, will be paid for in accordance with the Terms and Conditions of the contract. If the Contractor believes that such a directive increases Contractor's cost and would thereby entitle Contractor to a change in contract cost, Contractor shall notify the Engineer in accordance with the applicable article(s) in the Terms and Conditions pertaining to changes in the work.

3. The right of the Owner or Engineer to direct that certain excavation supports remain in place shall not be construed as creating any obligation on the Owner or Engineer to give such direction, nor shall failure to give such direction relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient excavation supports to prevent any movement of the ground or damage to adjacent structures.

D. Excavation supports shall be carefully removed in such manner so as not to endanger the Work or other adjacent structures, roadways, utilities, or property. All voids left or caused by withdrawal of supports shall be immediately filled with sand and compacted.

3.03 STRUCTURAL EXCAVATION PROCEDURES

A. Excavations for structures shall be suitably wide for construction of the structures, including excavation supports, dewatering and drainage systems and working clearances.

B. Excavation shall be performed in-the-dry and shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Drainage and dewatering systems shall be in place and operational prior to beginning excavation work. In no case shall the earth be plowed, scraped or excavated by any means so near to the finished subgrade that would disturb the finished subgrade. Hand excavation of the final 3 to 6-in may be required to obtain a satisfactory, undisturbed subgrade. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory for support of structures as a result of inadequate excavation, dewatering, or other construction methods shall be removed and replaced with lean concrete, compacted structural fill or suitable crushed rock, subject to prior approval by the Engineer, at no additional cost to the Owner.

C. When excavations have reached the required subgrade, notify the soils testing laboratory to verify the suitability of the existing subgrade soils for the anticipated foundation and structural loadings. If the existing subgrade soils are determined to be unsuitable, follow the requirements of paragraph 3.03 D and the geotechnical report identified in 1.02 B.

D. Subgrade Preparation

1. To reduce the potential for post construction settlements of pipelines which bear in clayey soils (area of Soil Boring HA1, HA2, HA6, and HA10, depth between 1.5 to 4.5 feet) the following is recommended:

   a. At least one (1) foot of clayey soils (SC) below the pipeline inverts be over-excavated and replaced with compacted structural backfill to final bearing elevations.

   b. If encountered at the structures bearing level, organic soils (A-8) should be completely removed below the structures and replaced with compacted structural fill.

   c. Compacted structural fill should then be placed around and above structures and pipelines to final grade.

   d. Alternatively, to reduce the amount of structural fill and over-excavation, a medium duty woven geotextile such as MIRAFI 600X, or equivalent, may be used as a barrier between compacted fill and clayey materials. If a woven geotextile is used, the amount of over-excavation can be waived for the pipeline. The geotextile should be placed in the excavation bottom and sides above the clayey soils creating a barrier between the clayey soils and structural backfill to preclude contamination of the backfill. A compacted structural fill material should then be used to backfill to the final bearing elevation and around and above structures and pipelines to final grade.

E. Over-excavation beyond the limits and depths required by the Contract Documents shall be replaced at no additional cost to the Owner by structural fill or other approved material subject to the prior approval of the Engineer.

3.04 GENERAL FILLING AND BACKFILLING PROCEDURES

A. Fill and backfill materials shall be placed in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e. topsoil, sod, etc). Soft spots or uncompacted areas shall be corrected.

B. Fill and backfill materials shall not be placed on frozen surfaces, or surfaces covered by snow or ice. Fill and backfill material shall be free of snow, ice and frozen earth.

C. Compaction in open areas may be accomplished by any of the following methods: compaction equipment, fully loaded ten-wheel trucks, tractor dozers weighing at least 30,000 lbs and operated at full speed, or heavy vibratory rollers. Compaction in confined areas (including areas within a 45-degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical, shall be accomplished by hand operated vibratory equipment or mechanical tampers. Lift thickness shall not exceed 6-inches (measured before compaction) when hand operated equipment is used.

D. Fill and backfill shall not be placed and compacted when the materials are too wet to properly compact (i.e. the in-place moisture content of the soil at that time is no more than three (3) percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction).

3.05 FILL AND BACKFILL PROCEDURES

A. Fill and backfill material placed immediately adjacent to and within 10-ft of all structures shall be select fill. All structure water-tightness tests and dampproofing/waterproofing shall be completed prior to placing fill or backfill around structures. Place and compact select fill in even lifts of 6-inches (compacted thickness) uniformly around the structure.

B. Common fill may be used in areas beyond those designated for select fill unless shown or specified otherwise. Common fill shall be placed in even lifts having a maximum thickness (measured before compaction) of 12-inches.

C. Fill required beneath building slabs or slabs on grade (except sidewalks) shall be structural fill. Place and compact structural fill in even lifts of 6-inches (compacted thickness).

3.06 EMBANKMENT FILL PROCEDURES

A. Prior to placing embankment fill materials, all organic materials (including peat and loam) and loose inorganic silt material (loess) shall be removed from areas beneath the embankments. If the subgrade slopes are excessive, the subgrade shall be stepped to produce a stable, horizontal surface for the placement of embankment materials. The existing subgrade shall then be scarified to a depth

of at least 6-inches.

B. Embankment fill shall consist of common fill material and shall be placed and compacted in even lifts of 12-inches (compacted thickness).

C. Rock may be used in embankment fill only with prior, written approval of the Engineer.

3.07 IMPERVIOUS FILL

A. Impervious fill shall be placed in controlled, even lifts having a maximum thickness (measured before compaction) of 6-inches. Compaction shall be sufficient to attain a permeability of less than 1x10-7 cm/sec.

B. Moisture content of impervious fill to be compacted shall be maintained at or near its optimum moisture content (minus 2 to plus 3 percent).

3.08 COMPACTION REQUIREMENTS

A. Compaction shall be performed in accordance with Section 02220: Excavating, Backfilling, and Compacting.

3.09 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS EXCAVATED MATERIAL

A. Unsuitable, waste and surplus excavated material shall be removed and disposed of off-site. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt construction activities, create any nuisances or safety hazards, or otherwise restrict access to the work site, as approved by Owner.

3.10 GRADING

A. Grading shall be performed to the lines and grades shown on the Construction Drawings. All objectionable material encountered within the limits indicated shall be removed and disposed of. Subgrades shall be completely and continuously drained and dewatered throughout the grading process. Install temporary drains, drainage ditches, etc., to intercept or divert surface water which may affect the execution or condition of grading work.

B. If at the time of grading it is not possible to place any material in its proper section of the Work, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.

C. Stones or rock fragments larger than 2-inches in their greatest dimensions will not be permitted within the top 6-inches of the finished grade of fills and embankments.

D. In cut areas, all loose or protruding rocks in slopes shall be removed to line or finished grade of the slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Construction Drawings unless otherwise directed by the Engineer.

END OF SECTION

INDEX TO

SECTION 02210 – SOIL EROSION CONTROL

SECTION 02210

SOIL EROSION CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this section.

1.2 DESCRIPTION OF WORK

A. Extent of soil erosion control work includes all measures necessary to meet the requirements of this section.

Erosion and sediment control measures shall be installed prior to any construction activity.

Soil erosion and sediment control measures shall include all temporary and permanent means of protection and trapping soils of the construction site during land disturbing activity. Activity covered in this contract shall meet standards of NPDES General Permit for the state where work is performed.

1.3 PURPOSES

A. Contractor is to achieve the following goals:

1. Minimize soil exposure by proper timing of grading and construction.
2. Retain existing vegetation whenever feasible.
3. Vegetate and mulch denuded areas as soon as possible.
4. Divert runoff away from denuded areas.
5. Minimize length and steepness of slopes when it is practical.
6. Reduce runoff velocities with sediment barriers or by increasing roughness with stone.
7. Trap sediment on site.
8. Inspect and maintain erosion control measures.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of soil erosion control systems products of types and sizes required, whose materials have been in satisfactory use for not less than 5 years.

B. Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion control.

Georgia Projects

C. The 24-hour contact for erosion and sedimentation control measures is:

Name: Mr. Keith Strong

Address: Thomas & Hutton
50 Park of Commerce Way
Savannah, GA 31405

Phone: (912) 667-9793

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion control materials and products.

1.6 MEASUREMENT AND PAYMENT

A. No unit measurements will be made for soil erosion control. Payment will be made at the lump sum price as shown on the bid proposal. The cost of soil erosion control shall include all equipment, labor and materials necessary to comply with the State of Georgia Erosion and Sediment Control Program.

PART 2 – PRODUCTS

2.1 GRASSING MATERIALS

A. Refer to Section 02922 – Loaming, Seeding, and Mulching and Section 02934 – Solid Sodding.

1. General: All grass seed shall be free from noxious weeds, grade A recent crop, recleaned and treated with appropriate fungicide at time of mixture. Deliver to site in original sealed containers with dealer's guarantee as to year grown, percentage of purity, percentage of germination and date of the test by which percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.

2.2 HAY BALES

A. Standard size, densely baled straw or hay, wrapped with synthetic or wire bands (two minimum per bale).

2.3 SILT FENCE

A. Silt fence shall be a woven geotextile fabric sheet. Fabric shall be a synthetic polymer composed of at least 85% by weight propylene, ethylene, amide, ester, or vinylidene chloride, and shall contain stabilizer and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultra-violet and/or heat exposure. Fabric should be finished so the filaments will retain their relative position with respect to each other. Fabric shall be free of defects, rips, holes, or flaws.

Fabric shall meet the following requirements:

Woven Fabrics	
Grab Strength	90 lbs.
Burst Strength	175 PSI
UV Resistance	80%

2.4 CHEMICALS FOR DUST CONTROL

A. Calcium Chloride, Anionic Asphalt Emulsion, latex Emulsion or Resin-in-Water Emulsion may be used for dust control.

2.5 RIP-RAP

A. Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight, or weather. Stone shall range in weight from a minimum of 25 pounds to a maximum of 125 pounds. At least 50 percent of the stone shall weigh more than 60 pounds. The stone shall have a minimum dimension of 12 inches.

2.6 PRODUCT REVIEW

A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 GENERAL

A. All disturbed soil areas except those to support paving shall be graded and protected from erosion by grassing. Disturbed areas must be grassed within 14 days of work ending unless work is to begin again before 21 days. Storm water conveyance systems shall have sediment barriers installed at all entrances, intersections, change in direction and discharge points.

3.2 GRASSING

A. Refer to Section 02922 – Loaming, Seeding, and Mulching and Section 02934 – Solid Sodding.

3.3 SEDIMENT BARRIERS

A. Hay Bales for Sheet Flow Applications:

1. Excavate a 4 inch deep trench the width of a bale and length of proposed barrier. Barrier should be parallel to the slope. Place barrier 5 to 6 feet away from toe of slope, unless otherwise instructed.

2. Place bales in the trench with their ends tightly abutting. Corner abutment is not acceptable. A tight fit is important to prevent sediment from escaping through spaces between the bales.

3. Backfill the trench with previously excavated soil and compact it. Backfill soil should conform to ground level on downhill side of barrier and should be built up to 4 inches above ground on uphill side of bales.

4. Inspect and repair or replace damaged bales promptly. Remove hay bales when uphill sloped areas have been permanently stabilized.

B. Hay Bales for Ditch Check Applications:

1. Install hay bales as described for sheet flow with the following exceptions:

a. Place bales in a single row, lengthwise, oriented perpendicular to the flow, and with ends of adjacent bales tightly abutting one another.

b. Extend barrier to such a length so the bottoms of end bales are at a higher elevation than the top of lowest middle bale to assure sediment-laden runoff will flow either through or over barrier but not around it.

3.4 SILT FENCE

A. Silt fence shall be placed at approximate location shown and installed in accordance with the detail on the construction drawings. Contractor shall maintain silt fence as required by state regulations.

3.5 DUST CONTROL

A. Dust raised from vehicular traffic will be controlled by wetting down access road with water or by the use of a deliquescent chemical, such as calcium chloride, if relative humidity is over 30%. Chemicals shall be applied in accordance with manufacturer's recommendations.

B. Contractor shall use all means necessary to control dust on and near the work, or off-site borrow areas when dust is caused by operations during performance of work or if resulting from the condition in which any subcontractor leaves the site. Contractor shall thoroughly treat all surfaces required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of work on site.

3.6 SEDIMENT BASIN

A. As indicated on the construction drawings, a sediment basin equal in volume to 3,600 cubic feet per disturbed acre is required. The sediment basin/lagoon adjacent to the outfall for the site shall be constructed and stabilized prior to any additional land disturbed activity.

3.7 RIP-RAP

A. Rip-Rap shall be placed at the locations shown and installed in accordance with the detail on the construction drawings.

3.8 CONSTRUCTION EXIT

A. Construct exit at the location shown per detail on the construction drawings. Contractor shall maintain construction exit as required by state regulations.

3.9 INLET PROTECTION

A. Install inlet protection per detail on the construction drawings. Contractor shall maintain inlet protection as required by state regulations until all disturbed surfaces are stabilized.

END OF SECTION

INDEX TO

SECTION 02211 – EROSION, SEDIMENTATION, AND POLLUTION CONTROL (GA)

SECTION 02211

EROSION, SEDIMENTATION, AND POLLUTION CONTROL (GA)

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Soil erosion, sediment and pollution control measures shall include all temporary and permanent means of soil protection, trapping soils and containment of pollutants on the construction site during land disturbing activities. Activities covered in this section are regulated by the Manual for Erosion and Sediment Control in Georgia (latest revision) and Georgia's National Pollutant Discharge Elimination System Permit (NPDES), General Permit No. GAR100002 (Infrastructure Construction Projects).

B. Reporting

C. Sampling

1.2 RELATED SECTIONS

A. Section 02110 – Site Clearing

B. Section 02200 – Earthwork

C. Section 02660 – Water Distribution System

D. Section 02662 – Sanitary Sewer Systems

1.3 PURPOSES

A. The purpose of this section is to achieve the following goals:

1. Minimize soil exposure by proper timing of clearing, grading and construction.

2. Retain existing vegetation whenever feasible.

3. Vegetate and mulch disturbed areas as soon as possible.

4. Divert runoff away from disturbed areas.

5. Minimize length and steepness of slopes when it is practical.

6. Reduce runoff velocities with check dams or surface roughing.

7. Trap sediment on site.

8. Inspect and maintain erosion, sedimentation and pollution control measures.

9. Report on condition of Best Management Practices (BMPs).

10. Sample site run off per Georgia's NPDES Permit.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of soil erosion, sedimentation and pollution control systems products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion, sedimentation and pollution control.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion, sedimentation and pollution control materials and products.

1.6 MEASUREMENT AND PAYMENT

A. No unit measurements will be made for soil erosion control. Payment will be made at the lump sum price as shown on the bid proposal and described in Section 01025 Measurement and Payment. The cost of soil erosion control shall include all equipment, labor, maintenance, monitoring, reporting, and materials necessary to comply with the State of Georgia NPDES Permit.

PART 2 – PRODUCTS

2.1 VEGETATIVE MATERIALS

A. Mulch

1. Dry straw or hay.

2. Wood chips, sawdust or bark.

3. Cutback asphalt.

B. Temporary Seeding

1. Annual Ryegrass

2. Browntop Millet

C. Permanent Seeding

1. Reference Section 02922 – Loaming, Seeding and Mulching

D. Sod

1. Reference Section 02934 – Solid Sodding

E. Fertilizer

1. Reference Section 02922 – Loaming, Seeding and Mulching and Section 02934 – Solid Sodding.

2.2 STRUCTURAL MATERIALS

A. Check Dam

1. Stone (2" – 10")

2. Bales of densely baled hay or straw wrapped with synthetic or wire bands (two minimum per bale).

B. Construction Exit

1. Minimum 20' x 50' x 0.5' layer of 1.5" to 3.5" stone with a geotextile underliner.

C. Filter Ring

1. Minimum 2' high stone ring. Stone shall be no smaller than 3" to 5" when utilized at storm drain inlets and pond outlets with pipe diameters less than 12".

2. Minimum 2' high stone ring. Stone shall be no smaller than 10" to 15" when utilized at storm drain inlets and pond outlets with pipe diameters greater than 12".

D. Sediment Barrier

1. Bales of densely baled hay or straw wrapped with synthetic or wire bands (two minimum per bale).

2. Silt Fence – Shall be a woven geotextile fabric sheet of plastic yarn composed of a long chain synthetic polymer with at least 85% by weight propylene, ethylene, amide, ester or vinylidene chloride, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and/or heat exposure. The fabric shall be finished so the filaments will retain their relative position with respect to each other. The fabric shall be free of defects, rips, holes or flaws. The manufacturer shall have either an approved color mark yarn in the fabric or label the fabricated silt fence with both the manufacturer and fabric name every 100'.

The fabric shall meet the following requirements:

Grab Strength	90 lbs.
Mullen Burst Strength	150 lbs.
UV Resistance	80 %

E. Inlet Sediment Trap

1. Silt fence (Type C) supported by steel posts.

2. Baffle Box – Constructed of 2" x 4" boards spaced a maximum of 1" apart or plywood with weep holes 2" in diameter.

3. Sod Inlet Protection – Four (4) one (1) foot wide strips of sod on each side of the inlet.

4. Curb Inlet Protection – Eight (8) inch concrete blocks wrapped in filter fabric, placed in front of a curb inlet.

F. Storm Drain Outlet Protection

1. Geotextile fabric equivalent to Mirafi 140N.

2. Rip-rap.

2.3 CHEMICAL MATERIALS

A. Dust Control – Calcium Chloride, Anionic Asphalt Emulsion, Latex Emulsion or Resin-in-Water Emulsion.

B. Anionic Polyacrylamide (PAM) – Consult state and local laws concerning the regulations of this chemical.

PART 3 – EXECUTION

3.1 GENERAL

A. All disturbed soil areas except those to support paving shall be graded and protected from erosion with vegetative materials. Sedimentation discharge from the construction site into natural drainage ways and storm drainage systems shall be prevented by means of vegetative measures and temporary structural practices. These vegetative measures and structural practices are known as Best Management Practices (BMPs). Rainfall, pollution control measures and construction exit condition shall be monitored and reported on each day when construction activities take place. Erosion and sedimentation control measures shall be monitored and reported on every seven (7) days and within 24 hours of a qualifying rainfall event of 0.5-inches or more. Sampling of construction site discharging water shall be sampled within 45 minutes of a qualifying rainfall event and analyzed immediately or no later than 48 hours after collection. The above reports shall be submitted to the Georgia EPD by the fifteenth day of the month following the reporting period.

B. The Contractor (Operator) is considered a "Primary Permittee" and shall submit a Notice of Intent (NOI) in accordance with General Permit Number GAR100002 at least one (1) week prior to the commencement of construction activities. The Contractor shall retain a copy of the Erosion, Sedimentation and Pollution Control Plan and the Comprehensive Monitoring Program required by the above permit at the construction site or be readily available at a designated alternate location from the date of project initiation to the date of final stabilization. Copies of all Notice of Intent, Notice of Termination, plans, monitoring reports and all other records required by the above permit shall be retained by the Contractor for a period of at least three (3) years from the date the site is finally stabilized. Copies of the Notice of Intent (NOI), Notice of Termination (NOT) and General Permit Number GAR1000002 are available at the noted Georgia EPD website: https://epd.georgia.gov/forms-and-permits/watershed-protection-branch-forms-permits/storm-water-forms/npdes-construction

3.2 ON-SITE OBSERVATION

A. The Engineer is required by General Permit Number GAR100002 to check the installation of the Erosion, Sedimentation and Pollution Control measures within one (1) week after the initial construction activities commence. The Contractor shall notify the Engineer within 24 hours of the control measures installation for the above site visit. The Engineer, within the above parameters, shall check subsequent installation of control measures.

3.3 VEGETATIVE PRACTICES

A. Mulch

1. Dry straw or hay shall be applied at a depth of 2 to 4 inches by hand or mechanical equipment providing complete soil coverage. Straw or hay shall be anchored immediately after application. Straw or hay can be anchored with a disk harrow, packer disk or emulsified asphalt.

2. Wood chips, sawdust or bark shall be applied at a depth of 2 to 3 inches by hand or mechanical equipment providing complete soil coverage. Netting of the appropriate size shall be used to anchor the above materials.

3. Cutback asphalt shall be applied at 1,200 gallons per acre or ¼ gallon per square yard.

B. Seeding

1. Seed shall be applied uniformly by hand, cyclone seeder, drill, cultipacker seeder or hydraulic seeder. Drill or cultipacker seeders shall place seed 1/4" to 1/2" deep. Soil shall be raked lightly to cover seed with soil if seeded by hand.

2. During times of drought, water shall be applied at a rate not causing runoff and erosion. The soil shall be thoroughly wetted to depth insuring

germination of the seed. Subsequent applications of water shall be made when needed.

3. Refer to Section 02922 – Loaming, Seeding and Mulching for additional seeding requirements.

C. Sodding

1. Bring soil surface to final grade. Clear surface of trash, woody debris stones and dirt clods larger than 1". Mix fertilizer into soil surface. Apply sod to soil when surface is not muddy or frozen. Lay sod with tight joints and in straight lines. Do not overlap joints. Stagger joints and do not stretch sod. On slopes steeper than 3:1, sod shall be anchored with pins or other approved methods. Installed sod shall be rolled or tamped to provide good contact between sod and soil. Irrigate sod and soil to a depth of 4" immediately after installation. Irrigation shall be used to supplement rainfall for a minimum of 2-3 weeks.

2. Refer to Section 02934 – Solid Sodding for additional sodding requirements.

3.4 STRUCTURAL MEASURES

A. Check Dam

1. Stone – Shall be constructed of graded size 2-10 inch stone underlayed with a geotextile fabric. Mechanical or hand placement shall be required to insure complete coverage of entire width of ditch or swale and center of dam is lower than edges. Sediment shall be removed when it reaches a depth of one-half the original dam height or before.

2. Haybale – Shall be staked and embedded a minimum of 4" and may be used as temporary check dams in concentrated flow areas while vegetation is becoming established. They should not be used where the drainage area exceeds one acre. Sediment shall be removed when it reaches a depth of one-half the original dam height or before.

B. Construction Exit

1. A stone stabilized pad shall be located at any point where traffic will be leaving the construction site to a public right-of-way, street, alley, sidewalk, parking area or any other area where there is a transition from bare soil to a paved area. The pad shall be constructed of 1.5" to 3.5" stone, having a minimum thickness of 6" and not less than 20' wide and 50' long. The pad shall be underlayed with a geotextile fabric. The pad shall be maintained in a condition, which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with 1.5" to 3.5" stone. All materials spilled, dropped, washed or tracked from vehicles or site onto roadways or into storm drains must be removed immediately.

C. Filter Ring

1. Shall surround all sides of the structure receiving runoff from disturbed areas. It shall be placed a minimum of 4' from the structure. It may also be used below storm drains discharging into detention ponds, creating a centralized area for sediment accumulation. When utilized below a storm drain outlet, it shall be placed such that it does not create a condition causing water to back-up into the storm drain and inhibit the function of the storm drain system. The larger stone can be faced with smaller filter stone on the upstream side for added sediment filtering capabilities. Mechanical or hand placement of stone shall be required to uniformly surround the structure.

2. Filter ring must be kept clear of trash and debris. This requires continuous monitoring and maintenance, which includes sediment removal when one-half full. Filter rings are temporary and should be removed when the site has been stabilized.

D. Sediment Barrier

1. Hay or straw bales may be used in areas of low sheet flow rates. They shall not be use if the project duration is expected to exceed three (3) months. Bales shall be placed in a single row, lengthwise, and embedded in the soil to a depth of 4". Bales must be securely anchored in place by stakes or bars driven through the bales or by other acceptable means to prevent displacement. Bales shall be placed so the binding wire or twine around the bale will not touch the soil. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed. The slope lengths contributing runoff to a bale barrier cannot exceed those listed below.

Land Slope (Percent)	Maximum Slope Length Above Bale (Feet)
< 2	75
2 to 5	50
5 to 10	35
10 to 20	20
> 20	10

2. Silt fence may be used in areas of higher sheet flow rates. The drainage area shall not exceed ¼ acre for every 100' of silt fence. **Silt fence shall not be installed across streams, ditches, waterways or other concentrated flow areas.** Silt fence shall be installed according to this specification, as shown on the construction drawings or as directed by the Engineer. See details on the construction drawings for installation requirements.

   a) Type A – A 36" wide filter fabric silt fence shall be used on construction sites where the life of the project is greater than or equal to six (6) months.

b) Type B – A 22" wide filter fabric silt fence shall be limited to use on minor projects, such as residential home sites or small commercial developments where permanent stabilization will be achieved in less than six (6) months.

c) Type C – A 36" wide filter fabric silt fence with wire reinforcement shall be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10'. Along stream buffers and other sensitive areas, two (2) rows of Type C silt fence or one (1) row of Type C silt fence backed by hay bales shall be used.

3. Where all runoff is to be stored behind the silt fence (where no stormwater disposal system is present), the slope lengths contributing runoff to a silt fence barrier cannot exceed those listed below.

Land Slope (Percent)	Maximum Slope Length Above Fence (Feet)
< 2	100
2 to 5	75
5 to 10	50
10 to 20	25
> 20*	15

*In areas where the slope is greater than 20%, a flat area length of 10' between the toe of the slope and the fence shall be provided.

4. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Filter fabric shall be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months). Barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed.

E. Inlet Sediment Trap

1. Shall be installed at or around all storm drain inlets receiving runoff from disturbed areas. Sediment traps must be self draining unless they are otherwise protected in an approved manner that will not present a safety hazard. The drainage area entering the inlet sediment trap shall be no greater than one acre. Sediment traps may be constructed on natural ground surface, on an excavated surface or on machine compacted fill provided they have a non-erodible outlet.

2. Type C silt fence supported by steel posts may be used where the inlet drains a relatively flat area (slope no greater than 5%) and shall not apply to inlets receiving concentrated flows, such as in street or highway medians. The stakes shall be spaced evenly around the perimeter of the

inlet a maximum of 3' apart and securely driven into the ground, approximately 18" deep. The fabric shall be entrenched 12" and backfilled with crushed stone or compacted soil. Fabric and wire shall be securely fastened to the posts and fabric ends must be overlapped a minimum of 18" or wrapped together around a post to provide a continuous fabric barrier around the inlet. The trap shall be inspected daily and after each rain. Repairs are to be made as needed. Sediment shall be removed once it has accumulated to one-half the height of the trap. **Sediment shall not be washed into the inlet.** It shall be removed from the sediment trap and disposed of and stabilized so it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment shall be removed and either salvaged or disposed of properly. The disturbed area shall be brought to proper grade, smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

3. A baffle box shall be used for inlets receiving runoff with a higher volume or velocity. The box shall be constructed of 2" x 4" boards spaced a maximum of 1" apart or of plywood with weep holes 2" in diameter. The weep holes shall be placed approximately 6" on center vertically and horizontally. The entire box shall be wrapped in Type C filter fabric that is entrenched 12" and backfilled. Gravel shall be placed around the box to a depth of 2" to 4". The trap shall be inspected daily and after each rain. Repairs are to be made as needed. Sediment shall be removed once it has accumulated to one-half the height of the trap. **Sediment shall not be washed into the inlet.** It shall be removed from the sediment trap and disposed of and stabilized so it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment shall be removed and either salvaged or disposed of properly. The disturbed area shall be brought to proper grade, smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

4. Sod Inlet Protection shall be used only at the time of permanent seeding, to protect the inlet from sediment and mulch material until permanent vegetation has become established. The sod shall be placed to form a turf mat covering the soil for a distance of 4' from each side of the inlet structure. Sod strips shall be staggered so adjacent strip ends are not aligned. Re-sod areas where an adequate stand of sod is not obtained. New sod should be mowed sparingly. Grass height should not be less than 2" to 3".

5. Curb Inlet Protection shall be used on curb inlets receiving runoff from disturbed areas once pavement has been installed. Place 8" concrete blocks wrapped in filter fabric in front of the curb inlet opening. A gap of approximately 4" shall be left between the inlet filter and the inlet to allow for overflow and prevention of hazardous ponding in the roadway. **This method of inlet protection shall be removed if a safety hazard is created.** Sediment shall be removed from curb inlet protection immediately.

F. Storm Drain Outlet Protection

1. Outlet protection aprons shall be constructed at all storm drain outlets, road culverts, paved channel outlets discharging into natural or constructed channels. Apron will extend from end of the conduit, channel or structure to the point of entry into an existing stream or publicly maintained drainage system. Apron length, width and stone size shall conform to details on the construction drawings. Apron shall be constructed with no slope along its length. Invert elevation of the downstream end of apron shall be equal to the elevation of the receiving channel invert. There shall be no overfall at the end of apron. Apron shall be located so there are no bends in the horizontal alignment.

2. Subgrade for geotextile fabric and rip-rap shall follow required lines and grades shown on the construction drawings. Compact any subgrade fill required to the density of surrounding undisturbed material. Low areas in subgrade on undisturbed soil may also be filled by increasing rip-rap thickness. Geotextile fabric shall be protected from punching or tearing during installation. Repair any damage by removing rip-rap and placing another piece of fabric over the damaged area. All connecting joints shall overlap a minimum of 1'. If damage is extensive, replace entire geotextile fabric. Rip-rap shall be placed by equipment or hand. Minimum thickness of rip-rap shall be 1.5 times the maximum stone diameter. Immediately after construction, stabilize all disturbed areas around apron with vegetation.

3. Check outlet apron after heavy rains to see if any erosion around or below the rip-rap has taken or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

3.5 CHEMICAL MEASURES

A. Dust Control

1. Dust raised from vehicular traffic shall be controlled by wetting down roads with water or by the use of chemicals. Chemicals shall be applied in accordance with the manufacturer's recommendations.

B. Soil Binding

1. This temporary practice is intended for direct soil surface application to sites where the timely establishment of vegetation may not be feasible or where vegetative cover is absent or inadequate. **This temporary practice is not intended for application to surface waters of the state.** It is intended for application within construction storm water ditches and storm drains which, feed into previously constructed sediment ponds or basins.

2. Anionic Polyacrylamide (PAM) is available in emulsions, powders, gel bars and logs. It is required that other Best Management Practices be used in combination with anionic PAM. The use of seed and mulch for additional erosion protection beyond the life of anionic PAM is recommended. Use 50' setbacks when applying anionic PAM near natural water bodies. Never add water to PAM, add PAM slowly to water. If water is added to PAM, globs can form which can clog dispensers. This signifies incomplete

dissolving of PAM and therefore increases the risk of under application. Application rates shall conform to manufacturer's guidelines. **The maximum application rate of PAM, in pure form, shall not exceed 200pounds/acre/year.** Contractors using anionic PAM shall obtain and follow all Material Safety Data Sheet requirements and manufacturer's recommendations. Gel bars and logs of anionic PAM mixtures may be used in ditch systems. This application shall meet the same testing requirements as anionic PAM emulsions and powders. Maintenance will consist of reapplying anionic PAM to disturbed areas, including high traffic areas, which interfere in the performance of this practice.

3.6 MONITORING AND REPORTING

A. Each day, when any type of construction activity takes place on the construction site, Contractor's qualified personnel shall monitor and record rainfall, inspect all areas where petroleum products are stored, used or handled for spills and leaks from vehicles and equipment and check all locations where vehicles enter or exit the site for evidence of off site sediment tracking. These inspections shall be conducted until a Notice of Termination (NOT) is submitted. For linear construction where a phased activity is conducted, this paragraph applies to the active phase(s) of work.

B. Once every seven (7) calendar days and within 24 hours of the end of a storm 0.5 inches or greater, Contractor's qualified personnel shall inspect disturbed areas of the construction site that have not undergone final stabilization, areas used for storage of materials that are exposed to precipitation that have not undergone final stabilization and structural control measures (BMPs). Erosion and sediment control measures identified in the Erosion, Sedimentation and Pollution Control Plan shall be observed to ensure they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). These inspections must be conducted until a Notice of Termination is submitted. For linear construction where a phase activity is conducted, this paragraph applies to the active phase(s) of work.

C. Contractor's qualified personnel shall inspect a least once per month during the term of the General Permit, areas of the construction site having undergone final stabilization. These areas shall be inspected for evidence of, or the potential for, pollutants entering the drainage system and receiving water(s). Erosion and sediment control measure shall be observed to ensure they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). For linear construction, monthly inspections in accordance with this paragraph shall be made for those phases on which final stabilization has been completed.

D. Contractor shall prepare a report summarizing the scope of inspections, name(s) of qualified personnel making the inspections, date(s) of inspections, major observations relating to the implementation of the Erosion, Sedimentation and Pollution Control Plan and any actions taken. This report shall be retained on the construction site or be readily available at a designated alternate location until the entire site or portion of a construction project that was phased, has undergone final stabilization and a Notice of Termination (NOT) is submitted to

EPD. Such reports shall identify any incidents of non-compliance. Where the report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the Erosion, Sedimentation and Pollution Control Plan and the General Permit. The report shall be signed in accordance with the General Permit.

3.7 SAMPLING AND ANALYSIS

A. Contractor must manually or automatically sample in accordance with the Comprehensive Monitoring Plan (CMP) at least once for each rainfall event described below. For a qualifying event, samples must be taken within forty-five (45) minutes of:

1. The accumulation of the minimum amount of rainfall, if the storm water discharge to a monitored receiving water or from a monitored outfall has begun at or prior to the accumulation.

2. The beginning of any storm water discharge to a monitored receiving water or from a monitored outfall, if the discharge begins after the accumulation of the minimum amount of rainfall.

However, where manual and automatic sampling are impossible (as defined in the permit), or are beyond the Contractor's control, the Contractor shall take samples as soon as possible, but in no case more than twelve (12) hours after the beginning of the storm water discharge.

B. Sampling shall occur for the following events:

1. The first rainfall event greater than or equal to 0.5 inches in 24 hours after the first implementation of BMPs.

2. In addition to (1) above, any rainfall event greater than or equal to 1.0 inches in 24 hours but no more than one (1) event per calendar month until a Notice of Termination (NOT) is submitted with final sampling data.

3. In addition to (1) and (2) above, any rainfall event greater than or equal to 2.0 inches in 24 hours until a Notice of Termination (NOT) is submitted with final sampling data.

4. Following final stabilization, at least one rainfall event greater than or equal to 0.5 inches in 24 hours.

5. In addition to (1), (2), (3) and (4) above, where BMPs have not been properly designed, installed or maintained in accordance with the General Permit, any rainfall event greater than or equal to 0.5 inches in 24 hours. This sampling must continue through the first rainfall event after BMPs have been properly designed, installed and maintained in accordance with the General Permit.

6. For linear construction, if at any time during the life of the project, BMPs have not been properly designed, installed or maintained for the construction activities that discharge into a receiving water which is not

being sampled, the Contractor shall sample that receiving water for the first rainfall event greater than or equal to 0.5 inches thereafter and for every rainfall event greater than or equal to 0.5 inches until BMPs are properly designed, installed and maintained.

C. Sampling shall be collected by "grab samples" and the analysis of these samples must be conducted in accordance with methodology and test procedures established in the General Permit. Sample containers shall be labeled prior to collecting the samples. Samples shall be well mixed before transferring to a secondary container. Large mouth, well cleaned and rinsed glass or plastic jars shall be used for collecting samples. The jars shall be cleaned thoroughly to avoid contamination. Manual or automatic sampling shall be utilized. Samples required by the General Permit shall be analyzed immediately, but in no case later than 48 hours after collection. However, samples from automatic samplers must be collected no later than the next business day after their accumulation, unless flow through automated analysis is utilized. Samples are not required to be cooled. Samples taken for the purpose of compliance with the General Permit shall be representative of the monitored activity and representative of the water quality of the receiving water(s) and/or the storm water outfalls using the following minimum guidelines:

1. The upstream sample for each receiving water(s) must be taken immediately upstream of the confluence of the first storm water discharge from the permitted construction site but downstream of any other storm water discharges not associated with the site. Where appropriate, several upstream samples from across the receiving water(s) may need to be taken and the average turbidity of these samples used for an upstream turbidity value.

2. The downstream sample for each receiving water(s) must be taken downstream of the confluence of the last storm water discharge from the construction site but upstream of any other storm water discharge not associated with the site. Where appropriate, several downstream samples from across the receiving water(s) may need to be taken and the average turbidity of these samples used for a downstream turbidity value.

3. Samples shall be taken from the horizontal and vertical center of the receiving water(s) or the storm water outfall channel(s).

4. Care shall be taken to avoid stirring the bottom sediments in the receiving water(s) or in the outfall storm water channel(s).

5. Sampling container shall be held so the opening faces upstream.

6. Samples shall be kept from floating debris.

D. For all construction sites and common developments other than linear construction projects, the Contractor shall sample all receiving water(s), or all outfall(s) or a combination of receiving water(s) and outfall(s). For linear construction projects, the Contractor must sample all perennial and intermittent streams and other water bodies shown on an USGS topographic map and all

other field verified perennial and intermittent streams and other water bodies, or all outfalls into such streams and other water bodies, or a combination thereof.

E. Contractor shall provide and implement all safety equipment and procedures necessary for sampling during hazardous weather conditions and in the event of biological, chemical or physical hazards

F. Contractor shall submit a summary of the monitoring results to the EPD at the address shown in the General Permit by the fifteenth day of the month following the reporting period. For a monitoring period during which no qualifying rainfall events occur, a monitoring report must be submitted stating such. Monitoring periods are calendar months beginning with the first month after the effective date of the General Permit. Monitoring reports shall be signed in accordance with the General Permit and submitted to EPD until such time as a NOT is submitted.

G. Contractor must retain copies of all monitoring results and monitoring information reported. In addition to other record keeping requirements, the monitoring information shall include:

1. Date, exact place and time of sampling or measurements.

2. Name(s) of the individual(s) who performed the sampling and measurements.

3. Date(s) analyses were performed.

4. Time(s) analyses were initiated.

5. Name(s) of the individual(s) who performed the analyses.

6. References and written procedures, when available, for the analytical techniques or methods used. A quality control/quality assurance program must be included in the written procedures.

7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, used to determine these results.

END OF SECTION

INDEX TO

SECTION 02220 – EXCAVATION, BACKFILLING, AND COMPACTING

SECTION 02220

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included under this Section consists of clearing, excavating, grading and backfilling as required for the construction of the buildings, structures, piping and appurtenances as shown on the Drawings and specified herein.

B. Related Work Described Elsewhere:

1. JWSC Standards for Water and Sewer Design and Construction

2. Dewatering: Section 02140.

3. Site Clearing: Section 02110.

4. Earthwork: Section 02220.

5. *August 23, 2019, Terracon Geotechnical Engineering Investigation, Glynco Linear Force Water Main, Brunswick, Glynn County, Georgia, Terracon Project No. ES195146.*

C. Definitions:

1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.

2. Optimum Moisture: Percentage of water in a specific material at maximum density.

3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.

4. Suitable: Suitable materials for fills shall be a non-cohesive, non-plastic granular local sand and shall be free from vegetation, organic material, marl, silt or muck and shall generally consist of soils classified SP per ASTM D-2487. The Contractor shall furnish all additional fill material required. Where shown on the Drawings, back fill shall be No. 57 stone meeting all applicable Georgia Department of Transportation standards. All fill and backfill material shall be subject to approval of the Engineer.

5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) or loose to very loose clayey soils classified as Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or Groups A-2-6, A-2-7, A-4, A-5, A-6, A-7, and A-8 according to AASHTO M 145, or a combination of these groups.

a. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Plan for Earthwork: The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations to the Engineer for review. The Contractor shall consider, and his plan for excavation shall reflect, the equipment and methods to be employed in the excavation. No claims for extras based on substrata or groundwater table conditions will be allowed.

1.02 QUALITY ASSURANCE

A. A Testing Laboratory employed by the Contractor and approved by the Engineer will make such tests as are specified. The Contractor shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for all testing shall be paid by the Contractor, including any and all tests which have to be repeated because of the failure of the tested material to meet specifications. Testing Laboratory or Contractor shall provide a map of all test locations.

B. Determination of laboratory moisture-density relationship and maximum density shall be by modified Proctor method of ASTM D-1557. At least one (1) test per soil type shall be made.

C. In place soil density shall be determined either by use of the Drive Sleeve Method per ASTM D-2937 or by use of a Nuclear Density Meter per ASTM D-2922. In place field densities shall be taken at least one (1) every 2,500 square feet at not greater than one (1) foot vertical intervals for all areas of potential building construction. Field Density Tests are to be located no further than 300 feet apart on center with a minimum of one (1) per roadway and one (1) per 5,000 square feet of parking/maneuvering area. One (1) density test is required for each pad or isolated footing and for every 20 linear feet of strip/wall footing length. For each tank mat foundation at least four (4) in place field densities shall be taken. In place field densities shall be taken at least one (1) every 300 feet of utility trench and not further than one (1) foot vertically or per lift, whichever is less.

D. Fill material from offsite shall be tested using a minus 200 sieve wash to check grain size. At least one (1) such test shall be run per 500 cubic yards of material brought from offsite.

E. Compaction shall be deemed to comply with the Specifications if no tests fall below the specified relative compaction. The Contractor shall pay the costs of any retesting of work not conforming to the Specifications.

1.03 JOB CONDITIONS

A. If, in the opinion of the Engineer, conditions encountered during construction

warrant a change in structure elevation, or in the depth of removal of unsuitable material from that indicated on the Drawings, an adjustment will be made in the contract price by the unit cost, as provided per the Terms and Conditions of the Contract and the Schedule of Values.

1.04 PROTECTION

A. Pre-Construction Survey:

1. Prior to commencing excavation or dewatering, the Contractor shall conduct a survey of those existing structures which may be subject to settlement or distress resulting from excavation or dewatering operations.

2. The Contractor shall monitor the structures surveyed to ascertain evidence of settlement or distress. If settlement or distress becomes evident the Contractor shall be required to repair the structures to the previous condition to the satisfaction of the Engineer. Costs shall be paid by the Contractor.

B. Excavation Support

1. Furnish, install, monitor and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc) as required by Federal, State or local laws, ordinances, regulations and safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and protect adjacent structures from undermining, settlement or other damage. Take care to prevent the formation of voids outside of sheeting. If voids occur behind sheeting, immediately backfill and compact the voids with common fill material. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete.

2. Install excavation supports outside the neat lines of foundations. Supports shall be plumb and securely braced and tied in position. Excavation support shall be adequate to withstand all pressures to which the supports will be subjected. Any movement or bulging of supports shall be corrected to provide the necessary clearances, dimensions and structural integrity.

3. Excavation Supports Left in Place

a. Excavation supports that are required to remain in place, if applicable, are indicated on the Drawings.

b. The Owner or Engineer may direct that certain excavation supports remain in place, or be cut off at any specific elevation. Supports directed by the Owner or Engineer to be left in place and not so designated on the Drawings or otherwise specified herein to remain in place, will be paid for in accordance with Terms and Conditions of the Contract. If the Contractor believes that such a directive increases Contractor's cost and would thereby entitle Contractor to a change in contract cost, Contractor shall notify the Engineer in accordance with the applicable article(s) in the Terms and Conditions of the Contract pertaining to changes in the work.

c. The right of the Owner or Engineer to direct that certain excavation supports remain in place shall not be construed as creating any obligation on the Owner or Engineer to give such direction, nor shall failure to give such direction relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient excavation supports to prevent any movement of the ground or damage to adjacent structures.

4. Excavation supports shall be carefully removed in such manner so as not to endanger the Work or other adjacent structures, utilities, or property. All voids left or caused by withdrawal of supports shall be immediately filled with sand and compacted.

C. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed suborder foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The Contractor shall engage a Geotechnical Professional Engineer registered in the State of Georgia, to design the temporary dewatering systems for all structures in accordance with Division 2 Section 02140 Dewatering. The dewatering system installed shall be in conformity with the overall construction plan, and certification of this shall be provided by the Geotechnical Professional Engineer. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.

2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the suborder soils at proposed bottom of excavation and to preserve the integrity of adjacent structures. Well or sump installation shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.

4. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.

5. The conveying of water in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted

and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the authority having jurisdiction, at no cost to the Owner.

6. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.

7. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system shall be removed by the Contractor.

8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

D. Trench Safety Practices:

1. The Contractor shall comply with the Federal Department of Labor, Bureau of Labor Standards, 29 CFR, 1926.650 Subpart P. All trench work shall be in compliance with requirements of the State of Georgia.

2. The Contractor shall submit written assurance with the associated cost that the trench excavator shall comply with all applicable trench safety standards.

1.05 SUBMITTALS

A. The Contractor shall submit sieve analysis for all soils and Testing Laboratory data in accordance with Special Conditions and JWSC Standards for Water and Sewer Design and Construction.

1.06 MEASUREMENT AND PAYMENT

A. Except as noted (such as for unsuitable soils) in Section 01025 Measurement and Payment, no payment will be made separately for Excavation, Backfilling, and Compaction. The cost thereof is included in the unit or lump sum price set forth for the items to which the excavation and backfill is incidental or appurtenant.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. All fill and backfill material shall be subject to the approval of the Engineer.

2. All fill and backfill material shall be free of organic material, trash, or other objectionable material. Excess or unsuitable material shall be removed from the job site by the Contractor.

B. Common Fill Material: Common fill shall be sand and shall not contain stones, rock, concrete or other rubble larger than 2 inches in diameter. It shall have physical properties which allow it to be easily spread and compacted.

C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand having the following gradation:

U.S. Sieve Size	Percent Passing by Weight
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

To minimize capillary rise under the slabs on grade, the upper one (1) foot of soil in building pad areas shall consist of soils classified SP per ASTM D-2487 and shall have less than 2 percent passing the No. 200 sieve.

D. Select Fill material shall meet the following soil and gravel classifications as covered in ASTM D2321 and restated below:

1. Class I Soils*: Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 4 mm) size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

   a. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C-33 stone size No. 89 and with particle size limits as follows:

U.S. Sieve Size	Percent Passing by Weight
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

2. Class II - Coarse sands and gravels with maximum particle size of one and one half (1-1/2") inch, including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW, and SP (Unified Soil Classification System) are included in this class. In accordance with ASTM D-2487, less than 5 percent pass No. 200 sieve.

   a. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. 50 percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

b. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. 50 percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

c. SW: Well-graded sands and gravelly sands, little or no fines. More than 50 percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

d. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

E. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

U.S. Sieve Size	Percent Passing by Weight
3/8 inch	100
No. 10	85-100
No. 40	20-40
No. 200	0-12

F. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing:

1. The site shall be cleared in accordance with Division 2 Section 02110 Site Clearing.

2. The construction areas shall be cleared of all obstructions and vegetation including large roots and undergrowth, within 10 feet of the lines of the excavation.

3. Strip and stockpile topsoil on the site at the location to be determined by the Engineer.

3.02 EXCAVATION

A. General: Excavations for roadways, structures and utilities must be carefully executed in order to avoid interruption of any existing utilities and to minimize disruption of traffic flows.

B. Excavating for Roadways/Structures/Utilities:

1. Excavation shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.

    a. Excavation for precast or prefabricated structures shall be carried to an elevation 2 feet lower than the proposed outside bottom of the structure to provide space for the selected backfill material. Prior to placing the selected backfill the excavation shall be sounded, if not dewatered, using a rigid pole to indicate to the satisfaction of the Owner that excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.

    b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the foundation elevation in dewatered excavation shall be replaced with 3000 psi concrete.

    c. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation. Forming for footing sides is specified elsewhere.

2. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.

3. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of work.

4. Encounters with subsurface obstructions shall be hand excavated.

5. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of suborder soils. Suborder soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods, shall be removed and replaced by crushed stone as required by the Engineer at the Contractor's expense.

6. The bottom of excavations shall be rendered firm and dry before placing any structure. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor.

7. All pavements shall be cut prior to removal, with saws and approved power tools.

8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.

9. All locations and elevations as required herein must be permanently documented by the Contractor, on the As-Built Drawings prior to the

Engineer approval of the Application for Payment for that work.

3.03 DRAINAGE

A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed suborder foundation condition. The dewatering method used shall prevent disturbance of earth below grade.

B. All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.

C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete within 24 hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.

D. The Contractor will be required at his expense to excavate below grade and refill with approved fill material if the Owner determines that adequate drainage has not been provided.

3.04 UNDERCUT

A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable suborder due to the Contractor's excavating method, he shall refill to normal grade with structural fill at his own cost. Fill material and compaction method shall be as directed by the Engineer.

3.05 FILL AND COMPACTION

A. Compact and backfill excavations according to the following schedule. (Proctor Standard shall be ASTM D-698, Modified Proctor Standard shall be ASTM D-1557):

B. STRUCTURES AND ROADWORK

Area	Material	Compaction
Backfill beneath Structures (footings and/or slab Excavations)	Structural Fill	6 inch lifts, compacted backfill beneath to 98 percent by Modified Proctor Method Maximum density. Fill should not be placed over any in-place soils until those deposits have been compacted to 98 percent Modified Proctor maximum

density.

Backfill beneath Roadways, Parking, and Service Drives *	Structural Fill	12 inch lifts, compacted backfill beneath to 100 percent by Standard Proctor Method Maximum density. Fill should not be placed over any in-place soils until those deposits have been compacted to 100 percent Standard Proctor maximum density.

*The upper one (1) foot of soils supporting slabs on grade or sidewalks should be compacted to 100 percent maximum dry density.

Utility Trenches	Select Fill/ Structural Fill (beneath Roadways)	6 inch lifts (to 1 ft above pipe), compacted backfill beneath to 98 Percent by Modified Proctor Method Maximum density. Fill should not be placed over any in-place soils until those deposits have been compacted as indicated.
Around structures	Select Fill	6 inch lifts, 95 percent of Modified Proctor maximum density by Proctor Method. Use light rubber-tired or vibratory plate compactors.
Non-structural Areas	Common Fill	12 inch lifts, 90 percent of Modified Proctor Method

B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.

C. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.

D. Embankments shall be constructed true to lines, grades and cross sections shown on the Drawings or ordered by the Owner and Engineer. Embankments shall be placed in successive layers of not more than 12 inches in thickness, loose measure, for the full width of the embankment. As far as practical, traffic over the work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.

E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified here, such request shall be in writing to the Engineer. Approval will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The Owner's approval will be in writing.

END OF SECTION

INDEX TO

SECTION 02660 – WATER DISTRIBUTION SYSTEMS

SECTION 02660

WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Installation of water distribution system piping, valves, and appurtenances.

B. Reference BGJWSC Water and Sewer Standards, Section 2 Water Distribution Systems, for general requirements.

PART 2 – PRODUCTS

2.1 General

A. Reference BGJWSC Water and Sewer Standards, Section 2 Water Distribution Systems, for water distribution product requirements.

PART 3 – EXECUTION

3.1 Installation and Testing

A. Reference BGJWSC Water and Sewer Standards, Section 2 Water Distribution Systems, for water distribution system installation and testing requirements.

END OF SECTION

INDEX TO

SECTION 02662 – SANITARY SEWER SYSTEMS

SECTION 02662

SANITARY SEWER SYSTEMS

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Installation of sanitary sewer systems including gravity sewer piping, manholes, forcemains, valves, and appurtenances.

B. Reference BGJWSC Water and Sewer Standards, Section 3 Gravity Sewer Systems, for general requirements of gravity sewer components.

C. Reference BGJWSC Water and Sewer Standards, Section 4 Sanitary Sewer Lift Stations and Force Mains, for general requirements of forcemain systems, valves and appurtenances.

D. In addition to BGJWSC Water and Sewer Standards, reference CSX Design and Construction Standard Specifications, Pipeline Occupancies (latest version) and Construction Drawings for additional requirements of steel casing pipe installation under CSX railroad right-of-way by Jack-and-Bore. https://www.csx.com/index.cfm/library/files/customers/property-real-estate/permitting/pipeline-design-construction-specifications/

PART 2 – PRODUCTS

2.1 GENERAL

A. Reference BGJWSC Water and Sewer Standards, Section 3 Gravity Sewer Systems, for gravity sewer components product requirements.

B. Reference BGJWSC Water and Sewer Standards, Section 4 Sanitary Sewer Lift Stations and Force Mains, for forcemain systems, valves and appurtenances product requirements.

PART 3 – EXECUTION

3.1 INSTALLATION AND TESTING

A. Reference BGJWSC Water and Sewer Standards, Section 3 Gravity Sewer Systems, for gravity sewer components installation and testing requirements.

B. Reference BGJWSC Water and Sewer Standards, Section 4 Sanitary Sewer Lift Stations and Force Mains, for forcemain systems, valves and appurtenances installation and testing requirements.

C. Jack-and-Bore Operations under CSX railroad right-of-way.

1. No work withing the CSX Transportation (CSXT) right-of-way shall be conducted until JWSC has completed negotiation of the CSX Utility Encroachment Permit and all work activities have been scheduled with CSX.
2. Casing/carrier pipes placed under CSX tracks shall not be less than 5.5 feet from base of rail to top of pipe at its shallowest point.
3. Contractor responsible for providing design plans and computations for the jacking and receiving pits stabilization. Plans and computations shall be sealed by a licensed Professional Engineer, registered in the State of Georgia. Must be submitted to CSXT prior to the start of construction and must obtain approval from CSXT's Chief Engineer, Design and Construction, prior to beginning and work on or which may affect CSXT property. Sheeting shall be designed to support all lateral forces causes by the earth, railroad and other surcharge loads.
4. Contractor responsible for providing all necessary dewatering operations for Jack-and-Bore operations. Dewatering Plan shall be sealed by a licensed Professional Engineer, registered in the State of Georgia.

END OF SECTION

INDEX TO

SECTION 02922 – LOAMING, SEEDING AND MULCHING

SECTION 02922

LOAMING, SEEDING, AND MULCHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Contractor shall furnish all labor, materials, equipment, incidentals necessary and place loam finish grade, seed, and maintain all seeded areas as specified herein including all areas disturbed by the Contractor's operations.

B. Related Work Described Elsewhere:

1. Earthwork: Section 02200.
2. Construction Drawings – Erosion Control Plans.

1.02 WARRANTY

A. All restoration and re-vegetation work shall be subject to the one (1) year warranty period of the Contract as specified in the Special Conditions of the Contract herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Loam (topsoil) shall be fertile, natural soil, typical of the locality, free from large stones, roots, sticks, peat, weeds and sod and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain toxic material harmful to plant growth. Topsoil stockpiled under other Sections of this Division may be used, but the Contractor shall furnish additional loam at his own expense, if required. All areas disturbed by the Contractor's operations which are not to be sodded shall be seeded as specified herein, in addition to those areas delineated on the plans for seeding.

B. Fertilizer shall be complete commercial fertilizer, 6-12-12 (First and Second Year) and 10-10-10 (Maintenance Year), reference Erosion Control Plans, or as recommended by the seed supplier. It shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis. Store fertilizer so that when used it shall be dry and free flowing.

C. Lime shall be ground limestone.

D. Seed shall be from the same or previous year's crop; each variety of seed shall have a percentage of germination not less than 90, a percentage of purity not less than 85, and shall have not more than a one (1) percent weed content.

D. Temporary seed shall be Rye, Sudangrass, or Pearl Millet based on the planting date

and shall be applied at the rate indicated in the Erosion Control drawings and notes. Permanent seed for final stabilization shall be Pensacola Bahia and shall be applied at the rate indicated in the Erosion Control drawings and notes.

F. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis.

G. Mulch shall be clean small-grain straw.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Loam shall be placed to a minimum depth of 4 inches.

B. Lime shall be applied at the rate necessary to achieve a pH of 6 to 7.

C. Fertilizer shall be applied at the rate of 800 pounds per acre.

D. The subgrade of all areas to be loamed and seeded shall be raked and all rubbish, sticks, roots, and stones larger than 2 inches shall be removed. Loam shall be spread and lightly compacted to finished grade. Compacted loam shall not be less than the depth specified. No loam shall be spread in water or while frozen or muddy.

E. After the loam is placed and before it is raked to true lines and rolled, limestone shall be spread evenly over loam surface and thoroughly incorporated with loam. Lime shall be added in sufficient quantity to provide a soil pH of 6 to 7.

F. Fertilizer shall be uniformly spread and immediately mixed with the upper 2 inches of topsoil.

G. Immediately following this presentation the seed shall be uniformly applied and lightly raked into the surface. Lightly roll the surface and water with fine spray.

H. All seeded areas shall be mulched with clean small-grain straw at a rate of 1-1/2 to 2 tons per acre. Latex acrylic copolymer, or organic tackifier shall be a commercial product specifically manufactured for use as straw mulch tackifier. An asphalt tackifier shall only be used when temperatures are too low to allow the use of a latex acrylic copolymer and only with prior written approval from the Engineer. Mechanical tacking will be considered on a case-by-case basis as approved by the Engineer.

I. The Contractor shall keep all seeded areas watered and in good condition, reseeding if and when necessary, until a good, healthy, uniform growth is established over the entire area seeded, and shall maintain these areas in an approved condition until final acceptance of the Contract.

J. On slopes, the Contractor shall protect against washouts by an approved method. Any washout which occurs shall be regraded and reseeded at the Contractor's expense until good sod is established.

K. The Contractor shall maintain the areas in grass in a neat manner by watering, mowing, raking clippings and leaves, and appurtenances until the project is completed.

END OF SECTION

INDEX TO

SECTION 02934 – SOLID SODDING

SECTION 02934

SOLID SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work specified in this Section consists of establishing a stand of grass, within the areas indicated on the Drawings or Specifications, by furnishing and placing grass sod. Also included are fertilizing, watering and maintenance as required to assure a healthy stand of grass.

B. Related Work Described Elsewhere:

1. Earthwork: Section 02200.
2. Construction Drawings – Erosion Control Plans.

1.02 SUBMITTALS

A. A certification of sod quality by the producer shall be delivered to the Engineer ten (10) days prior to use.

1.03 WARRANTY

A. All restoration and re-vegetation work shall be subject to the one (1) year warranty period of the Contract as specified in the Special Conditions of the Contract herein.

PART 2 - PRODUCTS

2.01 GRASS SOD

A. Grass sod shall be matched to existing lawn and shall be well matted with grass roots. The sod shall be taken in rectangles, preferably 12 inch by 24 inch, shall be a minimum 2 inches in thickness and shall be live, fresh and uninjured at the time of planting. Sod type shall be as required by Glynn County within their respective areas. If no specific requirement is made, supplied sod shall be Bahia grass.

B. It shall be reasonably free of weeds and other grasses and shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. The sod shall be planted as soon as possible after being dug and shall be shaded and kept moist until it is planted.

2.02 FERTILIZER

A. Commercial fertilizer shall comply with the state fertilizer laws.

B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water-soluble potash contained in the fertilizer.

C. The chemical designation of the fertilizer shall be 6-12-12 (First and Second Year) and 10-10-10 (Maintenance Year), reference Erosion Control Plans, or as recommended by the sod supplier. At least 50 percent of the nitrogen shall be derived from organic sources. At least 50 percent of the phosphoric acid shall be from normal super phosphate or an equivalent source which will provide a minimum of two units of sulfur.

The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container.

2.03 WATER FOR GRASSING

A. The water used in the sodding operations shall be obtained from potable water sources. Contractor shall be responsible for transporting water from the source of supply and applying it to the sodded area.

PART 3 - EXECUTION

3.01 PREPARATION OF GROUND

A. The area over which the sod is to be placed shall be scarified or loosened to a depth of at least four (4) inches and then raked smooth and free from debris. Where the soil is sufficiently loose and clean, the Engineer, at his discretion, may authorize the elimination of ground preparation.

3.02 APPLICATION OF FERTILIZER

A. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 to 7.0.

B. The fertilizer shall be spread uniformly over the area to be sodded at the rate recommended by the fertilizer manufacturer, by a spreading device capable of uniformly distributing the material at the specified rate. Immediately after spreading, the fertilizer shall be mixed with the soil to a depth of approximately 4 inches.

C. On steep slopes, where the use of a machine for spreading or mixing is not practicable, the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a depth of approximately 2 inches.

3.03 PLACING SOD

A. The sod shall be placed on the prepared surface, with edges in close contact and shall be firmly and smoothly embedded by light tamping with appropriate tools.

B. Where sodding is used in drainage ditches, or on slopes of 4:1 or greater, the setting of the pieces shall be staggered so as to avoid a continuous seam along the line of low. Along the edges of such staggered areas, the offsets of individual strips shall not exceed 6 inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a feather-edge effect.

C. On slopes greater than 2:1, the Contractor shall, if necessary, prevent the sod from sliding by means of wooden pegs driven through the sod blocks into firm earth, at suitable intervals.

D. Sod which has been cut for more than 72 hours shall not be used unless specifically authorized by the Engineer after his inspection thereof. Sod which is not planted within 24 hours after cutting shall be stacked in an approved manner and maintained and properly moistened. Any pieces of sod which, after placing, show an appearance of extreme dryness shall be removed and replaced by fresh, uninjured pieces.

E. Sodding shall not be performed when weather and soil conditions are, in the Engineer's opinion, unsuitable for proper results.

3.04 WATERING

A. The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the Engineer, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2 weeks. Thereafter, the Contractor shall apply water as needed until the sod roots and starts to grow for a minimum of 60 days (or until final acceptance, whichever is latest).

3.05 MAINTENANCE

A. The Contractor shall, at his expense, maintain the sodded areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include repairing of any damaged areas and replacing areas in which the establishment of the grass stand does not appear to be developing satisfactorily.

B. Replanting or repair necessary due to the Contractor's negligence, carelessness or failure to provide routine maintenance shall be at the Contractor's expense.

END OF SECTION

INDEX TO

SECTION 02960 – TEMPORARY SEWER BYPASS SYSTEMS

SECTION 02960

TEMPORARY SEWER BYPASS SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall design the systems and furnish all tools, supplies, materials, labor, equipment, fuel, and maintenance necessary for the installation, testing, placing into operation, maintaining, and monitoring of temporary bypass systems for the purpose of diverting sewer flow around components of the JWSC existing sewer system. At no point during the setup, installation, operation, or demobilization of the temporary bypass systems shall interruption of the sewer flow upstream or downstream of the bypassing location be caused. Should such interruption or backup of existing sewer infrastructure occur, Contractor shall provide all equipment and vacuum/pumper trucks which may be necessary to reduce the potential for sewer spills and maintain the up and downstream flows, and properly dispose of all collected sewage.

1. Temporary sewer bypass systems will be required upstream of PS4036 near B&W Grade Road during the contract period for installation of segments of new 30-inch gravity sewer, new 8-feet diameter manhole, and tie-in of 30-inch gravity sewer and 24-inch forcemain.
2. Contractor shall monitor, log and report pumping flow data to JWSC.
3. Temporary sewer bypass operations will be required for the following activities:
    a. To establish bypass pumping operations from the existing manhole upstream of PS4036 in the yard of 1250 B&W Grade Road to the existing manhole in the PS4036 site at 1253 B&W Grade Road, bypassing the existing 30-inch gravity sewer pipe.

B. The design, installation, operation, and monitoring of the temporary bypass pumping systems shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the JWSC and Engineer that it specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five (5) references of projects of a similar size and complexity as this project performed by the vendor's firm within the past ten (10) years.

C. The bypass systems shall meet the requirements of all Federal, State, and Local codes and regulatory agencies having jurisdiction.

1.02 DEFINITIONS

A. "Interruption of pumping operations" is defined as any activity that will result in a change in the current method of operation. Contractor shall request such "interruption of pumping operations" from JWSC no less than ninety-six (96) hours

in advance. JWSC may defer the request as allowed by Article 2.01 A. 4. of this Section.

B. "Partial Utilization", "Substantial Completion", and "Warranty Period for Items in Continuous Service": Refer to the "Contract Documents" for definition.

C. The terms "open, close, start, stop, operate, verify, energize, de-energize, transfer, switchover, etc." when used in conjunction with permanent equipment that is in-service or about to be placed in-service are understood to mean: JWSC's operation or maintenance staff shall perform the operation upon written request from the Contractor.

D. The term "operational test" refers to the period of specified duration that the installed system is tested to verify operational integrity of a system prior to placing the system in-service. Operational testing requires that representatives of the equipment manufacturers be on-site for timely identification and resolution of system issues.

E. "Low Flow Period" refers to the time of day when the sewer flow rate in the system reaches the diurnal minimum. It typically occurs between the hours of 3 AM and 7 AM but shall be verified by JWSC.

1.03 SUBMITTALS

A. Bypass Systems Plan: The Contractor shall submit to the JWSC/Engineer detailed Drawings and shop drawings outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing sewer flows. The Bypass Systems Plan shall be signed and sealed by a Professional Engineer registered in the State of Georgia. The Bypass Systems Plan shall be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, connections, fuel storage, and all other incidental items necessary to provide satisfactory bypassing operations and backups for each of the proposed activities identified in paragraph 1.01 A. 2. The Bypass Systems Plan shall provide sufficient detail to ensure proper protection of PS4036, the existing forcemains and gravity sewer, and other relevant JWSC facilities, including protection of the access and bypass pumping locations. **No bypassing activities or construction shall begin until all provisions and requirements have been reviewed and approved by the JWSC and Engineer.** The Bypass Systems Plan shall include, but is not limited to, the following details for each of the proposed activities identified in paragraph 1.01 A..:

1. Detailed drawings showing all required equipment and staging areas for pumps, tanks, fuel storage, and piping within the project site, at PS4036 and/or Glynn County right-of-way areas;

2. Plugging methods and types of plugs;

3. Number, size, material, location and method of installation of suction piping;

4. Number, size, material, method of installation and location of installation of discharge piping;

5. Bypass pump sizes, capacity, number of each size to be on site and fuel/electrical requirements;

6. Pump curves showing pump operating range are to be submitted;

7. Fuel storage information and tank size;

8. Thrust and restraint block sizes and locations as necessary in accordance with manufacturer/supplier of LineStops, Insert Valves, and other equipment to be installed within piping;

9. Sections showing suction and discharge bypass piping depth, embedment, select fill and special backfill, and any equipment necessary to maintain vehicular and construction equipment in driveways and parking areas; modification of existing structures including manholes to allow for efficient installation of bypass pumping equipment and operation.

10. Method of noise control for each bypass pump. The project site is located within a residential area.

11. Any temporary pipe supports and anchoring required;

12. Design for access to bypass system operation locations indicated on the Drawings and specified herein;

13. Calculations and selection of bypass pump pipe size(s); including static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted);

14. Schedule for installation of and maintenance of bypass pumping lines.

15. Emergency plan for adverse weather and flooding for various phases of the Work and bypass system operation locations.

16. Contractors plan for providing continuous monitoring of the bypass pumping operations including qualifications of any onsite monitoring persons and specifications of any electronic monitoring operations.

17. Necessary restoration including repairs to existing structures which were modified to install and operate bypass pumping equipment.

18. Standby power generator size and location (for electric pumps).

B. Sequence of Bypass System Operations

1. The Contractor shall develop a Sequence of Bypass System Operations regarding staging of piping connections and equipment. Under no circumstances shall the proposed Sequence of Bypass System Operations lead to an interruption of the

pump stations or sewer collection system directly upstream of the bypass location or of the downstream operations at PS4036 during the project.

2. Contractor shall submit the proposed Sequence of Bypass System Operations to the JWSC and Engineer for review and approval in conjunction with the Bypass Systems Plan. The Sequence of Bypass Systems Operations shall define work to be performed, including the following items:

   a. Definition of the start date, duration and end date for each of the segments of the work at each bypass location.

   b. For each segment of work, define activities to be performed by or witnessed by JWSC and date on which these activities are to be performed.

   c. Scheduling/timing of manufacturer's field services, as specified.

3. Provide complete list of equipment and material that is required to perform each segment of work.

1.04 SCHEDULE OF BYPASS OPERATIONS

Contractor shall provide bypassing operations for the following activities/locations identified in 1.01 A. as noted below:

A. To establish bypass pumping operations from the existing manhole upstream of PS4036 in the yard of 1250 B&W Grade Road to the existing manhole in the PS4036 site at 1253 B&W Grade Road, bypassing the existing 30-inch gravity sewer pipe.

   1. The establishment of these bypass systems shall be conducted as necessary to prepare for and complete the installation of segments of new 30-inch gravity sewer, new 8-feet diameter manhole, and tie-in of the 30-inch gravity sewer and 20-inch forcemain to manhole upstream of PS4036.
   2. These bypass systems shall remain in operation, at a minimum, until the gravity sewer and forcemain connections to the new manhole has been made.

1.05 MEASUREMENT AND PAYMENT

A. Payment for Temporary Bypass Sewer Systems shall not be made separately. The cost thereof is included in the unit or lump sum price set forth for the items to which the temporary bypass sewer system operations are necessary. Reference Section 01025 Measurement and Payment for additional information.

PART 2 – PRODUCTS

2.01 PUMPING EQUIPMENT

A. General:

1. It is essential to the operation of the JWSC's sewer system that there be no interruption in the conveyance of wastewater to and from any of the proposed bypass system locations throughout the duration of the project. To this end, the Contractor shall provide, maintain, operate, and monitor all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary fuel, and all other labor and equipment necessary to intercept the sewer flow before it reaches the point where it would interfere with the construction work, carry it past the work and return it to the existing sewer system downstream of the work.

2. It is the Contractor's responsibility to provide equipment that is adequate for the performance of the temporary bypassing operations under this Contract within the time specified. All equipment shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required operations, and shall be subject to review by the JWSC's Representative at any time within the duration of the Contract. All operations hereunder shall conform to the applicable requirements of the OSHA Standards for construction.

3. Should the Contractor fail to maintain the continuous operation of the bypass systems and operations, JWSC shall repair/operate the bypass systems to include materials, sewage hauling and any other activities required and shall look to recover costs incurred during its operation/repair of the temporary bypass system or other pump stations affected from monies owed the Contractor for other portions of the project work.

4. Operational requirements take precedence over Contractor activities. Therefore, interruption of the influent flow of wastewater to PS4036 will not be allowed and all bypassing operations shall be coordinated with and are subject to the operational requirements of JWSC.

5. The Contractor shall provide for utilities and services for its own operations. The Contractor shall furnish, install and maintain all temporary utilities during the contract period including removal upon completion of the project work.

6. Pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system.

7. The pumps may be electric or diesel/fuel powered.

8. All pumps must have solar batteries and solar battery chargers for the bypass pump starters, both provided by the same manufacturer.

8. Each pump shall be fully enclosed with sound attenuated panels by the pump manufacturer (<69 db at 30 feet) due to the proximity to housing units.

9. All pumps used shall be constructed to allow dry running for long periods of time to accommodate the cyclical nature of the flows.

10. All pumps shall be High Pressure Solids Handling Self-Priming Pumps as manufactured by Godwin Critically Silenced Dri-Prime Pumps by Xylem, or JWSC/Engineer approved equal.

11. Furnish each pump with the necessary stop/start and liquid level controls.

12. Each bypass location utilizing pumping systems shall have 100% supplemental pumping capability in standby for the entire required bypass capacity.

14. Contractor shall not be permitted to stop or impede the sewer system flows under any circumstances except as otherwise defined and approved by JWSC and Engineer. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding.

15. The Contractor shall protect water resources, wetlands and other natural resources.

B. Temporary Bypass System Requirements: The Contractor shall be responsible for the construction, mobilization/demobilization, maintenance, operation, and monitoring of the temporary bypass facilities as described herein and indicated on the Drawings. Bypass systems shall be operated 24 hours per day once placed into operation until JWSC approves demobilization of system. **100% supplemental pumping capability shall be provided at each bypass location/installation in standby. Standby pump shall be piped and completely online, isolated only by a valve from the primary system. All Flow and TDH information shall be verified and approved prior to installing temporary bypass systems.**

1. 30-inch Gravity Sewer Bypass Upstream of PS4036

To establish bypass pumping operations from the existing manhole upstream of PS4036 in the yard of 1250 B&W Grade Road to the existing manhole in the PS4036 site at 1253 B&W Grade Road, bypassing the existing 30-inch gravity sewer pipe. Bypass operations are necessary in order to prepare for and complete the installation of segments of new 30-inch gravity sewer, new 8-feet diameter manhole, and tie-in of the 30-inch gravity sewer and 24-inch forcemain to manhole upstream of PS4036.

Primary Operating Condition	
Estimated Peak Flow and required minimum capacity: 5000 GPM	Distance from suction to discharge locations: 250 LF Depth of Suction MH: ~ 18.0 Ft. Bypass System Designer to determine TDH conditions.

Contractor shall calculate system head conditions based on their proposed suction and discharge piping systems and locations, for both typical operation and peak conditions with primary and standby pump operation. Contractor shall utilize the number of pumps necessary to

satisfactorily move flow from/to the identified suction and discharge points without potential for backup in the existing gravity sewer system. Total peak flow bypass pumping capability for the bypass system shall be 5000 GPM.

C. Additional Bypass Requirements

1. All backup/standby pumps shall be piped into the suction and discharge piping/headers and shall be on-line and ready for use in the event they are needed.

2. All bypass pumps (lead, lag, backup) shall have a performance curve that meets the performance curve for the operating conditions indicated in 2.01 B 1. with pump established on ground elevation as shown on the drawings.

3. Contractor shall provide continuous monitoring of the bypass pumping operations whether by qualified onsite monitoring persons or by electronic monitoring operations to ensure continuous operation of the system.

4. The bypass pumps shall be quiet models producing no more than 69 dBA at a distance of 30 feet.

5. Provide all pipeline plugs, LineStops, Insert Valves, pumps of adequate size to handle peak flows, and temporary suction and discharge piping and fittings to ensure that the total current flow capacities indicated can be safely diverted during the project.

6. The Contractor shall make all arrangements for temporary bypass pumping operations during the time when the sewer infrastructure is shut down/offline for any reason.

7. Discharge Piping shall be constructed of steel, ductile iron, or polyethylene pipe with positive, restrained joints. Under no circumstances will aluminum “irrigation” type piping or glued PVC pipe be allowed. Discharge hose will only be allowed in short sections and by specific permission from the JWSC/Engineer.

8. Operation: The bypass pumps shall have variable capacity by controlling the speed of the diesel engine. Each pump shall have a separate control panel.

9. Provide vacuum and pressure gauges on the suction and discharge headers.

10. Provide liquid level controls to automatically change the speed of the pumps to suit the incoming flow conditions.

11. Control Sequence – Contractor shall coordinate with JWSC operations staff to determine appropriate set points and controls for temporary bypass pumping operations including lead and lag pumps.

12. All fuel required for the bypass pumps is the responsibility of the Contractor. Pumps are to have adequate fuel at all times while onsite.

PART 3 – EXECUTION

3.01 PREPARATION

A. The Contractor shall be responsible for locating any existing utilities in the area where the Contractor selects to locate the bypass equipment, pumps and pipelines. The Contractor shall locate the bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from JWSC and the Engineer. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor. Driveway access and parking areas shall not be impeded by bypass piping.

B. During bypass operations, the Contractor shall protect PS4036, gravity sewers, and all infrastructure from damage inflicted by the Contractor's equipment and operations. The Contractor shall be responsible for all physical damage to existing infrastructure caused by human or mechanical failure.

C. During bypass pumping, Contractor shall not allow sewage to be leaked, dumped, or spilled in or onto any area outside of the existing sanitary sewer system.

D. In the event of accidental spill or overflow, Contractor shall immediately stop the discharge and take action to clean up and disinfect the spill. Promptly notify JWSC and Engineer so that required reporting can be made. Refer to the Special Conditions for additional requirements.

E. In the event of accidental spill or overflow, the Contractor is responsible for any damages that may have occurred to public or private property including cleaning, disinfection, and other corrections to the satisfaction of the Engineer at no cost to the Owner.

3.02 INSTALLATION AND REMOVAL

A. The Contractor shall pipe sections or make connections to the existing suction and discharge structures and shall construct temporary bypass pumping structures only at the access locations indicated on the Drawings, as approved in the Bypass Systems Plan and Sequence, and as may be required to provide an adequate suction and discharge conduit, unless otherwise approved by JWSC and Engineer.

B. Plugging or blocking of sewer flows shall be performed with the use of plugs and/or LineStops (if appropriate and approved) which shall be installed by contractors approved by JWSC. When plugging or blocking is no longer needed for performance of the work, the plugs shall be removed in a manner that permits the sewer flow to slowly return to normal without surge, surcharging, or causing other major disturbances downstream.

C. The installation of bypass pipelines is prohibited in all wetland areas. When the bypass pipelines cross driveways or local streets, the Contractor must place the bypass pipelines in trenches and cover with traffic rated plates or temporary pavement.

D. At the conclusion of the bypass system operations, when all of the relevant modifications are complete, tested, and ready for operation, the Contractor shall demonstrate the new system in automatic mode for 72 hours. At the completion of the demonstration period, and upon receipt of JWSC's/Engineer's written approval, the Contractor shall remove all the piping and bypass pumping equipment, restore all property to pre-construction condition and restore all pavement.

3.03 CONTROL REQUIREMENTS

A. Contractor shall provide back-up power (i.e. generator) for all electric by-pass pumps required to complete the work. Contractor shall provide alarms for all by-pass pumps used to complete the work. The JWSC is not obligated to supply any equipment.

B. Contractor shall provide continuous bypass monitoring for bypass pumps and backup bypass pumping system.

C. Contractor shall provide 110 V power and phone service for operation of the autodialer during bypass pump operation.

D. Contractor shall provide a high-level mercury float switch in the suction manhole for the bypass pumps. The mercury float switch shall be enclosed in a smooth, chemical resistant urethane or polypropylene casing suspended on its own cable. The cable shall be of proper length to reach from the float switch in the manhole to the autodialer location without splices. The autodialer location shall be designated by the JWSC. Contractor shall bury the cable for the float switch in the trench with the bypass suction lines.

3.04 QUALITY CONTROL AND MAINTENANCE

A. Testing: Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The Engineer and JWSC shall be given 24 hours notice prior to testing.

B. Inspection: Contractor shall inspect the bypass pumping system a minimum of twice daily, typically at the beginning and end of the work day, to ensure that the system is working correctly.

C. Maintenance Service: Contractor shall insure that the temporary bypass system is properly maintained and a responsible operator shall inspect the bypass pumping and other equipment a minimum of once daily during all times when pumps are operating.

D. Monitoring: The Contractor shall be responsible for monitoring the bypass operations 24 hours per day, 7 days per week. Any electronic monitoring in lieu of

onsite monitoring must be detailed in the comprehensive written Bypass Systems Plan and approved by JWSC and Engineer.

E. Extra Materials: Spare parts for pumps and piping shall be kept on site as required. Adequate diesel fuel storage for pumps shall be provided to maintain constant operations of the pumps.

3.05 COORDINATION

A. The Contractor shall submit a Sequence of Bypass Operations in accordance with 1.03 B. which details the interruptions to be made which the Contractor shall be fully responsible for. One week prior to connections being made to existing structures or pipes, a coordination meeting shall be held between the Contractor, Engineer, and JWSC to discuss the approved construction plan.

B. Schedule of construction, interconnecting details, and other revisions necessary for proper interfacing of the Work shall be subsequently modified by Contractor accounting for results of said coordination meeting. The JWSC and Engineer shall be notified 24 hours prior to any actual interruptions or connections being made. No bypassing operations shall begin prior to securing JWSC's approval of respective connection plan and work schedule.

3.06 EMERGENCY CONTACT REQUIREMENTS

A. Contractor shall provide two (2) emergency phone numbers that will be programmed into the auto dialer during operation of the bypass. The first two alarm calls will be made to the contractor, and the second two alarm calls will be sent to the JWSC. The contractor must call **Jason Vo at 912-324-9905** to acknowledge receipt of each alarm call.

END OF SECTION

INDEX TO

SECTION 15000 – MECHANICAL – GENERAL REQUIREMENTS

SECTION 15000

MECHANICAL - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. All equipment furnished and installed under this contract shall conform to the general stipulations set forth in this section and with the JWSC Water and Sewer Standards for Design and Construction.

2. Contractor shall coordinate all details of equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alternations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

B. Contract Drawings and Specifications: The Contract Drawings and Specifications shall be considered as complementary, one to the other, so that materials and work indicated, called for, or implied by the one and not by the other shall be supplied and installed as though specifically called for by both. The Contract Drawings are to be considered diagrammatic, not necessarily showing in detail or to scale all of the equipment or minor items. In the event of discrepancies between the Contract Drawings and Specifications, or between either of these and any regulations or ordinances governing work of these specifications, the bidder shall notify the Engineer in ample time to permit revisions.

1.02 QUALITY ASSURANCE

A. Materials and Equipment: Unless otherwise specified, all materials and equipment furnished for permanent installation in the work shall conform to applicable standards and specifications and shall be new, unused, and undamaged when installed or otherwise incorporated in the work. No such material or equipment shall be used by the Contractor for any purpose other than that intended or specified, unless such use is specifically authorized in writing by the Owner. No material shall be delivered to the work site without prior acceptance of drawings and data by the Engineer.

B. Equivalent Materials and Equipment:

1. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specific item mentioned shall be understood as establishing the type, function, and quality desired. Other manufacturers' products will be accepted, if so noted, provided sufficient information is submitted to allow the Engineer to determine that the products proposed are equivalent to those named. Such items shall be submitted for review in

accordance with Special Conditions section.

C. Governing Standards: Equipment and appurtenances shall be designed in conformity with ANSI, ASME, ASTM, IEEE, NEMA, OSHA, AGMA, and other generally accepted applicable standards. They shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions or operations. All bearings and moving parts shall be adequately protected against wear by bushings or other acceptable means. Provisions shall be made for adequate lubrication with readily accessible means.

D. Tolerances: Machinery parts shall conform to the dimensions indicated on the drawings within allowable tolerances. Protruding members such as joints, corners, and gear covers shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.

E. Clearances: Ample clearances shall be provided for inspection and adjustment. All equipment shall fit the allotted space and shall leave reasonable access room for servicing and repairs. Greater space and room required by substituted equipment shall be provided by the Contractor and at his expense.

F. Testing:

1. When the equipment is specified to be factory tested, the results of the tests shall be submitted to the Engineer and approval of the test results shall be obtained before shipment of the equipment.

2. When an item of equipment, including controls and instrumentation, has been completely erected, the Contractor shall notify the Engineer, who will designate a time to make such tests as required, and operate the item to the satisfaction of the Engineer. All testing shall be done in the presence of the Engineer. "Completely erected" shall mean that the installation is erected, all necessary adjustments have been made, all required utility connections have been made, required lubricants and hydraulic fluid have been added and the unit has been cleaned and painted.

G. Pressure Test:

1. After installation, all of the pressurized piping shall be pressure tested. Piping shall be tested in accordance with Section 15044: Pressure Testing of Piping.

2. All tests shall be made in the presence of and to the satisfaction of the Owner's Representative and Engineer and also, to the satisfaction of any local or state inspector having jurisdiction.

a. Unless otherwise indicated in the Special Conditions or specific technical specifications, provide not less than three days' notice to the Owner's Representative, Engineer and the authority having jurisdiction when it is proposed to make the tests.

b. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of the Engineer shall be retested in part or in whole as directed by the Engineer.

c. The piping systems may be tested in sections as the work progresses but no joint or portion of the system shall be left untested.

3. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.

4. All defects and leaks observed during the tests shall be corrected and made tight in an approved manner and the tests repeated until the system is proven tight.

5. Repair all damage done to existing or adjacent work or materials due to or on account of the tests at no cost to Owner.

6. Provide test pumps, gauges, or other instruments and equipment required for the performance of all tests. Provide all temporary bracing, test plugs, additional restraint, and thrust blocking which may be required for test pressures above normal working pressures.

7. All tests shall be maintained for as long a time as required to detect all defects and leaks but not outside of the minimum/maximum durations specified for each type of pipe or piping system.

H. Failure of Test:

1. Defects: Any defects in the equipment, or deviations from the guarantees or requirements of the Specifications, shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to correct any defects or deviations, or if the replaced equipment when tested shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture for such equipment, may reject that equipment and order the Contractor to remove it from the premises at the Contractor's expense.

2. Rejection of Equipment: In case the Owner rejects a particular item of equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him to deliver to the Contractor a bill of sale of all his rights, title, and interest in and to the rejected equipment provided, however that the equipment shall not be removed from the premises until the Owner obtains from other sources other equipment to take the place of that rejected. The bill of sale shall not abrogate the Owner's right to recover damages for delays, losses or other conditions arising out of the basic Contract. The Owner hereby agrees to obtain the alternate equipment within a reasonable time and the Contractor agrees that the Owner may use the original equipment furnished by him without rental or

other charge until the other equipment is obtained.

I. Responsibility During Tests: The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

J. Acceptance of Materials:

1. Only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and acceptance of the Owner. No material shall be delivered to the work without prior submittal approval of the Engineer.

2. The Contractor shall submit to the Engineer data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.

3. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit samples of materials for such special test as may be necessary to demonstrate that they conform to the specification. Such sample shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for tests.

4. The Contractor shall submit data and samples sufficiently early to permit consideration and acceptance before materials are necessary for incorporation in the work.

K. Safety Requirements: In addition to the components shown and specified, all machinery and equipment shall be safeguarded in accordance with the safety features required by the current codes and regulations of ANSI, OSHA, and local industrial codes.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packaging: All equipment shall be suitably packaged to facilitate handling and protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry at all times.

B. Protection: All machined surfaces and shafting shall be cleaned and protected from corrosion by the proper type and mount of coating necessary to assure protection during shipment and prior to installation. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

C. Lubrication: Grease and lubricating oil shall be applied to all bearings and similar items as necessary to prevent damage during shipment and storage.

D. Marking: Each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

E. Fabricated sub-assemblies, if any, shall be shipped in convenient sections as permitted by carrier regulations and shall be properly match-marked for ease of field erection.

F. Responsibility:

1. The Contractor shall be responsible for all material, equipment, and supplies sold and delivered to the site under this Contract until final inspection of the work and acceptance thereof by the Owner. In the event any such material, equipment, and supplies are lost, stolen, damaged, or destroyed prior to final inspection and acceptance, the Contractor shall replace same without additional cost to the Owner.

2. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within seven (7) days after written notice to do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contractor's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.

G. Delivery: The Contractor shall arrange deliveries of products in accordance with construction schedules and coordinate to avoid conflict with work and condition at the site.

1. The Contractor shall deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately on delivery, the Contractor shall inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

3. Under no circumstances shall the Contractor deliver equipment to the site more than one month prior to installation without written authorization from the Engineer.

H. Storage and Protection of Products:

1. The Contractor shall furnish a covered, weather-protected storage structure providing a clean, dry non-corrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project. Storage of equipment shall be in strict accordance with

the "Instructions for Storage" of each equipment supplier and manufacturer including connection of space heaters, and placing of storage lubricants in equipment. Corroded, damaged, or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate.

a. The Contractor shall store products subject to damage by the elements in weather-tight enclosures.

b. The Contractor shall maintain temperature and humidity within the ranges required by manufacturer's instructions.

c. The Contractor shall store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. The Contractor shall cover products which are subject to deterioration with impervious sheet coverings and provide adequate ventilation to avoid condensation.

d. The Contractor shall store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

2. All materials and equipment to be incorporated in the work shall be handled and stored by the Contractor before, during, and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft, or damage of any kind whatsoever to the material or equipment.

3. Cement, sand, and lime shall be stored under a roof and off the ground, and shall be kept completely dry at all times. All structural and miscellaneous steel and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt, or grease, and in a position to prevent accumulations of standing water, staining, chipping, or cracking. Brick, block, and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling to a minimum.

4. All materials which, in the opinion of the Engineer/Owner's Representative, have become damaged and are unfit for the use intended or specified, shall be promptly removed from the site of the work, and the Contractor shall receive no compensation for the damaged material or its removal.

5. The Contractor shall arrange storage in a manner to provide easy access for inspection. The Contractor shall make periodic inspections of stored products to assure products are maintained under specified conditions, and free from damage or deterioration.

6. Protection After Installation: The Contractor shall provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. The Contractor shall remove covering when no longer needed.

1.04 WARRANTY AND GUARANTEES

The manufacturer's warranty period shall be concurrent with the Contractor's correction period for one (1) year (unless otherwise indicated in the technical specifications or other Contract Documents) after the time of final completion and acceptance.

1.05 MAINTENANCE MATERIALS

All grease, oil, and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied.

PART 2 - PRODUCTS

2.01 FABRICATION AND MANUFACTURE

A. Workmanship and Materials:

1. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage or other failure. Materials shall be suitable for service conditions.

2. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and gages so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

3. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least ¼-inch thick.

B. Lubrication:

1. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrications systems shall not require attention during startup or shutdown and shall not waste lubricants.

2. Lubricants of the type recommended by the equipment manufacturer shall be furnished by the Contractor in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Unless otherwise specified or permitted, the use of synthetic lubricants will not be acceptable.

3. Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

C. Safety Guards: All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage or heavier galvanized or aluminum-clad sheet steel or ½-inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

D. Equipment Foundation Supports:

1. All foundations, platforms and hangers required for the proper installation of equipment shall be furnished and installed by the Contractor.

2. Unless otherwise indicated or specified, all equipment shall be installed on reinforced concrete bases at least 6 inches high. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout. All open equipment bases shall be filled with non-shrinking grout sloped to drain to the perimeter of the base.

3. The Contractor shall furnish, install and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of equipment. These shall be of ample size and strength for the purpose intended.

4. Equipment suppliers shall furnish suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

5. Structural steel supports and miscellaneous steel required for supporting and/or hanging equipment and piping furnished under this Section shall be provided and installed by Contractor.

6. All foundations, anchor pads, piers, thrust blocks, inertia blocks and structural steel supports shall be built to template and reinforced as

required for loads imposed on them.

7. The Contractor shall assume all responsibility for sizes, locations and design of all foundations, anchor pads, pier, thrust blocks, inertia blocks, curbs and structural steel supports.

E. Shop Painting:

1. All steel and iron surfaces shall be protected by suitable paint or coatings applied in the shop. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment. Exposed surfaces shall be finished smooth, thoroughly cleaned, and filled as necessary to provide a smooth uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with a high-grade oil-resistant enamel suitable for coating in the field with an alkyd enamel. Coatings shall be suitable for the environment where the equipment is installed.

2. Surfaces to be painted after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer. Unless otherwise specified, the shop primer for steel and iron surfaces shall be Cook "391-N-167 Barrier Coat", Koppers "No. 10 Inhibitive Primer", or approved equal.

3. Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound, Houghton "Rust Veto 344", Rust-Oleum "R-9", or approved equal.

F. Nameplates: Contractor shall provide equipment identification nameplates for each item of equipment. Unless otherwise indicated, nameplates shall be 1/8-inch Type 304 stainless steel and shall be permanently fastened. Plates shall be fastened using round head metallic drive screws, or where metallic drive screws are impractical, with stainless steel pop rivets. Metallic drive screws shall be brass or stainless steel, Type V and No. 8 by 3/8-inch long. Names and/or equipment designations shall be engraved on the plates and the engraving painted with a primer and black paint system compatible with stainless steel. Contractor shall submit a list of proposed names and designations for review prior to fabrication of nameplates. At a minimum, each nameplate shall include equipment manufacturers name, year of manufacture, serial number and principal rating data.

G. Pipe Identification: Underground pipe: All non-metallic water and forcemain piping has have locate wire systems installed in accordance with Owner's standards and technical specifications. Detection tape shall be installed for all water and force main piping in accordance with Owner's standards.

2.02 ACCESSORIES

Special Tools and Accessories: Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be

furnished complete with those devices.

PART 3 - EXECUTION

3.01 INSTALLATION AND OPERATION

A. Installation: Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary for proper results. When so specified, or when employees of Contractor or his subcontractors are not qualified, such personnel shall be field representatives of the manufacturer of the equipment or materials being installed.

1. The Contractor shall have on site sufficient proper construction equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory assembled when practical.

2. Equipment shall be erected in a neat and workmanlike manner on the foundations and supports at the locations and elevations shown on the Drawings, unless otherwise directed by the Engineer during installation.

3. All equipment shall be installed in such a manner as to provide access for routine maintenance including lubrication.

4. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the equipment manufacturer's qualified mechanic, millwright, machinist, or authorized representative, to align the pump and motor prior to making piping connections or anchoring the pump base.

5. Equipment of a portable nature which require no installation shall be delivered to a location designated by the Owner.

B. Tolerances: Precision gauges and levels shall be used in setting all equipment. All piping and equipment shall be perfectly aligned, horizontally and vertically. Tolerances for piping and equipment installation shall be ½-inch to 30 ft horizontal and vertically. All valves and operators shall be installed in the position shown on the Contract Drawings or as directed by the Engineer, if not shown.

C. Alignment and Level: The equipment shall be brought to proper level by shims (1/4 inch maximum). After the machine has been leveled and aligned, the nuts on the anchor bolts shall be tightened to bind the machine firmly into place against the wedges or shims.

D. Grouting: The grout shall be tamped into position with a board, steel bar, or other tool. Tamping should not be so hard as to raise or otherwise displace the plate.

E. Contact of Dissimilar Metals: Where the contact of dissimilar metal may cause electrolysis and where aluminum will contact concrete, mortar, or plaster, the contact surface of the metals shall be separated using not less than one coat of

zinc chromate primer and one heavy coat of aluminum pigmented asphalt paint on each surface.

F. Cutting and Patching: All cutting and patching necessary for the work shall be performed by the Contractor.

G. Operation: All equipment installed under this Contract, including that furnished by Owner or others under separate contract, shall be placed into successful operation according to the written instructions of the manufacturer or the instructions of the manufacturer's field representative. All required adjustments, tests, operation checks, and other startup activity shall be provided.

3.02 OBSERVATION OF PERFORMANCE TESTS

Where the specifications require observation of performance tests by the Owner's Representative or Engineer such tests shall comply with the quality assurance paragraph in this section.

3.03 MANUFACTURER'S FIELD SERVICES

Services Furnished Under This Contract:

1. An experienced, competent, and authorized representative of the manufacturer of each item of equipment shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall re-visit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer/Owner's Representative at no additional cost to Owner. The authorized representative shall also utilize the site visit to instruct the Owner's staff in the proper operation of the equipment.

2. Each manufacturer's representative shall furnish to Owner and Engineer, a letter of certification stating that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

3. All costs for field services shall be included in the contract amount for such item.

END OF SECTION

INDEX TO

SECTION 15044 – PRESSURE TESTING OF PIPING

SECTION 15044

PRESSURE TESTING OF PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

Hydrostatic testing shall be conducted for all pressurized piping systems. Pressure and leakage testing shall be performed in accordance with the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications.

1.02 MEASUREMENT AND PAYMENT

A. Payment for Pressure Testing of Piping shall not be made separately. The cost thereof is included in the unit or lump sum price set forth for the items to which the pressure testing of piping is necessary. Reference Section 01025 Measurement and Payment for additional information.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Testing fluid shall be potable water.

2.02 MATERIALS AND EQUIPMENT

A. Unless otherwise indicated, Contractor shall provide pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic testing.

PART 3 - EXECUTION

3.01 TESTING

A. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications as noted below.

1. Reference Section 2.5.3.8 of the JWSC Standards for hydrostatic testing of water mains.

2. Reference Section 4.7.7 of the JWSC Standards for hydrostatic testing of force mains.

3. For hydrostatic testing of HDPE piping reference Section 15075. HDPE piping shall be tested separately from PVC

4. and DIP piping.

END OF SECTION

INDEX TO

SECTION 15062 – DUCTILE IRON PIPE AND FITTINGS

SECTION 15062

DUCTILE IRON PIPE AND FITTINGS

PART I - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. The work under this section includes the furnishing, installation, and testing of all Ductile Iron pipe and fittings and appurtenant materials and equipment as indicated on the Construction Drawings and/or as specified herein. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and as described in this Section.

1.02 QUALITY ASSURANCE

A. Reference Standards

1. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A 21.51.

2. Ductile iron pipe thickness: ANSI A 21.50.

3. Cement mortar lining for water: ANSI21.4.

4. Cast and ductile iron fittings: ANSI A 21.10.

5. C.I. pipe flanges and fittings: ANSI B 16.1.

6. Threaded flanges: CIPRA standard.

B. Qualifications: All ductile iron pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

C. Manufacturer: Acceptable Ductile Iron Pipe and Fitting manufacturers shall be as listed in JWSC Water and Sewer Standards Appendix 2A (water) and Appendix 4A (forcemains).

1.03 SUBMITTALS

A. Shop Drawings, including layouts within, and under buildings and structures shall be submitted to the Engineer for approval in accordance with Special Conditions. Shop Drawings shall be prepared by the pipe manufacturer.

B. Tabulated layout schedule, as appropriate for project.

C. Details of special elbows and fittings.

D. Calculations and/or test data demonstrating that the proposed retrained joint arrangement can transmit the required forces.

E. Copy of the manufacturer's quality control check of pipe material and production.

F. Provide an affidavit of compliance with AWWA standards referenced in this specification.

1.04 MEASUREMENT AND PAYMENT

A. Payment for Ductile Iron Pipe and Fittings will be made under the unit price items designated for ductile iron pipe or fittings. Reference Section 01025 Measurement and Payment.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All pipe shall be shipped and stored at the jobsite with wood lagging between pipes such that pipes do not make contact with one another.

B. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe - Ductile Iron Pipe Conforming to ANSI A21.51 and AWWA C151:

1. Unless otherwise shown on the Construction Drawings or Contract Documents, the minimum thickness of ductile iron pipe shall be Pressure Class 350 for piping 3 in. through 12. in., and Pressure Class 250 for piping 14 in. and larger.

2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.

3. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the coupling manufacturer.

4. Pipe shall be supplied in lengths not in excess of 20 feet having rubber-ring type push-on joints, standard mechanical joints or restrained joints where required for underground piping and flanged joint piping, for all above ground piping as shown on the Drawings.

B. Coatings and Linings:

1. Interior Coatings and Linings:

a. Pipe for finished potable water use shall be cement-mortar lined and seal coated, conforming to ANSI A21.4 and AWWA C104.

b. Pipe and fittings for non-potable use, except as otherwise noted, shall have a ceramic epoxy coating installed on the interior of the pipe. The coating shall be Tnemec Series 431 Perma-Shield PL or Engineer approved equal. Coating thickness shall be 40 mils minimum dry film thickness.

2. Exterior Coating: All ductile iron pipe and fittings shall be externally coated with a bituminous coating per ANSI A21.51.

C. Fittings:

1. All ductile iron pipe fittings shall match the pressure class rating of the adjacent piping.

2. Grooved-end fittings shall conform to AWWA C110 and ANSI B16.1 with grooved ends conforming to AWWA C606, radius cut rigid joints. Fitting material shall conform to ASTM A 48, Class 30, or ASTM A 126, Class B.

D. Joints (as shown on the Construction Drawing and/or as specified):

1. General: Joints in "runs" of aboveground piping or piping located in vaults and structures shall be rigid radius grooved end or flanged. Joints in "runs" of buried piping shall be of the push-on or mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment.

2. Grooved-End Couplings:

a. Grooved-end couplings shall be malleable iron, ASTM A 47 (Grade 32510), or ductile iron, ASTM A 536 (Grade 65-45-12).

b. Bolts: ASTM A 183, 110,000 psi tensile strength.

c. Gaskets: Halogenated butyl rubber or EPDM for water service and Buna-N for sewage service, conforming to ASTM D 2000

d. Couplings: AWWA C606 for rigid radius ductile-iron pipe. Couplings shall be Victaulic Style 31, Gustin-Bacon No. 500, or equal.

e. Grooved-end adapter flanges for piping having an operating pressure of 150 psi and less shall be Victaulic Style 341, or equal. Flange dimensions shall conform to ANSI B16.1 Class 125.

3. Flanges:

a. Flanges shall be Class 125 per ANSI B16.1 unless otherwise specifically noted. Determine the pressure rating of the fittings based on the test pressures shown in Section 15044: Pressure Testing of Piping.

b. Gaskets: Fullface, 1/8 inch thick, neoprene: Johns-Manville, John Crane Co. , or Engineer approved equal. Gaskets shall be suitable for a water pressure of 350 psi at a temperature of 180 degrees Fahrenheit (°F). Gaskets shall comply with Appendix A of AWWA C110.

c. Bolts and Nuts for Flanges

1) Bolts and nuts for flanges located indoors, in enclosed vaults and structures, buried and submerged and located outdoors above ground or in open vaults in structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B&M for bolts, and ASTM A 194, Grade M for nuts. Bolts shall comply with Appendix A of AWWA C110.

2) Provide washers for each nut. Washers shall be of the same material as the nuts.

d. Provide specially drilled flanges when required for connection to existing piping or special equipment.

e. Factory assemble screwed on flanges shall be long-hub type screwed tightly on pipe by machine at the foundry prior to facing and drilling. Flange faces shall be coated with a rust inhibitor immediately after facing and drilling. Field assembled screwed on flanges are prohibited.

4. Push-on and mechanical joint (ANSI A21.11):

a. The plain ends of push-on pipe shall be factory, machined to a true circle and chamfered to facilitate fitting the gasket.

b. Provide gaskets manufactured from a composition material suitable for exposure to the liquid to be contained within the pipe.

c. Each joint shall be complete with rubber gasket, cast iron gland and all required bolts and nuts.

D. Thrust restraint:

1. Thrust blocks: Shall not be permitted unless specifically indicated on the Drawings.

2. Restrained joints:

a. Pipe joints shall be mechanically restrained type as accepted by the Engineer. Restrained joints that require field welding or requiring set screws will not be acceptable, except restrained joints for mechanical joints shall be Megalug by Ebba Iron, or Engineer approved equal. Standard retainer glands are not considered equal

b. Pipe joints shall be restrained on each side of the fitting for a continuous distance in accordance with DIPRA "Thrust Restraint Design for Ductile Iron Pipe". Distance restrained shall be based on sand-silt soil type, 3.0 feet of cover and Type 5 laying condition.

C. Bolts and nuts for restrained joints shall be Corten, low alloy, high strength steel.

2.02 PIPING ACCESSORIES

A. Outlets:

1. For outlets larger than 2 inches, provide a tee with a flanged outlet.

2. Provide outlets 2 inches and smaller by tapping and attaching a service clamp. Service clamps shall be as specified herein.

PART 3 - EXECUTION

3.01 INSPECTION AND TESTING

A. All pipe shall be inspected and tested at the foundry.

B. The Owner shall have the right to have any or all piping, fittings or special castings inspected and tested by an independent testing agency at the foundry or elsewhere. Such inspection and testing will be at the Owner's expense.

C. Mark as rejected and immediately remove from the job site, all pipe lengths showing a crack, damaged lining, or receiving a severe blow that may cause an incipient fracture, even though no such fractures can be seen.

D. Removal of cracked portions:

1. Any pipe showing a distinct crack, but no incipient fracture beyond the limits of the visible crack, may be cut off and the sound portion installed. Cut the pipe at least 12 inches from the visible limits of the crack. Cutting of pipe shall be done by skilled workmen, and in such a manner as to not damage the pipe. Every cut shall be square and smooth, with no damage to the pipe lining. Cut surfaces, shall be recoated as specified for the pipe.

2. Cutting and installing cracked pipe shall only be performed when approved by the Engineer, and shall be at the expense of the Contractor.

E. Carefully inspect and hammer test all pipe and fittings prior to installation.

3.02 INSTALLATION

A. Assembling joints:

1. Push-on joints:

a. Insert the gasket into the groove of the ball.

b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.

c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.

2. Bolted joints:

a. Remove rust preventative coatings from machined surfaces prior to assembly.

b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.

3. Grooved end joints:

a. Install grooved end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following.

b. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove before installing coupling. Apply the coupling manufacturer's gasket lubricant to the gasket exterior, including lips, pipe ends, and housing interiors.

c. Fasten coupling alternately and evenly until coupling halves are seated. Use torques as recommended by the coupling manufacturer.

4. Flanged Joints:

a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate bolts with oil and graphite.

b. Insert the nuts and bolts (or studs) finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.

c. Execute care when tightening joints to prevent undue strain upon valves, pumps and other equipment.

d. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

5. Mechanical Joints:

a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.

b. Lubricate the gasket, bell and spigot by washing with soapy water.

c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly sealed.

d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.

e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joints to the proper tension with a torque wrench.

6. Bell and spigot joints:

   a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.

   b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

B. Fabrication:

1. Tapped connections:

   a. Make all tapped connections as shown on the Drawings or as directed by the Engineer.

   b. Make all connections watertight and of adequate strength to prevent pullout.

   c. Drill and tap normal to the longitudinal axis of the pipe.

2. Cutting:

   a. Perform all cutting with machines having rolling wheel cutters or knives designed to cut ductile iron. The use of a hammer and chisel to cut pipe is prohibited.

   b. After cutting, examine all cut ends for possible cracks.

   c. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.

C. Installing Buried Piping:

1. Inspect each pipe and fitting before lowering the buried pipe or fitting into the trench. Inspect the interior and exterior protective coatings. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

2. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or dump pipe into trenches under any circumstances.

3. When installing piping in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.

4. Grade the bottom of the trench by hand to the line and grade to which the pipe is to be laid, with allowance for pipe thickness. Remove hard spots that would prevent a uniform thickness of bedding. Before laying each section of the pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

5. At the location of each joint, dig bell (joint) holes of dimensions in the bottom of the trench and at the sides to permit visual inspection of the entire project.

6. Keep the trench in a dewatered condition during pipelaying in accordance with Section 02200: Earthwork, and Section 02220; Excavating, Backfilling and Compacting.

7. When the pipelaying is not in progress, including the noon hours, close the open ends of pipe. Do not permit trench water, animals, or foreign material to enter the pipe.

D. Installing Interior Piping

1. All piping and fittings shall be installed true to alignment and rigidly supported thrust anchors shall be provided where required. Any damage to linings shall be repaired to the satisfaction of the Engineer before the pipe is installed. Each length of pipe shall be cleaned out before erection.

2. Sleeves shall be installed of proper size for all pipes passing through floors or walls as shown on the Drawings. Where indicated on the Drawings, or required for liquid or gas-tightness, the pipe shall be sealed with mechanical seal equal to Link-Seal as manufactured by GPT Industries., or Engineer approved equal.

3. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall be, in accordance with the requirements of the piping layout and jointing method and their locations shall be verified from approved piping layout drawings and the structural drawings.

4. Except as otherwise shown on the Construction Drawings either split type couplings or flange joints may be used. Prior to approval of jointing, method layouts for hanger and supports shall be submitted to the Engineer for approval.

5. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped.

6. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, a certification shall be submitted stating that such requirements have been complied with.

E. Pipe deflection:

1. Push-on and mechanical joints:

   a. The maximum permissible deflection of alignment at joints shall be 80% of the manufacturer's allowable deflection.

2. Flexible joints: The maximum deflection in any direction shall not exceed

80% of the manufacturer's instructions and recommendations.

F. Hydrostatic Testing: Test in accordance with Section 15044: Pressure Testing of Pipe.

END OF SECTION

INDEX TO

SECTION 15075 – HORIZONTAL DIRECTIONAL DRILLING

SECTION 15075

HORIZONTAL DIRECTIONAL DRILLING

PART 1. GENERAL

1.01 SCOPE OF WORK:

The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation for pipe 12 inches and larger inside diameter (ID), also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

1.02 QUALITY ASSURANCE:

The requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification or within any associated permit (i.e.: railroad, US ACOE, EPD, DOT, Etc.). Adherence to the specifications contained herein, or the JWSC Representative's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract. The HDD contractor shall be responsible for the repair of all damage to private and/or public property (at no expense to JWSC). Repair work shall meet all local and state rules and requirements.

1.03 QUALIFICATIONS:

The work specified in this Section requires significant previous experience and expertise in similar work to avoid negative impacts to public safety and the environment. Therefore, the Contractor performing the work shall be qualified, in JWSC's judgment, to complete the horizontal directional drilling work specified herein. **The Contractor shall submit substantiating evidence of qualifications, in accordance with the provisions of this Section and the Instructions to Bidders.** Failure to submit the required documentation may cause the Contractor to be declared unqualified to perform the scope of work for the project. **Contractor or subcontractor responsible for horizontal directional drilling operations shall perform all horizontal directional drilling operations including pipe joining/fusing**. In order to qualify to perform work specified in this Section the Contractor must provide evidence satisfactory to JWSC, as noted in the Instructions to Bidders with bid response.

1.04 PROJECT SCHEDULE AND COOPERATION:

The project schedule shall be established on the basis of working a normal work schedule as defined in the Special Conditions, or otherwise indicated in the Construction Drawings. Unless approved or requested otherwise by JWSC, normal or general items of work, such as bacteriological testing, leakage and pressure testing, locate wire testing, density testing and final inspections, shall be scheduled during the normal work schedule. Due to operational

and manpower limitations on the JWSC systems, JWSC may require the contractor to perform work outside of the normal work schedule. These operational and manpower limitations may include line filling and flushing operation, tie-in work, (cut-in work or other work) and other phases of the work which may impact the continued (non-interruptible) service to existing JWSC customers. The contractor shall plan and anticipate the cost impact of these systems limitations and provide such work or services at no additional cost to JWSC.

1.05 WARRANTY:

The Contractor shall supply to JWSC a one (1) year unconditional warranty. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications.

The pipe manufacturer shall provide a warranty to the Contractor that the pipe conforms to these specifications and that the pipe shall be free from defects in materials and workmanship for a period of one (1) year from the date of final completion of the installation. The manufacturer's warranty shall be in a form acceptable to and for the benefit of JWSC and shall be submitted by the contractor as a condition of final payment. The manufacturer's warranty to the contractor shall in no way relieve the contractor from its unconditional warranty to JWSC.

The contractor shall warrant to JWSC that the methods used on the contract, where covered by patents or license agreements, are furnished in accordance with such agreements and that the prices included herein cover all applicable royalties and fees in accordance with such license agreements. The contractor shall defend, indemnify, and hold JWSC harmless from and against any and all costs, loss, damage or expense arising out of, or in any way connected with, any claim of infringement of patent, trademark, or violation of license agreement.

1.06 REFERENCED STANDARDS:

A. The work shall conform to applicable provisions of the JWSC Standards for Water and Sewer Design and Construction, and the following standards, latest editions, except as modified herein.

B. American Water Works Association (AWWA) Standards:

AWWA C900 Polyvinyl Chloride Pressure Pipe and Fabricated Fittings, 4 inch through 60 inch.

AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution American Society for Testing and Materials (ASTM) Standards.

ASTM D638 Standard Test Method for Tensile Properties of Plastics.

ASTM D2122 Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings.

ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

ASTM E3261 Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

ASTM D3350 Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.

ASTM F412 Standard Terminology Relating to Plastic Piping Systems.

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

1.07 PERMITS:

The Contractor shall verify the existence of all necessary permits before commencing any work on the project.

1.08 SUBMITTALS (For HDD Portions of Project Only):

A. Work Plan: Prior to beginning work, the Contractor must submit to the JWSC Representative a work plan detailing the procedure and schedule to be used to execute the project. Horizontal directional drilling shall not commence until the contractor has received written approval of all work plan submittals from JWSC.

1. Methods: The Contractor shall provide complete descriptions of proposed plans, procedures, and personnel, as well as supporting calculations, for the following:

   a. Drilling operations, addressing: Procedures for pilot hole drilling and reaming. Procedures for tracking and controlling the drilling head location. Procedures for preparing as-builts.
   b. Drilling fluid management plan.
   c. Spoils handling and disposal plan.
   d. Pipe storage and handling, addressing: Means and methods for protecting pipe and ensuring temperature control in accordance with the Contractor's installation calculations.
   e. Pipeline assembly and installation, addressing: Procedures for pipe joining, pipeline pullback, and pullback monitoring.
   f. Prevention of inadvertent fluid losses and spills, and contingencies for rapid containment and cleanup, addressing: Measures to mitigate risk of inadvertent fluid returns to surface. Procedures for monitoring and controlling drilling fluid flows and pressures. Equipment, resources, and procedures for identifying, containing, and cleaning up fluid losses and spills.
   g. Quality control and testing procedures.
   h. Safety plan.

2. Schedule: The Contractor shall provide a schedule for all horizontal directional drilling activities commencing with the site preparation and terminating on completion of testing and final acceptance of the installed pipe. The schedule shall address anticipated subsurface conditions and overall project requirements.

3. Equipment

   a. The contractor shall provide the make, model, and technical specifications for each of the following:
      1. Horizontal directional drill rig.
      2. Drilling system components.
      3. Downhole drilling assembly and reaming equipment.
      4. Downhole pressure sub.
      5 Guidance and control system.
      6. Pulling head.
      7. Swivel.
      8. Rollers.
      9. Solids separation and drill fluid recirculation systems.
      10. Pipe fusion equipment.
      11. Pipe fusion data logger.
      12. Pipe handling equipment.
      13. Pigs and pigging equipment.

   b. The Contractor shall provide the following specific equipment information:
      1. Calibration certification for the pilot bore guidance and control system.
      2. Calibration certification for the heat fusion datalogger.

4. Supplemental Work Plan Requirements: The Contractor shall provide the following additional work plan submittals. The submission requirements for additional work plan submittals including number of copies and delivery of submittals shall follow the requirements outlined in the Submittals Section of the Special Conditions. Horizontal directional drilling shall not commence until the Contractor has received written approval of all supplemental work plan submittals.

   a. The Contractor shall submit acknowledgement of use of the Maintenance of Traffic plans in the Construction Drawings or shall submit alternate detailed Maintenance of Traffic plans for entry and exit pit sites and all areas of construction which will impact typical roadway or pathway use. Approval of Glynn County will be required for ALL Maintenance of Traffic plans with the ROW Permit.
   b. Frac-Out and Surface Spill Contingency Plan: Plans for mitigating the potential for inadvertent drilling fluid losses to surface, and for

rapidly identifying and cleaning up spills near the investigation borings located along the project alignment. Investigation boreholes along the alignment have been backfilled as reported in the Geotechnical Report. The Contractor's work plans shall address the risk that investigation boreholes may contribute to the risk of drill fluid loss.

c. Contingency plan for rapidly identifying, locating, and containing any drilling fluid returns.

d. The Contractor shall submit a contingency plan to address procedures to be employed in the event any of the listed items occur.

1. Utility strike, obstruction, or inability to advance drill pipe.
2. Excessive deviation from proposed line and grade, as described within this Section.
3. Inability to move pipe through borehole during pullback.
4. Settlement or heave of roadways and structures within 50 feet of the alignment.

B. Calculations:

The Contractor shall submit final design calculations for JWSC's review and approval as soon as possible following Notice to Proceed, and in accordance with the Project Schedule section of the Special Conditions. Final design calculations shall support the Contractor's specific proposed means, methods, and products. The Contractor's final design calculations shall be prepared and sealed by a Licensed Professional Engineer registered to practice in the State of Georgia, and retained by the Contractor. Horizontal directional drilling shall not commence until the Contractor has received written approval of all design calculation submittals from JWSC.

At a minimum, design calculations shall demonstrate that the proposed pipe, equipment, and means and methods comply with the requirements of this Section and have been designed based on the design borepath, and installation means and methods, for anticipated installation and handling, hydrostatic, earth, and live loads, installation temperature and site conditions. Design calculations shall address the considerations and guidelines presented in ASTM F1962: Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings

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The Contractor shall supply copies of all other calculations required to support the required submittals for horizontal directional drilling. At a minimum, the following calculations should be included:

1. Maximum allowable pipe loading limits.
2. Pullback load calculation based upon proposed drill path plan and profile.
3. Buoyancy effect calculations.
4. Effects of ballasting plan on pipe pullback forces.
5. Hydrofracture analysis. This should include a maximum annular pressure curve and the respective formation pressure versus depth based on the

proposed drill plan and profile.

6. Confirmation that design parameters do not exceed predicted installation stresses including factors such as tensile load, buckling and deformation.

C. Shop Drawing Submittals:

For all materials provided, Contractor shall provide copies of documentation (actual catalog data, brochures, drawings and descriptive literature) necessary to establish compliance with the Specifications in accordance with Submittals Section of the Special Conditions.

D. Construction Records:

1. Daily Reports: The Contractor shall maintain daily activity reports throughout all horizontal directional drilling operations, including pipe installation. A sample daily report shall be submitted to JWSC for approval prior to the commencement of drilling operations. Daily reports shall be submitted within 24 hours of completion, and shall include, for each drill rod added or withdrawn, or every 30 feet during drilling, pre-reaming, and pullback:

   a. Downhole tools and equipment in use.
   b. Description of ground conditions encountered.
   c. Description of drilling fluid.
   d. Drilling fluid pumping rate.
   e. Maximum and minimum downhole fluid pressures.
   f. Drilling head location - at least every 10 feet along the bore path.
   g. Drill stem torque.
   h. Details and perceived reasons for delays greater than one hour other than normal breaks and shift changes.
   i. Details of any unusual conditions or events.

2. Production and Record Drawings: The Contractor shall maintain at the construction site a complete set of field drawings for recording the as-built conditions. The Contractor shall plot as-built conditions on the field drawings, including the location in plan and elevation of the drill string, reaming head, and installed pipe, at the completion of each production shift. The Contractor shall compile and submit as-built data in accordance with the Project Record Documents requirements in the Special Conditions.

   a. As-Built data provided to the Engineer of Record for incorporation into the Record Drawings shall include Horizontal Directional Drill pipe installation information in plan and profile views in AutoCAD format with X, Y, and Z coordinates in Georgia State Plane East Zone Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD 88) conducted by a surveyor licensed in the State of Georgia. Directional Drill Bore Log shall be provided as part of the As-Built documentation and shall be in Georgia State Plane East Zone

Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD 88) and be relative to the established surface survey bench mark and baseline stationing that is tied to existing, fixed and visible sight features. Directional Drill Bore Log shall show recorded X, Y, and Z locations of the drill head at minimum every 20 feet in the AutoCAD format documentation.

3. Testing and Quality Control and Assurance Documentation: The Contractor shall maintain records for all testing and quality control and assurance procedures. The following records shall be provided to JWSC or JWSC's Representative on the day that information is acquired by the Contractor:
   a Manufacturer's Field Reports.
   b. Test reports.
   c. Fusion reports. For each weld, provide an electronic and printed report of the downloaded information for each weld. Fusion reports shall be submitted for review and approval to Engineer/Owner prior to initiating pullback operations.

1.09 NOTIFICATION:

The JWSC Representative must be notified 48 hours (minimum) in advance of starting the drilling work. The Directional Bore shall not begin until the proper preparations (see Work Plan) for the operation have been completed.

1.10 MEASUREMENT AND PAYMENT

A. Payment for Horizontal Directional Drilling will be made under the unit price items designated for piping installed by horizontal directional drilling. Reference Section 01025 Measurement and Payment.

1.11 SITE PREPARATION:

A. Prior to any alterations to work-site, Contractor shall video record and photograph entire work area in accordance with Section 01380: Construction Photographs and Video. Two (2) copies of such documentation shall be given to the JWSC Representative and Engineer and one (1) copy shall remain with Contractor for a period of two (2) years following the completion of the project. Pre-construction videos and photographs shall be reviewed and approved by JWSC and Engineer prior to disturbing project site.

B. The Contractor shall coordinate utilities locates with Georgia811 (web site www.Georgia811.com). Once the locate service has field marked all utilities, the Contractor shall verify each utility (including any service laterals, i.e. water, wastewater, cable, gas, electric, telecommunications, etc.) and those within each paved area. Verification may be performed utilizing Ground Penetrating Radar, hand dig, or vacuum excavation. Prior to initiating drilling, the Contractor shall record on the drawings both the horizontal and vertical location of the utilities off

of a predetermined baseline. The Contractor shall utilize the Ground Penetrating Radar over the projected bore path whether utilities are located in the horizontal drill pathway or not, in order to reduce the opportunity of conflicting with any unforeseen obstructions.

C. Work site shall be graded and filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.

D. Following drilling operations, Contractor will de-mobilize equipment and restore the work-site to original condition. All excavations will be backfilled and compacted in accordance with Section 02220 Excavating, Backfilling, Compacting and the Construction Details.

1.12 ENVIRONMENTAL PROTECTION:

Contractor shall place erosion and sediment control measures between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, permits, and state, federal and local regulations. Contractor shall place approved protection methods to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations including environmental condition stated in local, state and federal permits. Fuel may not be stored in bulk containers (greater than 25 gallons) within 200' of any water-body or wetland.

1.13 SAFETY:

Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

1.14 DOMESTIC WATER:

For the supply of domestic water during construction, the Contractor shall utilize a JWSC meter assembly (meter & backflow device) and pay for all water consumed.

PART 2. MATERIALS

2.01. HIGH DENSITY POLYETHYLENE (HDPE, PE) PIPE AND FITTINGS:

A. Materials:

Materials used for the manufacture of polyethylene pipe and fittings shall be PE4710 high density polyethylene meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting Manufacturer in PPI

TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F per ASTM D-2837. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

B. Polyethylene Pipe

HDPE Pipe shall conform to AWWA C906, DR-11, Ductile Iron Pipe (DIP) size and NSF 61 Standard. For pipe sizes 24-inch and larger, the HDPE may be IPS size, DR 11. Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, dimensions and either quick burst or ring tensile strength (equipment permitting).

C. Nominal Pipe Sizes

Nominal pipe sizes only are indicated on the drawings and bid form. Outside diameter of pipe is generally 1 to 2-inches greater than the nominal pipe diameter.

D. Service Identification:

Permanent identification of piping service shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. The striping material shall be the same material as the pipe material except for color. Colors for identifying piping service shall be in accordance with JWSC Standards for Water and Sewer Design and Construction.

E. Back-up Rings and Flange Bolts:

Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. Convoluted style backup rings preferred over the flat stock rings. The lap joint flange bore shall be chamfered to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

F. Manufacturer's Quality Control:

The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control.

G. Polyethylene Mechanical Joint (MJ) Adapters:

Mechanical connections of HDPE pipe to Ductile Iron or PVC piping, mechanical joint fittings, or valves shall be through a fusible polyethylene mechanical joint adapter with an integral, internal stainless steel insert. Mechanical joint adapter shall be of the same DR rating as the pipe. Adaptors shall include longer T-bolts or all thread rods with nuts at the mechanical joint bell.

2.02 FUSIBLE POLYVINYL CHLORIDE (FPVC) PIPE (IF APPROVED BY OWNER):

A. FPVC Pipe shall conform to AWWA C900, Ductile Iron Pipe Size (DIPS), DR18, and color coded. The pipe material shall be clean, virgin, National Sanitation Foundation No. 14, ASTM cell class 12454. FPVC shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe. Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter.

B. FPVC pipe shall not be bent beyond the manufacturer's recommended minimum allowable bend radius. The published allowable bend radius is applicable to all pipe alignments, including during handling and movement, as well as final positioning and installation.

C. FPVC pipe shall not be subjected to a pull force greater than 80% of the manufacturer's recommended allowable pull force for the pipe wall thickness and size. Allowable pull force is the tensile load that may be safely applied to the pipe and is a function of the tensile stress capacity of FPVC and the cross-sectional area of the FPVC pipe section. FPVC pipe shall meet the cell class tensile stress capacity of 7,000 psi when the compound is tested per ASTM 1784. Safety factor shall be 2.5.

2.03 DRILLING FLUIDS SHALL BE A BENTONITE SLURRY.

2.04 DELIVERY, STORAGE AND HANDLING OF MATERIALS:

A. Inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.

B. Unload and store opposite or near the place where the work will proceed with minimum handling. Store material under cover out of direct sun light. Do not store directly on the ground. Keep all materials free of dirt and debris. Storage and handling of pipe shall be in accordance with manufacturer's recommendations.

C. Contractor is responsible for obtaining, transporting and sorting any fluids, including water, to the work site.

D. Disposal of fluids is the responsibility of the Contractor. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. The bentonite drilling slurry, as appropriate, shall be recycled for reuse in the hole opening operation, or shall be hauled by the Contractor to an approved location or landfill for proper disposal. Contractor shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants, vegetation, and sod damaged, discolored or stained by drilling fluids. Contractor is responsible for the cost of disposal including but not limited to hauling and disposal charges.

1. Potential Disposal Site: Potential disposal site, previously used for disposal of drilling fluids - Seaboard Construction Company, Inc. Contractor to verify

availability for this project. Seaboard Construction (912) 265-6410.

2.05 EQUIPMENT REQUIREMENTS

A. GENERAL:

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used, a guidance system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safety operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

B. DRILLING SYSTEM

1. Drilling Rig:

The directional drilling machine shall consist of a power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drilling string and an audible alarm which automatically sounds when an electrical current is detected.

2. Drill Head:

The drill head shall be steerable and shall provide the necessary cutting surfaces and drilling fluid jets.

3. Mud Motors (if required):

Mud motors shall be of adequate power to turn the required drilling tools.

4. Drill Pipe:

Shall be constructed of high quality 4130 seamless tubing, grade D or better.

C. GUIDANCE SYSTEM:

Magnetic Guidance System (MGS) wireline, wireless or gyroscopic shall provide real time electronic data to the inspector on request. All daily data and project data shall be displayed on the "As Built". If deemed necessary, JWSC shall, at the

contractor's expense, require a third party to verify the drill path profile and location of the installed line to JWSC satisfaction. The guidance system shall be capable of tracking at all depths up to forty feet (40') below the maximum proposed depth and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 1.5 meters horizontally.

The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

1. Bore Tracking and Monitoring:

   At all times during the pilot bore the Contractor shall provide and maintain a bore tracking system that is capable of accurately locating the position of the drill head in the x, y, and z axes. The Contractor shall record these data at least once per drill pipe length.

   a. Downhole and Surface Grid Tracking System:

      Contractor shall monitor and record x, y, and z coordinates relative to an established surface survey bench mark. The data shall be continuously monitored and recorded at least once per drill pipe-length.

   b. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed plus or minus 5 feet (horizontal or vertical deviation) from the design path, such occurrences shall be reported immediately to JWSC. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.

   c. Drilling Fluid Pressures and Flow Rates:

      Drilling fluid pressures including drilling fluid pressure in the borehole annular space and flow rates shall be continuously monitored and recorded by the Contractor. These measurements shall be made during pilot bore drilling, reaming, and pullback operations.

D. DRILLING FLUID (MUD) SYSTEM:

1. Mixing System:

   A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

2. Drilling Fluids:

Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material may be used in drilling fluid.

3. Delivery System:

The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system or disposed of properly. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid cycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage, recycling, and disposal facilities.

4. Drilling Fluid Viscosity

In the event that inadvertent returns or returns loss of drilling fluid occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor shall cease operations and notify JWSC Representative. JWSC Representative and Contractor shall discuss additional options and work will then proceed accordingly.

5. Drilling Fluid Recycling System:

The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

6. Control of Drilling Fluids:

The Contractor shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling mud weights, drilling speeds, and any other operational factors required to avoid hydrofracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. The Contractor shall maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming and pullback operations and shall be capable of quickly removing spoils. The Contractor shall immediately notify JWSC of any inadvertent returns or spills and immediately contain

and clean up the return or spill.

E. OTHER EQUIPMENT:

1. Pipe Rollers:

Pipe rollers shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe and to protect trees during pipe pullback operations. Sizing and maximum spacing and location of pipe rollers along pipe length shall adhere to pipe manufacturer's recommendations.

2. Pipe Rammers:

Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of JWSC Representative.

3. Restrictions:

Other devices or utility placement systems for providing horizontal thrust other than those defined above in the preceding sections shall not be used unless approved by the JWSC Representative prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

F. DATA LOGGER.

1. General:

A data logger shall be used to record and document all butt weld fusion processes. A record shall be made of every fusion weld made. The data logger shall be of a rugged, handheld computer as the recording device connected to a data collection device. The data collection device shall record the heater temperature and fusion pressure profile over time. All data shall be recorded and transmitted to the handheld computer where the joint report will be stored, viewed, printed, or transferred to a desk top computer for archiving. The operator associated with the fusion process shall utilize the data logger report as one means to confirm a complete and proper weld. This data shall be made immediately available to the JWSC Representative, upon request. Unless approved otherwise by JWSC, a written or downloaded report for each fusion weld process shall be required and submitted to the JWSC Representative after the fusion weld process for review and approval prior to initiating pullback operations. If a potential defect fusion weld is suspected by JWSC or the Contractor, the work shall stop and a mutually acceptable (between the Contractor and JWSC) corrective action plan shall be executed.

2. Data logger:

Equipment shall be Mc Elroy Datalogger Model no. DL6303 DL 6304 or JWSC approved equal.

PART 3. EXECUTION

3.01 DRILLING PROCEDURES

A. DRILL PATH:

Prior to drilling Contractor shall utilize all verified locate information to determine drill pathway. Marked up drawings (see Site Preparation paragraph) shall be on site at all times, and referred to during the drill operation.

B. GUIDANCE SYSTEM:

Contractor shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string torsional and axial forces and measure drilling fluid discharge rate and pressure. The JWSC Representative shall have access to instrumentation and readings at all times during operation.

C. PILOT HOLE:

The pilot hole shall be drilled along the path shown on the plans and profile drawings. Unless approved otherwise by JWSC, the pilot-hole tolerances shall be as follows:

1. Elevation:

As shown on the plans.

2. Alignment:

As indicated; at a minimum three (3) feet within the right-of-way, easement, wetland boundary, or other restrictive designations.

3. Curve Radius:

The pilot hole radius shall be no less than 80% of the maximum bending radius as recommended by the pipe manufacturer of the pipe being installed. In no case shall the bending radius be less than 30 pipe diameters, unless approved otherwise by JWSC.

4. Entry Point Location:

The exact pilot hole entry point shall be within ±5 feet of the location shown on the drawings without prior JWSC written permission for deviation.

5. Exit Point Location:

The exit point location shall be within ± 5 feet of the location shown on the drawings without prior JWSC written permission for deviation.

6. Limitations on Depth:

Pipe larger than bore hole path shall be specifically designed by the engineer and approved by JWSC. Where utilities cross under roads, the depth of cover shall comply with applicable authorizing agency and permit.

7. Water Main and Non-Water Main Separation Requirements:

The minimum separation requirements between water main and a non-water main shall be as required by Georgia EPD and in accordance with relevant permits. The current requirements are specified below:

a. Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge.

b. When local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. It is advised that the sewer be constructed of materials and with joints that are equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

D. PULL BACK:

After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel and appropriate tools per the contractor's approved Work Plan. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull force at any time. Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe manufacturer's safety pull (or tensile) strength.

1. Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly.

2. The pullback section of the pipeline shall be supported during pullback operations so that it moves freely and the pipe is not damaged.

3. External pressure shall be minimized during installation of the pullback

section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the JWSC.

4. Buoyancy modification shall be at the discretion of the Contractor and shall be approved by the JWSC Representative. The Contractor shall be responsible for any damage to the pull section resulting from such modifications.

5. In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify JWSC Representative. JWSC Representative and Contractor will discuss options and then work will proceed accordingly.

3.02 PIPE ASSEMBLY

A. GENERAL:

Pipe shall be welded/fused together in one length, if space permits. HDPE Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. FPVC pipe shall be placed on pipe rollers, in accordance with manufacturer's recommendations, before pulling into bore hole to minimize damage to the pipe. It is critical that all original oxidized pipe surface be removed in order for fusion to take place. The scraping process requires that approximately 0.10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier. Oxidized pipe surface simply will not bond.

B. ACCEPTABILITY OF DAMAGED PIPE:

Cuts or gouges that reduce the wall thickness by more than 10% are not acceptable and must be cut out and discarded.

C. BUTT FUSION LOG:

Each butt fusion shall be recorded and logged by an approved electronic monitoring device (Reference paragraph 2.04 F.2.) affixed to the fusion machine.

1. Joint data shall be submitted for review and approval to the Engineer/Owner prior to initiating pullback operations.
2. Joint data shall also be submitted as part of the As-Recorded information, in accordance with this specification.
3. Joint fusion reports shall reference station number and street name for geographical reference of installed location.

D. BUTT FUSION TESTING:

When requested by a JWSC inspector, butt fusion testing will be performed. The test fusion shall be allowed to cool completely, and then fusion test coupons shall be cut out. The test shall involve McElroy' "In Field Tensile Tester" which utilizes test coupons (conducted in accordance with manufacturer's recommendations) or JWSC pre-approved test methods and/or manufacturer.

E. MECHANICAL JOINING:

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

F. GENERAL REQUIREMENTS FOR OPEN-CUT CONSTRUCTION:

Mains shall be constructed of the materials specified and as shown on the drawings. Pipe and fittings shall be carefully handled to avoid damage, and if feasible, while they are suspended over the trench before lowering, they shall be inspected for defects and to detect cracks. Defective, damaged or unsound pipe or fittings shall be rejected. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel. Any pipe which has its grade or joint disturbed after laying shall be taken up and re-laid. Only suitable soils shall be utilized in the backfill operation. All precautions shall be taken to prevent sand or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any time the pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by the JWSC. Plugs shall remain in pipe ends until all water is removed from the trench. Any sand or foreign material that enters the pipe shall be removed from the pipe immediately. No pipe shall be installed when trench conditions (standing water, excess mud, etc.) or the weather (rain, etc.) is unsuitable for such work, except by permission of the JWSC. Any section of pipe already laid which is found to be defective or damaged shall be replaced with new pipe. Lines shall be located as shown on the drawings. The Contractor shall investigate well in advance of pipe laying any conflicts which may require readjustments in planned locations and advise the JWSC Representative of the results of these investigations so that the necessary modifications may be determined. Refer to JWSC Standards for Water and Sewer Design and Construction and other sections of the Technical Specifications for additional requirements.

3.03 SWABBING

A. The purpose of swabbing a new pipeline is to conserve water while thoroughly cleaning the pipeline of all foreign material, sand, gravel, construction debris and other items not found in a properly cleaned system. Prior to pressure testing of a new pipeline, swabbing shall be utilized as indicated below.

B. All new water and sewer force mains greater than 12" I.D. shall be hydraulically cleaned with a polypropylene swabbing device to remove dirt, sand and debris from main.

C. If swabbing access and egress points are not provided in the design drawings, it

will be the responsibility of the Contractor to provide temporary access and egress points for the cleaning, as required.

D. Passage of cleaning poly swabs through the system shall be constantly monitored, controlled and all poly swabs entered into the system shall be individually marked and identified so that the exiting of the poly swabs from the system can be confirmed.

E. Cleaning of the system shall be done in conjunction with, and prior to, the initial filling of the system for its hydrostatic test.

F. The Contractor shall insert flexible polyurethane foam swabs (two pounds per cubic foot density) complete with rear polyurethane drive seal, into the first section of pipe. The swabs shall remain there until the pipeline construction is completed. A JWSC representative shall be present for the swabbing process including swab insertion and retrieval.

G. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.

H. Locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.

I. At the receiver or exit point for the poly swab, the Contractor is responsible for creating a safe environment for collection of debris, water and the swab. Considerations shall be made for protecting surrounding personnel and property and safe retrieval of the swab.

J. Only with JWSC personnel on-site shall the supply valve from the existing distribution system be operated. Cleaning and flushing shall be accomplished by propelling the swab down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear and swab(s) is/are retrieved.

1. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.

2. Swabbing speed shall range between two and five feet per second.

K. After the swabbing process, pressure testing and disinfection, as appropriate, of the pipe shall be completed in accordance with the JWSC Standards for Water and Sewer Design and Construction and this specification.

3.04 TESTING

A. DISINFECTION TESTS:

1. Upon satisfactory completion of the hydrostatic testing, all new water lines and other pipe related installations which may have been contaminated by the work shall be disinfected prior to being placed in service. Disinfection shall follow the applicable provisions of AWWA Standard C651 – AWWA Standard for Disinfecting Water Mains, the Rules for Safe Drinking

Water as published by the Georgia Environmental Protection Division, and as outlined in the JWSC Standards for Water and Sewer Design and Construction.

B. HYDROSTATIC (PRESSURE AND LEAKAGE) TESTS:

1. Contractor shall test FPVC pipelines installed under this Contract in accordance with Section 15044: Pressure Testing of Piping.

2. Contractor shall test HDPE pipelines installed under this Contract in accordance with these specifications prior to acceptance of the pipeline by the JWSC. All field tests shall be made in the presence of the JWSC Representative. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by JWSC, all fusible or butt weld joints shall be tested, including MJ adapter fittings associated with the new construction. All piping to operate under liquid pressure shall be tested in sections of approved length. The pressure testing of an HDPE line section shall be tested separately from the PVC and DIP line sections. Where impractical, the HDPE test section shall include only a minimum amount of PVC and DIP within the test section. If at all possible, the PVC and DIP test sections shall be left exposed during the pressure test for visual leakage observation. For these tests, the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment, and all labor required. JWSC may elect to furnish suitable pressure gauges for these tests. If not, the Contractor will furnish suitable pressure gauges, calibrated by an approved testing laboratory, with increments no greater than 2 psi. Gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves. All HDD over 100 linear feet shall be air pressure tested (above ground) @ 5 PSI for a period of 15 minutes, prior to insertion. There shall be no pressure loss allowed.

2. Unless it has already been done, the section of pipe to be tested shall be filled with potable water and air shall be expelled from the pipe. If blow offs or other outlets are not available at high points for releasing air, the Contractor shall provide 1 inch (minimum taps and blow-off valves (at the 12:00 position), as necessary. The cost of constructing blow-off valves and plugging them, after a successful pressure test, shall be included in the unit price bid amount for the HDD installation.

3. Hydrostatic testing shall consist of 150 psig test pressures, based on the elevation of the highest point of the line or section under test. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the JWSC Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor and shall be subject to the approval of the JWSC Representative.

5. Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, and then

allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

6. Initial Phase of Pressure Testing: First, all air must be removed from the test section. The pressure test shall be completed after the line is backfilled. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection. If possible all PVC and DIP test sections shall be left exposed for visual leak inspection. Initially, the pressure within the test section should be raised to approximately 160 psi and then allowed to be idle (no additional make-up water/pressure to be injected), for approximately 3 hours. During this 3 hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water/pressure shall be applied to the test section during this 3 hour stabilization period unless the line pressure drops below 140 psi. In this case, make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 psi (during the 3 hour stabilization period).

7. Final Phase of Pressure Testing:

   The final phase of the pressure test shall involve applying make-up water/pressure to achieve an "initial test pressure" of 150 psi (minimum)/155 psi (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to re-establish the "initial test pressure". The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the table below. If the actual make-up water quantity is equal or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails (see enclosed JWSC test form).

Table 1: Allowable Make Up Amount

Nominal Pipe Size (inches)	Make-up Water Allowance (Gallons/Linear feet of Pipe) 2-hour test
6	0.0030
8	0.0050
10	0.0065
12	0.0115
14	0.0140
16	0.0165
18	0.0215
20	0.0275
22	0.0350
24	0.0440
26	0.0500
28	0.0555
30	0.0635
32	0.0715
34	0.0810
36	0.0900
42	0.1155
48	0.1350
54	0.1570

8. In the event a section fails to pass the tests, the Contractor shall do everything necessary to locate, uncover (even to the extent of uncovering the entire section), and replace the defective pipe, valve, fitting or joint. Visible leaks shall be corrected regardless of total leakage. Lines which fail to meet these tests shall be retested as necessary until test requirements are complied with. All testing shall be performed at the Contractor's expense.

9. If, in the judgment of JWSC, it is impracticable to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made with approval; but, in any event, the Contractor shall be responsible for the ultimate tightness of the piping within the above requirement. Re-disinfection of water mains shall be required if the line is de-pressurized for repairs prior to tying.

C. LOCATE WIRE:

Two locate wires shall be provided on all HDPE and FPVC installations. For HDD projects, locate wire shall be 12 AWG high strength copper-clad carbon steel with 45 mils (min) insulation. For open-cut portions of the project, the locate wire construction and testing shall meet the requirements as listed in the General Notes and Construction Details in the Construction Drawings. The external color shall be blue for water and green for wastewater. Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations" and all "exit point locations". For HDD projects, there is no maximum length or interval between locate wire stations. The testing and report requirements within the

General Notes of the Construction Drawings shall be required except as modified herein. If both locate wires break or are not continuous (from end to end), the Contractor shall, at the Contractor's expense, provide soft-digs for the portions of the main with 12-feet or less cover (every 25 LF along main) to confirm as-built data. This soft-dig data shall be recorded on the as-built record drawings.

BGJWSC RECORD of PRESSURE and LEAKAGE TEST (HDPE PIPE)

Project:_____

TEST SECION:_____

JWSC REPRESENTATIVE:_____SIGNATURE_____

TEST DATE:____/_____/_____ TEST TIME:_____ BEGIN_____ END_____

OTHER TEST PHASE ATTENDEE'S:

_____ _____

_____ _____

PRESSURE AND LEAKAGE TEST CALCULATIONS:

_____WATER MAIN __ WASTEWATER FORCE MAIN _____RECLAIMED WATER MAIN

Line Pressure Test:

Start:_____ PSI (Minimum of 150 PSI or 2x operating pressure) End:_____PSI

PSI Difference: _____PSI (IF GREATER THAN 5 PLI, THE TEST FAILS)

TYPE OF HDPE PIPE (DR RATING) (1)	**DIAMTER OF PIPE (INCHES) (2)**	**LINEAR FEET (3)**	**2-HOUR TEST FACTOR (see JWSC TABLE) (4)**	**TOTAL ALLOWABLE LEAKAGE (3X4) (5)**
			Total Allowable Leakage Amount (Gallons):	

Allowable Leakage Amount _____ Gal _____Oz. (32 oz per qt; 120 of per gal)

Actual Leakage Amount _____Gal _____Oz.

Pressure and Leakage Test Results (Pass or Fail) _____

The above is based on the average pressure test of 150 PSI, 2 hour test period. If the actual leakage amount is equal or less than the allowable leakage amount, the leakage test is acceptable.

JWSC 2 HOUR TEST FACTORS NOMINAL PIPE SIZE (inches) – ALLOWABLE LEAKAGE AMOUNT (Gallons/Linear Feet of Pipe)						
4" – 0.0020	6" – 0.0030	8" – 0.0050	10" – 0.0065	12" – 0.0115	14"- 0.0140	16" – 0.0165
18" – 0.0215	20" – 0.0275	22" – 0.0350	24" – 0.0440	26" – 0.0500	28" – 0.0500	30" – 0.0635
32" – 0.0715	34" – 0.0810	36" – 0.0900	42" – 0.1155	48"- 0.1350	54" – 0.1570	

File No. _____

END OF SECTION

INDEX TO

SECTION 01025 – MEASUREMENT AND PAYMENT

SECTION 01025

MEASUREMENT AND PAYMENT

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. This Section specifies administrative and procedural requirements to define pay items and determine payable amounts, and includes but is not limited to:
   1. General Provisions
   2. Cash Allowances
   3. Work Not Paid for Separately
   4. Measurement for Payment

B. Related Sections:

   1. General and Special Conditions

   2. JWSC Standards for Water and Sewer Design and Construction

1.02 GENERAL PROVISIONS

A. This specification includes standard descriptions for all bid items. This Contract's specific bid items are listed in the Bid Form which will be used to develop an approved Schedule of Values.

B. The total Contract Amount shall cover the Work required by the Contract Documents. All costs in connection with the successful completion of the Work, including furnishing all materials, equipment, supplies, and appurtenances; providing all construction, equipment, and tools; and performing all necessary labor and supervision to fully complete the Work, shall be included in the unit and lump sum prices bid. All Work not specifically set forth as a pay item in the Bid Form shall be considered a subsidiary obligation of the Contractor and all costs in connection therewith shall be included in the prices bid.

C. If used, all estimated quantities stipulated in the Bid Form or other Contract Documents are approximate and are to be used only (a) for the purpose of comparing the bids submitted for the Work, and (b) as a basis for determining an initial Contract Amount. The actual amounts of Work completed and materials furnished under unit price items may differ from the estimated quantities. The Owner does not expressly or by implication represent that the actual quantities involved will correspond exactly to the quantities stated in the Bid Form; nor shall the Contractor plead misunderstanding or deception because of such estimate or quantities or of the character, location or other conditions pertaining to the Work. Payment to the Contractor will be made only for the actual quantities of work performed or material furnished in accordance with the Drawings, Specifications, and other Contract Documents, and it is understood that the quantities may be increased or decreased as provided in the General Conditions.

D. If used, the unit prices listed in the Bid Form shall include all services, obligations,

responsibilities, labor, materials, devices, equipment, royalties and license fees, supervision, temporary facilities, construction equipment, bonds, insurance, taxes, clean up, traffic control, control surveys, field offices, close out, overhead and profit and all connections, appurtenances and any other incidental items of any kind or nature, as are necessary to complete the Work in accordance with the Contract Documents, unless otherwise noted.

E. Payment for Lump Sum Work will be based on the percent of completed work of each item in the Schedule of Values, including stored materials, as determined by the Owner. Progress of work in each item of the Schedule of Values will be determined separately by the Owner. However, the Owner will issue a single payment certificate for progress on the Contract.

F. The Contractor agrees that it will make no claim for damages, anticipated profits, or otherwise because of any difference between the amounts of work actually performed and materials actually furnished and the estimated amounts therefore.

G. Where payment by scale weight is specified under certain items, the Contractor shall provide suitable weighing equipment which shall be kept in accurate adjustment at all times and certified. The weighing of all material shall be performed by the Contractor in the presence and under the supervision of the Owner.

H. All schedules included in the Contract Documents are given for convenience and are not guaranteed to be complete. The Contractor shall assume all responsibility for the making of estimates of the size, kind, and quantity of materials and equipment included in Work to be done under this Contract.

I. Where pipe fittings are noted on the Drawings, such notation is for the Contractor's convenience and does not relieve the Contractor from laying and jointing different or additional items where required.

1.03 CASH ALLOWANCES

A. The Contractor shall include in the Total Bid Amount, all cash allowances stated in the Contract Documents and listed in the Bid Form. Items covered by these allowances shall be supplied for such amounts and by such persons as the Owner may direct.

B. The Contractor will obtain the Owner's written acceptance before providing equipment, materials or other Work under a cash allowance. Payments under a cash allowance will be made based on actual costs, excluding costs of general conditions, handling, unloading, storage, installation, etc., which will be considered to be included within the Contract Price. Payments within the limits of any allowance will exclude overhead and profit and bond and insurance premiums, since those costs will be considered to be included within the Contract Amount. The Contractor shall submit appropriate documentation to validate the actual cost of the item.

C. The amount of the allowance shall be adjusted accordingly by Change Order to recognize the allowable cost incurred by the Contractor.

1.04 WORK NOT PAID FOR SEPARATELY

A. Delivery: Payment for equipment delivery, storage or freight shall be included in the pay items including their installation and no other separate payment will be made therefore.

B. Bonds: Payment for bonds required by the Contract shall be included in the pay items for the Work covered by the required bonds and no separate payment will be made.

C. Preparation of Site: Unless otherwise noted, payment for preparation of site shall be included in pay items proposed for the various items of Work and no separate payment will be made therefore. Preparation of site includes setting up construction plant, offices, shops, storage areas, sanitary and other facilities required by the specifications or state law or regulations; providing access to the site; obtaining necessary permits and licenses; payments of fees; general protection, temporary heat and utilities including electrical power, water and sewer; providing shop and working drawings, certificates and schedules; providing required insurance; pre-construction and construction progress photographs and videos; demolition, site clearing, clearing and grubbing; trench excavation, sheeting, shoring and bracing; dewatering and disposal of surplus water, backfill, compaction and grading; testing materials and apparatus; maintenance of drainage systems; appurtenant work; and close-out documentation; cleaning up; and all other work regardless of its nature which may not be specifically referred to in a Bid Item but is necessary for the complete construction of the project set forth by the Contract.

D. Permitting & Permit Fees. Section 01065: Permits and Fees identifies all permits which the Owner has obtained or submitted applications for. All other permits and fees necessary for the project are the responsibility of the Contractor, shall be included in the pay items for the Work requiring the permits, and will not be paid for separately. Any fees associated with the CSX Railroad Encroachment Agreement and work within CSX right-of-way will be paid for by the Owner.

E. The Owner reserves the right to delete any item included in the Bid Form/Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

F. As-Built Documents and Drawings. Special Conditions identifies the requirements of as-built record documents. This work is considered incidental to the project and no separate payment will be made; cost of as-built documents and drawings shall be included in other relevant project pay items.

1.05 MEASUREMENT FOR PAYMENT

A. Methods of Measurement - Generally:

1. Units of measurement shall be defined in general terms as follows:
   a. Linear Feet (LF)
   b. Square Feet (SF)
   c. Square Yards (SY)
   d. Cubic Yards (CY)
   e. Each (EA)
   f. Lump Sum (LS)

2. Unit Price Items:

   a. Linear Feet (LF) shall be measured along the horizontal length of the centerline of the installed material, unless otherwise specified. Pipe shall be measured along the length of the completed pipeline, regardless of the type of joint required, without deduction for the length of valves or fittings. Pipe included within the limits of lump sum items will not be measured.

   b. Square Feet (SF), Square Yards (SY), Cubic Yards (CY), and Each (EA) shall be measured as the amount of the unit of measure installed and accepted as complete within the limits specified and shown in the Specifications and Drawings. Slope angles and elevations shall be measured using land-surveying equipment. Contractor shall provide supporting documentation (i.e. drawings, delivery tickets, invoices, survey calculations, etc.) to verify actual installed quantities.

3. Lump Sum Items:

   a. Payment will be made for each individual lump sum item on a percentage of completion basis as estimated by the Contractor and approved by the Owner.

4. Adjustments to costs provided in the accepted Schedule of Values may be made only by Change Order.

5. The Owner reserves the right to delete any item included in the Bid Form/Schedule of Values and decrease the Contract Price by the scheduled amount for the item deleted.

1.06 PAYMENT ITEMS

A. Mobilization and Demobilization

1. Measurement: Measurement of various items for Mobilization and Demobilization shall not be made for payment and all items shall be included in the lump sum price. This lump sum price shall not exceed 5% of the total of all bid items.

2. Payment: Payment of 75 percent of the applicable lump sum price for the item shall be full compensation for the Work consisting of the preparatory Work and operations in mobilizing for beginning Work on the Contract, including, but not limited to, movement of those personnel, equipment, supplies and incidentals to the project site, preparation of submittals, and for the establishment of temporary offices and buildings, safety equipment and first aid supplies, project signs, field surveys, sanitary and other facilities required by these specifications, and State and local laws and regulations. The costs of General Requirements, bonds, permits, and any required insurance, and any other preconstruction expense necessary for the start of the Work, excluding the cost of construction materials, shall also be included. This Work also consist of the general project management of the Work including, but not limited to, field supervision and office management,

as well as other incidental cost for management of the Work during the duration of the Contract. This Work also includes maintenance of the field office for the duration of the Contract.

3. Payment of the remaining 25 percent of the applicable lump sum price for this item shall be full compensation for the Work consisting of demobilization or the operations normally involved in ending Work on the project including, but not limited to, termination and removal of temporary utility service and field offices; demolition and removal of temporary structures and facilities; restoration of Contractor storage areas; disposal of trash and rubbish, removal of equipment from the site, and any other post-construction work necessary for the proper conclusion of the Work.

B. Maintenance of Traffic

1. Measurement: Measurement shall be based on satisfactory Control and Maintenance of Traffic in accordance with the Construction Drawings, Glynn County requirements and associated permit requirements.

2. Payment: Payment of the applicable Contract lump sum price will be full compensation for furnishing all labor, materials, and equipment necessary to maintain public roadway and pedestrian/bicycle traffic including flag men, uniformed police officers, barricades, warning lights/flashers, lighted sign boards, portable variable message boards, signs, and orange safety fencing. Also included is furnishing, installing, maintaining, and removal of a Traffic Control Plan, control and safety devices, control of dust, temporary crossing structures over trenches, any necessary detour facilities, and other special requirements for the safe and expeditious movements of traffic, including vehicular, bicycle, and pedestrian. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the Owner.

C. Erosion, Sedimentation and Pollution Control

1. Measurement: Measurement shall be based on satisfactory Erosion, Sedimentation and Pollution Control in accordance with the Construction Drawings, Contract Documents and all Federal, State and local requirements and associated permit requirements.

2. Payment: Payment of the applicable Contract lump sum price will be full compensation for furnishing all labor, materials, and equipment to control and prevent erosion and sediment transportation from the Work area to adjacent properties and waterways, including installation, maintenance, monitoring and water quality sampling and testing, inspection and reporting, and removal of temporary erosion, sedimentation and pollution controls. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the Owner.

D. Pressure Piping (Forcemain; Water Main) – (Varies by Size and Material; by Horizontal Directional Drill)

1. Measurement: Pressure Piping (Forcemain; Water Main) – Horizontal Directional Drill installation shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the

centerline of the completed directionally drilled pressure piping in accordance with the Construction Drawings and Contract Documents. The Contractor shall include in the Contract unit price its allowance for horizontal deflection, vertical deflection, and all wastage.

2. Payment: Payment will be made at the Contract unit price per linear foot for Pressure Piping (Forcemain; Water Main) – Horizontal Directional Drill. Payment shall be full compensation for all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, clearing, filling/leveling and stabilizing drill rig site and work areas, removal or relocation of items within the work area as noted on Construction Drawings including but not limited to signs, guardrails, fencing, etc., necessary temporary sewer bypassing operations, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, project planning, submittals, and calculations, horizontal directional drilling and related systems, mud recycling, entry/back reaming pits, laying and fusing/joining pipe, locate wire system, testing, swabbing, flushing, disinfection, cutting back and removing excess pipe installed by directional drill, clean-up, proper disposal of all remaining drilling mud, other fluids, and solids, and bore logs and reports. This item also includes all necessary restraining devices; identification markers; and all necessary adapters, stiffeners, and fittings not specifically called out in other line items. Any temporary water service lines the Contractor installs to provide water for the Horizontal Directional Drill operations shall be included in this item and shall include cost of piping, installation and abandonment. Contractor shall be responsible for removal, clean-up, and disposal of drill fluid breakouts.

E. Pressure Piping (Forcemain; Water Main) (Varies by Size and Material, by Open Cut)

1. Measurement: Pressure Piping (Forcemain; Water Main) – Open Cut installation regardless of size shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed open cut pressure piping in accordance with the Construction Drawings and Contract Documents, regardless of the type of joint required, without deduction for the length of valves and fittings. Pipe included within the limits of lump sum pay items will not be measured for payment under this item. Piping installed by horizontal directional drill has a separate description.

2. Payment: Payment will be made at the Contract unit price per linear foot for Pressure Piping (Forcemain; Water Main) – Open Cut. Payment shall be full compensation for all labor, materials, and equipment to construct the respective pipeline including coordination with existing utilities, protection of existing utilities including service connections, tree protection, clearing, filling/leveling and stabilizing work areas, removal or relocation of items within the work area as noted on Construction Drawings including but not limited to signs, guardrails, fencing, etc., necessary temporary sewer bypassing operations, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, joining piping, all testing, flushing, disinfection, and clean-up. This item also includes all necessary restraining devices (except for within any jack-and-bore installations), locate wire system, detection tape, and

identification markers. Carrier pipe within any jack-and-bore installations is included in this Pressure Piping (Forcemain/Water Main) pay item; any required casing spacers or joint restraints are included in the Steel Casing Pipe by Jack-and-Bore pay item.

G. Steel Casing Pipe by Jack-and-Bore (Forcemain)

1. Measurement: Steel Casing Pipe by Jack-and-Bore (Forcemain) installation shall be measured in actual linear feet satisfactorily furnished and installed, as measured along the length of the centerline of the completed casing piping in accordance with the Construction Drawings and Contract Documents. Carrier Piping to be installed within the casing pipe will be measured for payment under the Pressure Piping (Forcemain; Water Main) (Varies by Size and Material, by Open Cut) pay item.

2. Payment: Payment will be made at the Contract unit price per linear foot for Steel Casing Pipe by Jack-and-Bore (Forcemain). Payment shall be full compensation for all labor, materials, and equipment to construct the respective pipeline system including coordination with existing utilities, protection of existing utilities including service connections, tree protection, clearing, filling/leveling and stabilizing work areas, removal or relocation of items within the work area as noted on Construction Drawings including but not limited to signs, guardrails, fencing, etc., necessary temporary sewer bypassing operations, excavation, sheeting, shoring and bracing, dewatering, groundwater treatment and disposal, backfill, compaction, and grading, all testing, flushing, and clean-up. This item shall also include casing spacers, pipe joint restraints and total restraining system on carrier pipe, end seals, locate wire system, and identification markers. Carrier pipe within any jack-and-bore installations is included in the Pressure Piping (Forcemain/Water Main) pay item.

H. Fittings and Piping Accessories (Varies by Material, Type, Size)

1. Measurement: Fittings and Piping Accessories installation regardless of material, type, and size shall be measured by the actual number satisfactorily furnished and installed in accordance with the Contract Drawings and Contract Documents.

2. Payment: Payment will be made at the Contract unit price for each Fitting or Piping Accessory of each material, type, and size. Payment shall be full compensation for all labor, materials, and equipment to furnish and install Fittings and Piping Accessories, including any necessary mechanical restraints, tie rods, or supports, with all required excavation, backfill, and compaction, and all necessary incidentals required to complete, disinfect, and test the work.

H. Valves (Varies by Type and Size)

1. Measurement: Valves regardless of type and size shall be measured by the actual number satisfactorily furnished and installed in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment will be made at the Contract unit price for each Valve of each type and size. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install the Valve with

noted operator, complete, with all required excavation and backfill, necessary jointing, adapter/extension pieces, supports (if applicable), mechanical restraints at valve, nuts, bolts, socket clamps, sleeves; valve box and cover, valve tags, electronic ball markers; valve box extension (if applicable); debris shield; flushing; testing; and all incidental and related work required to complete, disinfect, and test the Valve. Air Release Valves shall have separate descriptions.

I. Air Release Valve Assembly in Pedestal

1. Measurement: Air Release Valve Assembly in Pedestal installation shall be measured by the actual number satisfactorily furnished and installed in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment will be made at the Contract unit price for each Air Release Valve Assembly in Pedestal. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install the Air Release Valve Assembly in Pedestal including all excavation, backfill, and compaction; drilling installation of tubing, tapping or cutting pipelines; all piping, fittings and valves between air release valve and main, saddle, sleeve or tee fitting in main; pedestal box and support; and all incidental and related work to complete the Air Release Valve Assembly in Pedestal.

J. Fire Hydrant Assembly

1. Measurement: Fire Hydrant Assembly installation shall be measured by the actual number satisfactorily furnished and installed in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment for the work will be made at the Contract Unit Price for each Fire Hydrant Assembly. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install Fire Hydrant Assembly including hydrant, hydrant lateral pipe, fittings and valve, complete, including all required excavation and backfill; furnishing and installing the hydrant assembly components (regardless of “bury depth”) and hydrant extension (if required); restraint rods; blue pavement reflector (if required); all nuts, bolts, glands, and socket clamps; construction of the hydrant sump including selected stone fill; performing hydrostatic and leakage testing; and all incidental and related work required to complete the Fire Hydrant Assembly. Separate payment will be made for tee on main.

K. LineStop

1. Measurement: LineStop installation and operation shall be measured by the actual number of each LineStops satisfactorily installed in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment for the work will be made at the Contract Lump Sum Price for each LineStop. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install and maintain LineStop in place (including daily charge) as necessary to complete related construction including but not limited to plugging of the existing main utilizing the“line stop” method; furnish and install fabricated steel line stop

fittings; epoxy coated, w/304 SS nuts and bolts; closure completion plugs (sized as required); 150 lb blind flange (sized as required) w/304 SS nuts and bolts; 2-inch equalization/purge fittings; subsequent removal and disposal of line stop; excavation; concrete work (support for line stop fittings); concrete thrust collar; restrained joint plug and tie rods as required; lifting and rigging equipment; dewatering; backfill; furnishing and placing steel decking over excavations (as necessary); all sheeting, shoring, and bracing required to maintain excavations in a safe condition; flushing, protecting existing structures, utilities and property both public and private; cleaning up the site; and all incidental and related work to complete the LineStop installation and operation.

L. Tie-In to Existing Main (Varies by Size, Type, Material and Location)

1. Measurement: Tie-In to Existing Main (Varies by Size, Type, Material, and Location) shall be measured by satisfactory installation of the tie-in complete and operational in accordance with the Construction Drawings and Contract Documents.

2. Payment: Payment of the Tie-In to Existing Main (Varies by Size, Type, Material and Location) will be made at the Contract unit price which shall be full compensation for furnishing all labor, materials, and equipment to identify the location of the existing main piping; excavation, backfilling, and compacting; sheeting, shoring and bracing, protection of surrounding structures and piping; necessary temporary sewer bypassing operations, cutting of existing main; tie-in of proposed and existing mains including any piping accessories or incidentals not otherwise identified on Construction Drawings; dewatering; testing; disinfection; cleanup; and related work to complete the installation. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the Owner. LineStops and Fittings associated with Tie-In to Existing Mains are provided under separate pay items.

M. Temporary Sample Tap

1. Measurement: Temporary Sample Tap installation shall be measured by the actual number of each Temporary Sample Tap satisfactorily installed and removed in accordance with the requirements of the Contract Documents.

2. Payment: Payment for the work will be made at the Contract Unit Price for each Temporary Sample Tap. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install and remove Temporary Sample Tap including all necessary piping; service saddle; corporation stop; plug; bushings; bends; tees; smooth hose, hose bib; gate valve, and all incidental and related work required to complete the installation and removal of the Temporary Sample Tap.

N. Single Water Service and Meter Box (Varies by size)

1. Measurement: Single Water Service and Meter Box (Varies by size) installation shall be measured by the actual number of each Single Water Service and Meter Box installed and completed in accordance with the requirements of the Construction Drawings and Contract Documents.

2. Payment: Payment for Single Water Service and Meter Box will be made at the Contract Unit Price for each. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install each size of Single Water Service and Meter Box including the service piping, connection to water main and plugging the new service termination in meter box, corporation stop, curb stop, all required fittings, meter box, locate wiring, boring (if required), flushing and disinfection, excavation, dewatering, backfill and compaction, all sheeting, shoring and bracing required to maintain excavations in a safe condition, protecting existing structures and utilities – both public and private, cleaning up the site, and all other items required to complete the installation.

O. Concrete Manhole with Protective Coating (Diameter and Depth)

1. Measurement: Measurement of Concrete Manhole with Protective Coating shall be measured by the complete and satisfactory installation of each Concrete Manhole with Protective Coating in accordance with the Construction Drawings and Contract Documents. The depth of the manhole will be measured vertically from the top of the manhole frame to the invert at the center of the manhole bottom.

2. Payment: Payment for the work will be made at the Contract Lump Sum Price for each Concrete Manhole with Protective Coating by diameter and depth. Payment shall be full compensation for all labor, materials, and equipment necessary to furnish and install the manhole and protective coating, manhole frame, cover, pipe connections and boots, and inside or outside drops including all required excavation; dewatering; backfilling; all sheeting, shoring and bracing required to maintain excavation in a safe condition; necessary temporary sewer bypassing operations; protecting existing structures, utilities and property; cleaning up the site; testing; and all incidental and related work to complete the Concrete Manhole and Protective Coating installation and operation. Payment will also include the required 10-year warranty on the materials and labor associated with the protective coating. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the Owner.

P. Removal and Replacement of Gravity Sewer Piping (Varies by Size, Dept, Material)

1. Measurement: Measurement for Removal and Replacement of Gravity Sewer Piping shall be measured in actual linear feet of pipe satisfactorily removed and replaced, as measured along the length of the centerline of the piping from the inside face of upstream structure or connection to inside face of downstream structure or connection, in accordance with the Construction Drawings and Contract Documents. The depth of cut of gravity sewer piping will be measured from existing grade elevations along the center line of the pipe, taken on 50-foot stations, down to the gravity sewer pipe invert elevation.

2. Payment: Payment will be made at the Contract Unit price per linear foot by size, type, and depth of existing gravity sewer pipe removed and new gravity sewer pipe installed. Payment shall be full compensation for all labor, materials, and equipment necessary for excavation; backfilling and compaction; dewatering; sheeting and shoring driven and pulled and drag

shields for trenches of all depths; necessary temporary sewer bypassing operations, removing existing gravity sewer piping, laying, jointing and testing the new gravity sewer pipe and connection to existing gravity sewer piping; removal and disposal of the existing wastewater pipe; stoppers for all ends of pipe and fittings (as necessary); transition couplings; and all incidental and related work to complete the gravity sewer pipe removal and replacement.

Q. Restoration (Varies by Location)

1. Measurement: Measurement for Restoration shall be based on satisfactory restoration of all areas disturbed by construction activities in accordance with the Owner's requirements, Construction Drawings, and Contract Documents.

2. Payment: Payment of Restoration shall be made at the Contract lump sum price. Payment shall be full compensation for furnishing all labor, materials, and equipment to restore the areas disturbed by construction to equal or better than pre-construction condition. Areas covered by this pay item are highly established and landscaped. Satisfactory restoration of these areas includes restoration of all concrete curb and gutter, pavement restoration (roadway and driveway), pavement milling and resurfacing (roadway and driveway), pavement markers and paint striping, ditches and swales, stormwater infrastructure, landscaping, mailboxes, trees, fences, signs, guardrails, concrete trail (Harry Driggers Blvd) and other concrete sidewalk, lawn/grass and right-of-way areas with sod or seed as required per Erosion Control Drawings, mulch/straw, foundations, irrigation systems, and other structures and items disturbed by construction, complete, tested and accepted by Owner and Glynn County. Quantities of curb and gutter and pavement removal and restoration, and asphalt milling and resurfacing are estimated quantities necessary for construction or required by Glynn County; contractor shall restore any additional curb and gutter or pavement disturbed beyond these limits at no additional cost to Owner. Payment will be made based on a percentage of completion basis as estimated by the Contractor and approved by the project Owner and Glynn County.

R. Tree Removal (In Easement Area near Old Jesup Road and Brunswick Altamaha Canal)

1. Measurement: Tree Removal (In Easement Area near Old Jesup Road and Brunswick Altamaha Canal) shall be measured for the complete and satisfactory removal of each noted tree as identified on the Construction Drawings and in accordance with the Contract Documents, and Glynn County Tree Advisory Board requirements.

2. Payment: Payment of Tree Removal (In Easement Area near Old Jesup Road and Brunswick Altamaha Canal) shall be made at the Contract Unit Price for each which shall be full compensation for furnishing all labor, materials, and equipment to remove and properly dispose of each tree and grind the stump as identified on the Construction Drawings in accordance with Glynn County Tree Advisory Board guidelines. Only the noted trees are included, any other tree removal or clearing operations shall be included as

part of the pay item to which it is related.

S. Disposal and Replacement (with A-3 Sand) of Unsuitable Soils

1. Measurement: Disposal and Replacement (with A-3 Sand) of Unsuitable Soils shall be measured in actual cubic yards of unsuitable soil material to be disposed of and replaced in accordance with the Contract Documents.

2. Payment: Payment for Disposal and Replacement (with A-3 Sand) of Unsuitable Soils shall be made at the Contract unit price per cubic yard and shall constitute full payment for all labor, materials, equipment, and transportation to remove from the job site and dispose of all unsuitable material and furnish, place and compact suitable backfill as specified in the Contract Documents. The cost of excavation of unsuitable backfill and dewatering shall be included with the cost of the related piping or structure installation.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

INDEX TO

SECTION 01065 – PERMITS AND FEES

SECTION 01065

PERMITS AND FEES

PART 1 - GENERAL

A. The Contractor shall obtain and pay for all permits and licenses related to his work, as relevant to the project, at no additional cost to Owner. Permits which Owner is acquiring are listed in this Section. All other permits are the responsibility of the Contractor and the Contractor is responsible for all associated permit fees. It is noted that permit fees associated with the CSX Railroad Encroachment Agreement which the Owner is acquiring will be paid by the Owner.

B. Permits by Owner: The Owner prior to the advertisement of the project has applied for permits with the following agencies:

Georgia Environmental Protection Division (GA EPD)

Georgia Department of Natural Resources (GA DNR)

Glynn County Engineering

Glynn County Tree Advisory Board

Georgia Soil and Water Conservation Commission (GSWCC)

CSX Transportation

Georgia Power

(Refer to Table 01065A for permit information.)

TABLE 01065A
PERMIT INFORMATION

The following permits have been obtained or are anticipated to be obtained by the Owner prior to construction:

Permit	Permit No.	Issue Date
Georgia Environmental Protection Division NPDES Permit – Wastewater PS and Forcemain (Not selected for review by EPD)	EPD#2019-200	12-16-2019
Georgia Environmental Protection Division Drinking Water Project	N/A (WSID#1270000)	1-22-2020
Georgia Environmental Protection Division Infrastructure Construction General Permit	NPDES Permit GAR 100002	Pending

Georgia Environmental Protection Division Notice of Intent to Discharge Storm Water Associated with Construction Activity (will be transferred to Contractor)	GAR248C3C-V1	12-17-2019
Glynn County Land Disturbing Activity Permit	Pending	Pending
Georgia Department of Natural Resources Coastal Resources Division Revocable License	Pending	Pending
Glynn County Tree Advisory Board	Pending	Pending Written Approval
CSX Utility Encroachment Permit	CSX898886 / 1033416	Pending
Georgia Power Encroachment Agreement	Pending	Pending

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

INDEX TO

SECTION 01380 – CONSTRUCTION PHOTOGRAPHS AND VIDEO

SECTION 01380

CONSTRUCTION PHOTOGRAPHS AND VIDEO

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this Section.

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for the following:

1. Pre-construction photographs.
2. Periodic construction photographs.
3. Final Completion construction photographs.
4. Pre-construction videotapes.
5. Periodic construction videotapes.
6. Time-lapse sequence construction videotapes.

B. Related Sections include the following:

1. JWSC Standards for Water and Sewer Design and Construction.

2. Measurement and Payment: Section 01025.

3. Submittals: Special Conditions.

4. Project Closeout: Section 01700.

1.3 ALLOWANCE

A. Costs: Costs for photographs and video services shall be included in Contractor's bid price for the project. No additional payment will be made for these services.

1.4 SUBMITTALS

A. Construction Photographs: Digital or Print may be submitted in accordance with the following requirements:

1. Print Photographs:
   a. Format: 4- by 6-inch minimum smooth-surface matte prints on single-weight commercial-grade photographic paper mounted on linen or card stock to allow a 1-inch-wide margin and enclosed back to back in clear plastic sleeves that are punched for standard 3-ring binder.
2. Digital Images: Submit a complete set of digital image electronic files as a Project Record Document on CD-ROM. Identify electronic media with date

photographs were taken. Submit images that have same aspect ratio as the sensor, uncropped.

3. Identification: With all photographs provide the following information either on the back of prints or as an electronic Word or PDF document corresponding to each digital image file name.

   a. Name of Project.
   b. Name of Contractor.
   c. Date photograph was taken if not date stamped by camera.
   d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   e. Unique sequential identifier.

B. Video: Submit two (2) copies of each video on CD or DVD with protective sleeve or case within seven days of recording.

1. Identification: On each copy, provide an applied label with the following information:

   a. Name of Project.
   b. Name of Contractor.
   c. Date video was recorded.
   d. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
   e. Weather conditions at time of recording.

2. Transcript: Provide two (2) copies, prepared on 8-1/2-by-11-inch (215-by-280-mm) paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as corresponding videotape. Include name of Project and date of videotape on each page. Electronic Word or PDF document corresponding to the video file transcript can be provided in lieu of paper/binder copies.

1.5 COORDINATION

A. Auxiliary Services: Cooperate with photographer and provide auxiliary services requested, including access to Project site and use of temporary facilities, including temporary lighting required to produce clear, well-lit photographs and video without obscuring shadows.

1.6 USAGE RIGHTS

A. Obtain and transfer copyright usage rights from photographer to Owner for unlimited reproduction of photographic documentation.

1.7 EXTRA PRINTS

A. If requested by Owner/Engineer, photographer shall prepare extra prints of photographs. Photographer shall distribute these prints directly to designated parties who will pay the costs for extra prints.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 CONSTRUCTION PHOTOGRAPHS

A. Photographer: Engage a qualified commercial photographer to take construction photographs.

B. General: Take photographs using the maximum range of depth of field, and that are in focus, to clearly show the Work. Photographs with blurry or out-of-focus areas will not be accepted.

1. Maintain key plan with each set of construction photographs that identifies each photographic location.

C. Film Images:

1. Date Stamp: Unless otherwise indicated, date and time stamp each photograph as it is being taken such that stamp is integral to photograph.
2. Field Office Prints: Retain one set of prints of progress photographs in the field office at Project site, available at all times for reference. Identify photographs same as for those submitted to Owner/Engineer.

D. Digital Images: Submit digital images exactly as originally recorded in the digital camera, without alteration, manipulation, editing, or modifications using image-editing software.

1. Date and Time: Include date and time in filename for each image.
2. Field Office Images: Maintain one set of images on CD-ROM or DVD in the field office at Project site, available at all times for reference. Identify images same as for those submitted to Owner/Engineer.

E. Preconstruction Photographs: Before commencement of clearing, excavation, demolition, or starting construction, take color/digital photographs of Project site, route, and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Owner/Engineer. Contractor shall maintain a copy of the pre-construction photographs for a period of two (2) years following the completion of the project. Pre-construction photographs shall be reviewed and approved by JWSC and Engineer prior to disturbing project site.

1. Flag excavation areas, construction limits before taking construction photographs.
2. Take photographs to show existing conditions adjacent to project site and right-of-way before starting the Work. Give particular attention to existing landscaping, trees, driveways, fences, and other such structures.
3. Take photographs of existing buildings either on or adjoining project site or right-of-way to accurately record physical conditions at start of construction.
4. Take additional photographs as required to record settlement or cracking of adjacent structures, pavements, and improvements.

F. Periodic Construction Photographs: Take photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment. Select vantage points to show status of construction and progress since last photographs were taken.

G. Engineer-Directed Construction Photographs: From time to time, Engineer will instruct photographer about number and frequency of color/digital photographs and general directions on vantage points. Select actual vantage points and take photographs to show the status of construction and progress since last photographs were taken.

H. Time-Lapse Sequence Construction Photographs: Take as indicated, to show status of construction and progress since last photographs were taken.

1. Frequency: Take photographs weekly, with timing each month adjusted to coincide with the cutoff date associated with each Application for Payment.

I. Final Completion Construction Photographs: Take color photographs after date of Substantial Completion for submission as Project Record Documents. Owner/Engineer will direct photographer for desired vantage points.

1. Do not include date stamp.

3.2 CONSTRUCTION VIDEO

A. Video Photographer: Engage a qualified commercial videographer to record construction videos.

B. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of construction. Display continuous running time and date. At start of each video recording, record weather conditions from local newspaper or television and the actual temperature reading at Project site.

C. Narration: Describe scenes on video by audio narration by microphone or by dubbing audio narration off-site after video is recorded. Include description of items being viewed, recent events, and planned activities. At each change in location, describe vantage point, location, direction (by compass point), and elevation or story of construction.

1. Confirm date and time at beginning and end of recording.
2. Begin each video with name of Project, Contractor's name, videographer's name, and Project location.

D. Transcript: Provide a typewritten transcript of the narration. Display images and running time captured from video opposite the corresponding narration segment.

E. Preconstruction Video: Before commencement of clearing, excavation, demolition, or starting construction, record video of Project site, route, and surrounding properties, including existing items to remain during construction, from different vantage points, as directed by Owner/Engineer. Contractor shall maintain a copy of the pre-construction video for a period of two (2) years following the completion of the project. Pre-construction videos shall be reviewed and approved by JWSC and Engineer prior to disturbing project site.

1. Flag excavation areas and construction limits before recording construction videotapes.
2. Record video to show existing conditions adjacent to project site and right-of-way before starting the Work. Give particular attention to existing landscaping, trees, driveways, fences, and other such structures.
3. Show existing buildings either on or adjoining project site or right-of-way to accurately record physical conditions at the start of construction.
4. Show protection efforts by Contractor.

END OF SECTION

INDEX TO

SECTION 01700 – PROJECT CLOSEOUT

SECTION 01700

PROJECT CLOSEOUT

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this Section.

1.2 SUMMARY

A. Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:

1. Substantial Completion procedures.
2. Final Completion procedures.
3. Warranties.
4. Final cleaning.

B. Related Sections:

1. Project Record Documents: Special Conditions.

2. Construction Photographs and Video: Section 01380.

3. Operation and Maintenance Data: Section 01730.

4. JWSC Standards for Water and Sewer Design and Construction and other Sections of Specifications for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBSTANTIAL COMPLETION

A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete with request.

1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
2. Advise Owner of pending insurance changeover requirements.
3. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include operating certificates, and similar releases.
4. Prepare and submit Project Record Documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.

5. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
6. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
7. Complete startup testing of systems.
8. Submit test/adjust/balance records.
9. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
10. Advise Owner of changeover in heat and other utilities.
11. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
12. Complete final cleaning requirements, including touchup painting.
13. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

B. Inspection: Submit a written request for inspection for Substantial Completion. On receipt of request, JWSC/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. JWSC/Engineer will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by JWSC/Engineer, that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.
2. Results of completed inspection will form the basis of requirements for final completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining Final Completion status, complete the following:

1. Submit a final Application for Payment according to Contract Requirements.
2. Submit certified copy of JWSC/Engineer's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by JWSC/Engineer. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
4. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
5. Submit consent of surety to final payment.
6. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.

B. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, JWSC/Engineer will either proceed with inspection or notify Contractor of unfulfilled requirements. JWSC/Engineer will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.

1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

A. Organization of List: Include name and identification of incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.

1. Organize list of spaces in sequential order
2. Organize items applying to each space by major element.
3. Include the following information at the top of each page:

    a. Project name.
    b. Date.
    c. Name of Engineer.
    d. Name of Contractor.
    e. Page number.

4. Submit list of incomplete items in one of the following formats:

    a. PDF electronic file.
    b. Three (3) paper copies of punch list, unless otherwise indicated. JWSC/Engineer will return one (1) copy.

1.6 WARRANTIES

A. Submittal Time: Unless otherwise requested, submit warranty documentation prior to request for Final Completion inspection. Submit written warranties on request of Engineer for designated portions of the Work where commencement of warranties other than date of Final Completion is indicated. Upon completion of successful final inspection, submit an original Letter of Warranty to the JWSC, signed by an authorized Officer of the Contracting company, on the Contractor's letterhead, guaranteeing workmanship, materials, and equipment for a period of 12 months from the date of the letter. Letter shall be dated within five (5) days following the successful final inspection.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Specifications.

1. Bind warranties and bonds in heavy-duty, three-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.
4. Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide table of contents at beginning of document.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.

D. WARRANTY REQUIREMENTS

1. When correcting warranted Work that has failed, remove and replace other Work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted Work.
2. When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
3. Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
4. Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.
5. The Owner reserves the right to reject warranties and to limit selections to products with warranties not in conflict with requirements of the Contract Documents.
6. The Owner reserves the right to refuse to accept Work for the Project where a special warranty, certification, or similar commitment is required on such Work or part of the Work, until evidence is presented that entities required to countersign such commitments are willing to do so.
7. When a special warranty is required to be executed by the Contractor, or the Contractor and a subcontractor, supplier or manufacturer, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner for approval prior to final execution.
8. Provide written certifications of compliance and other commitments and agreements for continuing services in a form which includes all pertinent information including:
    a. Quantities and dates of shipments.
    b. Attestment that materials incorporated into the Work comply with specified requirements. Certification shall not be construed as relieving the Contractor from furnishing satisfactory materials, if the material is later found to not meet specified requirements.
    c. Signature of officer of company.
    d. Laboratory test reports submitted with certificates of compliance shall show dates of testing, specification requirements under which testing was performed, and results of tests.
    e. Refer to Special Conditions and individual Specification Sections for specific content requirements, and particular requirements for submittal of special warranties.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Perform final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal, State, and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

2. Complete the following cleaning operations before requesting inspection for certification of Substantial Completion for entire Project or for a portion of Project:

    a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
    b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
    c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
    d. Remove tools, construction equipment, machinery, and surplus material from Project site.
    e. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
    f. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
    g. Sweep concrete floors broom clean in unoccupied spaces.
    h. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
    i. Clean transparent materials, including glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish glass, taking care not to scratch surfaces.
    j. Remove labels that are not permanent.
    k. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.

        1) Do not paint over "UL" and other required labels and identification, including mechanical and electrical nameplates.

l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.

m. Replace parts subject to operating conditions during construction that may impede operation or reduce longevity.

n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

p. Clean ducts, blowers, and coils if units were operated without filters during construction or that display contamination with particulate matter upon inspection.

1) Clean HVAC system in compliance with NADCA's ACR Standard, latest version. Provide written report upon completion of cleaning.

q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

r. Leave Project clean and ready for occupancy.

C. Construction Waste Disposal: Do not burn waste materials. Do not bury debris or excess materials on the Owner's property. Do not discharge volatile, harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

END OF SECTION

INDEX TO

SECTION 01730 – OPERATION AND MAINTENANCE

SECTION 01730

OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under Contract.

a. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent Sections of Specifications.

2. Instruct Owner's personnel in maintenance of products and in operation of equipment and systems.

B. Related Requirements Described Elsewhere:

1. Special Conditions

2. 01730: Project Closeout

3. Requirements as listed in various specification sections and in JWSC Standards for Water and Sewer Design and Construction.

1.02 QUALITY ASSURANCE

A. Preparation of data shall be done by personnel:

1. Trained and experienced in maintenance and operation of described products.

2. Familiar with requirements of the relevant Specification Sections.

3. Skilled as technical writer to the extent required to communicate essential data.

4. Skilled as draftsman competent to prepare required drawings.

1.03 FORM OF SUBMITTALS

A. Prepare data in form of an instructional manual for use by Owner's personnel.

B. Format: Hard Copy Manuals

1. Size: 8-1/2 inches by 11 inches.

2. Paper: 20-pound minimum, white, for typed pages.

3. Test: Manufacturer's printed data, or neatly typewritten.

4. Drawings:

   a. Provide reinforced punched binder tab, bind in with text.

   b. Reduce larger drawings and fold to size of text pages but not larger than 14 inches by 17 inches.

5. Provide fly-leaf for each separate product, or each piece of operating equipment.

   a. Provide typed description of products and major component parts of equipment.

   b. Provide identified tabs.

6. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:

   a. Title of Project.

   b. Identity of separate structure as applicable.

   c. Identity of general subject matter covered in the manual.

7. Binders:

   a. Commercial quality three-post binders with durable and cleanable plastic covers.

   b. Maximum post width: 2 inches.

   c. When multiple binders are used, correlate the data into related consistent groupings.

C. Format: Electronic Copy Manuals

1. All materials identified in 1.03 B. above shall also be provided in Adobe Acrobat© Portable Document Format (PDF) on CD, DVD, or USB Flash Drive.

1.04 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in systematic order.

1. Contractor, name of responsible principal, address and telephone number.

2. A list of each product required to be included, indexed to content of the volume.

3. List, with each product, the name, address and telephone number of:

   a. Subcontractor or installer.

   b. A list of each product required to be included, indexed to content of the volume.

   c. Identify area of responsibility of each.

   d. Local source of supply for parts and replacement.

4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

1. Include only those sheets which are pertinent to the specific product.

2. Annotate each sheet to:

   a. Clearly identify specific product or part installed.

   b. Clearly identify data applicable to installation.

   c. Delete references to inapplicable information

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate:

   a. Relations of component parts of equipment and systems.

   b. Control and flow diagrams.

2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.

3. Do not use Project Record Documents as maintenance drawings.

D. Written text, as required to supplement product data for the particular installation:

1. Organize in consistent format under separate headings for different procedures.

2. Provide logical sequence of instructions of each procedure.

E. Copy of each warranty, bond and service contract issued.

1. Provide information sheet for Owner's personnel, give:

   a. Proper procedures in event of failure.

b. Instances which might affect validity of warranties or bonds.

1.05 MANUAL FOR MATERIALS AND FINISHES

A. Submit four (4) copies of complete manual in final form.

B. Content: for architectural products, applied materials and finishes:

1. Manufacturer's data, giving full information on products.

a. Catalog number, size, composition.

b. Color and texture designations.

c. Information required for reordering special manufacturing products.

2. Instructions for care and maintenance.

a. Manufacturer's recommendation for types of cleaning agents and methods.

b. Cautions against cleaning agents and methods which are detrimental to product.

c. Recommended schedule for cleaning and maintenance.

C. Content, for moisture protection on weather-exposed products:

1. Manufacturer's data, giving full information on products.

a. Applicable standards.

b. Chemical composition.

c. Details of installation.

2. Instructions for inspection, maintenance and repair.

D. Additional requirements for maintenance data: Refer to respective sections of Specifications and JWSC Standards for Water and Sewer Design and Construction.

1.06 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit four (4) copies of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.

a. Function, normal operating characteristics, and limiting conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of replaceable parts.

2. Operating procedures:

a. Start-up, break-in, routine and normal operating instructions.

b. Regulation, control, stopping, shut-down and emergency instructions.

c. Summer and winter operating instructions.

d. Special operating instructions.

3. Maintenance procedures:

a. Routine operations.

b. Guide to "trouble-shooting".

c. Disassembly, repair and reassembly.

d. Alignment, adjusting and checking.

4. Servicing and lubrication required.

5. Manufacturer's printed operating and maintenance instructions.

6. Description of sequence of operation by control manufacturer.

7. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

a. Predicted life of parts subject to wear.

b. Items recommended to be stocked as spare parts.

8. As-installed control diagrams by controls manufacturer.

9. Each contractor's coordination drawings.

a. As-installed color coded piping diagrams.

10. Charts of valve tag numbers, with location and function of each valve.

11. List of original manufacturer's spare parts, manufacturer's current prices and recommended quantities to be maintained in storage.

12. Other data as required under pertinent sections of specifications and JWSC Standards for Water and Sewer Design and Construction.

C. Content, for each electric and electronic systems, as appropriate:

1. Description of system and component parts.

a. Function, normal operating characteristics, and limited conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of replaceable parts.

2. Circuit directories and panelboards.

a. Electrical service.

b. Controls.

c. Communications.

3. As installed color coded wiring diagrams.

4. Operating procedures:

a. Routine and normal operating instructions.

b. Sequences required.

c. Special operating instructions.

5. Maintenance procedures:

a. Routine operations.

b. Guide to "trouble-shooting".

c. Disassembly, repair and reassembly.

d. Adjustment and checking.

6. Manufacturer's printed operating and maintenance instructions.

7. List of original manufacturer's spare parts, manufacturer's current prices, and recommended quantities to be maintained in storage.

8. Other data as required under pertinent sections of specifications and JWSC Standards for Water and Sewer Design and Construction.

D. Prepare and include additional data when the need for such data becomes apparent during instruction of Owner's personnel.

E. Additional requirements for operating and maintenance data: Respective sections of Specifications and JWSC Standards for Water and Sewer Design and Construction.

1.07 SUBMITTAL SCHEDULE

A. Submit two (2) copies of preliminary draft of proposed formats and outlines of contents of Operating and Maintenance Manuals within 60 days after Notice to Proceed.

1. The Engineer and Owner will review the preliminary draft and return one (1) copy with comments.

B. Submit two (2) copies of completed data in final form no later than 30 days following the Engineer's and Owner's review of the last shop drawing and/or other submittal specified in the Special Conditions and other specification sections.

1. One (1) copy will be returned with comments to be incorporated into final copies.

C. Submit four (4) hard copies and two (2) CDs, DVDs, or USB Flash Drives with electronic PDF copies of approved manual in final form directly to the offices of the JWSC, within 30 calendar days of product shipment to the project site and preferably within 30 days after the reviewed copy is received.

D. Append four (4) hard copies and two (2) CDs, DVDs, or USB Flash Drives with electronic PDF copies of addendum to the operation and maintenance manuals as applicable and certificates as specified within 30 days after final inspection and equipment start-up test.

1.08 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in operation, adjustment and maintenance of products, equipment and systems.

B. Review operating and maintenance manual with personnel in full detail to explain all aspects of operations and maintenance which shall constitute the basis of instruction.

1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

PART 2 - PRODUCTS - (NOT USED)

PART 3 - EXECUTION - (NOT USED)

END OF SECTION

INDEX TO

SECTION 02050 – DEMOLITION

SECTION 02050

DEMOLITION

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. This Section provides for the complete or partial removal and disposal of specified existing structures, foundations, slabs, piping, mechanical, electrical, existing (to be abandoned) piping and miscellaneous appurtenances encountered during construction operations.

2. Demolition includes:

a. Demolition, partial removal and cutting of existing masonry and metals as required for the new construction.

b. Distribution of salvageable and excess unacceptable material and equipment as specified below.

c. Off-site disposal of excess and unacceptable materials and equipment.

3. The Contractor shall examine the various Drawings regarding the existing site, visit the project site and determine for himself the extent of the work affected therein and all conditions under which he is required to perform the various operations.

1.02 PERMITS AND NOTICES

A. Permits and Licenses: Contractor shall obtain all necessary permits and licenses for performing the work and shall furnish a copy of same to the Owner and Engineer prior to commencing the work. The Contractor shall comply with the requirements of the permits.

B. Notices: Contractor shall issue written notices of planned demolition to companies or local authorities owning utility conduit, wires or pipes running to or through the project site. Copies of said notices shall be submitted to the Owner and Engineer.

C. Utility Services: Contractor shall notify utility companies or local authorities furnishing gas, water, electrical, telephone or sewer service to remove any equipment owned by them in structures to be demolished and to remove, disconnect, cap or plug their services to facilitate demolition.

1.03 CONDITIONS OF STRUCTURES

A. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.

1.04 REMOVAL OF EXISTING EQUIPMENT

A. Scope of work: Contractor shall furnish all labor, equipment, materials, and incidentals necessary to remove existing equipment, piping, fittings, valves, and/or appurtenances not required for the proper operation of the project improvements as indicated on the Drawings and Specifications. Removal shall be consistent with the final configuration of the new and modified systems as indicated on the Drawings, as specified herein, or as required by the Owner.

B. The Contractor shall not proceed with the removal of any equipment, piping, or appurtenances without specific approval of the Owner. Any equipment, piping, or appurtenances removed without proper authorization, which are necessary for the operation of the project improvements shall be replaced to the satisfaction of the Owner at the Contractor's expense.

C. All equipment removed shall remain the property of the Owner unless designated otherwise by the Owner.

E. If the Owner elects not to retain ownership of a certain item, the item shall become the property of the Contractor and shall be removed from the site at the Contractor's expense.

F. Concrete, concrete block and unsalvageable bricks shall be hauled to an appropriate waste disposal site by the Contractor.

G. All other material shall be hauled to an appropriate waste disposal site by the Contractor.

H. The storage of or sale of removed items on the site will not be allowed.

1.05 TRAFFIC AND ACCESS

A. Conduct demolition and modification operations, and the removal of equipment and debris to ensure minimum interference with roads, streets, walkways both on-site and off-site, and to ensure minimum interference with occupied or used facilities.

B. Special attention is directed towards maintaining safe and convenient access to the new and existing facilities by Owner's personnel and associated vehicles. Relocation of the Contractor's materials, labor, or equipment due to uncoordinated interruption will be at the Contractor's expense.

D. Do not close or obstruct streets, walkways or other occupied or used facilities without permission from the authorizing agency, Engineer and Owner. Provide approved alternate routes around closed or obstructed traffic in access ways.

1.06 DAMAGE

Promptly repair damage caused to adjacent facilities by demolition operations as directed by the Engineer and at no cost to the Owner.

1.07 UTILITIES

A. Maintain new and existing utilities to remain in service and protect against damage during demolition operations.

B. Do not interrupt existing or new utilities serving occupied or used facilities, except when authorized by the Owner or Engineer. Provide temporary services during interruptions to existing utilities as acceptable to the Owner and Engineer.

C. The Contractor shall cooperate and coordinate with the Owner to shut off utilities serving structures of the existing facilities as required by demolition operations.

E. The Contractor shall be solely responsible for making all necessary arrangements and for performing any necessary work involved in connection with the discontinuance or interruption of all public and private utilities or services under this jurisdiction of the utility companies.

E. All utilities being abandoned shall be disconnected and terminated at the service mains in conformance with the requirement of the utility companies or the municipality owning or controlling them.

1.08 POLLUTION CONTROL

A. For pollution control, use water sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. Comply with the governing regulations.

1.09 QUALITY CONTROL

A. Protect all existing materials and equipment to be salvaged or reused from damage.

B. Cap or plug all lines to be abandoned. Place covers and label all junction boxes, conduits and wire as abandoned.

C. Leave all exposed ends of all pipe and conduit or junction boxes covered and safe.

PART 2 - MATERIALS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

INDEX TO

SECTION 02110 – SITE CLEARING

SECTION 02110

SITE CLEARING

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Removal of surface debris.

B. Removal of paving, curbs and other materials located within the project area.

C. Removal of trees, shrubs, and other plant life.

D. Topsoil excavation.

1.2 RELATED SECTIONS

A. Section 02200 – Earthwork

1.3 MEASUREMENT AND PAYMENT

A. Site Clearing: Clearing, grubbing and other items to be removed will be included in the contract price as noted in Section 01025 Measurement and Payment. Includes clearing site, removing trees and stumps, loading and removing waste materials from site. Specific trees may be called for removal separately.

1.4 REGULATORY REQUIREMENTS

A. Conform to applicable City, County, and State codes for environmental requirements, and disposal of debris.

B. Coordinate clearing Work with utility companies.

PART 2 – PRODUCTS

2.1 MATERIALS

A. Provide tree protection materials as detailed on the construction drawings, within this Section, or as required by local codes.

PART 3 – EXECUTION

3.1 PREPARATION

A. Verify existing plant life designated to remain is tagged or identified.

B. Identify a salvage area for placing removed materials. All non-salvageable materials and clearing debris shall be disposed off-site by Contractor, at his expense.

3.2 PROTECTION

A. All trees on site will be saved except those marked specifically by the Owner's representative or on the contract drawings for removal during construction. No trees, including those marked for removal on site or any other tree, may be removed prior to the preconstruction conference. All trees not to be removed will be protected from injury to their roots and to their top to a distance three feet beyond the drip–line and no grading, trenching, pruning, or storage of materials may go in this area except as provided by an Owner's representative stakeout. Contractor will pay a penalty for any tree removed from the site that has not been marked specifically for removal. Contractor also will pay for any tree that dies due to damage during construction. This applies to all trees on site whether or not they are shown on the plans.

B. Contractor shall not be held accountable for damages to trees resulting from placement of fill or removal of soils where such action is required by the contract documents. Any tree, the trunk of which is within 10 feet of any footing or trench, shall be exempt from these penalties except Contractor shall exercise all reasonable precautions to preserve even these trees. Contractor agrees to pay fines as established below in the event he or any of his subcontractors causes loss or removal of trees designated to be saved under provisions of this contract.

The fines are as follows:

Caliper	Fine
1" – 2"	$ 150.00
2" – 3"	200.00
3" – 4"	250.00
4" – 5"	400.00
5" – 6"	500.00
6" – 7"	600.00
7" – 8"	750.00
8" – 11"	1,500.00
12" – 20"	2,000.00
21" & larger	$ 2,500.00

C. Trees shall be graded by Owner's representative as to variety, condition, and site importance, with above figures acting as a maximum fine. Lowest assessment amount shall be no less than one–half of the above fine figures.

D. Protect bench marks, survey control points, and existing structures from damage or displacement.

E. Protect all remaining utilities.

F. Clearing operations shall be conducted to prevent damage by falling trees to trees left standing, to existing structures and installations, and to those under construction, and to provide for the safety of employees and others.

3.3 CLEARING

A. Clear areas required for access to site and execution of work. Clearing shall consist of felling and cutting trees into sections, and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within area to be cleared. Trees, stumps, roots, brush, and other vegetation in areas to be cleared shall be removed completely from the site, except such trees and vegetation as may be indicated or directed to be left standing. **No burning will be allowed unless authorized in writing by Owner.** Trees designated to be left standing within cleared areas shall be trimmed of dead branches 1–1/2 inch or more in diameter. Limbs and branches to be trimmed shall be neatly cut close to the trunk of the tree or main branches. Cuts more than 1–1/2 inches in diameter shall be painted with accepted treewound paint. Trees and vegetation to be left standing shall be protected from damage incident to clearing, grubbing, and construction operations, by the erection of timber barriers or by such other means as circumstances require. Such barriers must be placed and be checked by the OWNER before construction observations can proceed (See 3.2). Clearing shall also include removal and disposal of structures obtruding, encroaching upon, or otherwise obstructing the work.

3.4 REMOVAL

A. Where indicated or directed, trees and stumps shall be removed from areas outside those areas designated for clearing and grubbing. Work shall include felling of such trees and removal of their stumps and roots. Trees shall be disposed of as hereinafter specified.

B. Remove debris, rock, and other extracted plant life from site.

C. Partially remove paving, curbs, and driveways; as indicated. Neatly saw cut edges at right angle to surface.

3.5 DISPOSAL

A. Disposal of trees, branches, snags, brush, stumps, etc., resulting from clearing and grubbing shall be the Contractor's responsibility and shall be disposed of by removal from site. All costs in connection with disposing of materials will be at the Contractor's expense. Contractor shall be responsible for compliance with all local and State laws and regulations relative to the removal and disposal of material. **No material will be burned unless directed to do so in writing by the Owner.** Contractor shall obtain a permit to burn on site from local fire department, before beginning the work. All liability of any nature resulting from

disposal of cleared and grubbed material shall become the Contractor's responsibility. Disposal of all materials cleared and grubbed will be in accordance with rules and regulations of the State of Georgia.

3.6 GRUBBING

A. Grubbing shall consist of removal and disposal of stumps, roots larger than one-inch in diameter, and matted roots from designated grubbing areas. This material, together with logs and other organic or metallic debris not suitable for building of proposed construction, shall be excavated and removed to a depth of not less than 18-inches below original surface level of the ground in embankment areas and not less than 2 feet below finished earth surface in excavated areas. Depressions made by grubbing shall be filled with suitable material and compacted to make the surface conform to original adjacent ground.

END OF SECTION

INDEX TO

SECTION 02140 – DEWATERING

SECTION 02140

DEWATERING

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work to be performed under this section shall include furnishing all equipment and labor necessary to remove storm or subsurface waters from excavation areas in accordance with the requirements of this project.

B. Related Work Described Elsewhere:

1. JWSC Standards for Water and Sewer Design and Construction

2. Earthwork: Section 02200.

3. *August 23, 2019, Terracon Geotechnical Engineering Investigation, Glynco Linear Force Water Main, Brunswick, Glynn County, Georgia, Terracon Project No. ES195146*.

1.02 QUALITY ASSURANCE

A. The dewatering of any excavation area and the disposal of the water shall be in strict accordance with the latest revision of all local, state, and federal government rules and regulations.

B. Qualifications: The temporary dewatering system shall be designed by a firm who regularly engages in the design of dewatering systems and who is fully experienced, reputable and qualified in the design of such dewatering systems. The firm shall have a successful record of operation for a minimum of five (5) years prior to bid date.

1.03 SUBMITTALS

A. Contractor shall engage a Professional Geotechnical Engineer registered in the State of Georgia to prepare a signed and sealed Dewatering Plan for the project if either of the following should occur:

1. If Contractor anticipates dewatering activities will be necessary along the route of the forcemain or water main installed via open cut construction or for the Jack-and-Bore or Horizontal Directional Drill pits.

2. If Contractor anticipates dewatering activities will be necessary upstream of PS4036 on B&W Grade Road for the installation of the 30-inch gravity sewer and proposed manhole and pipeline tie-ins.

B. Materials and Shop Drawings: Shop drawings required to establish compliance with the specifications and any Dewatering Plan shall be submitted in accordance with

the provisions of the Special Conditions. Submittals shall include at minimum the following:

1. Design notes and drawings.

2. Descriptive literature of the temporary dewatering system.

3. Layout of all pumps and piping involved.

4. Bill of materials.

1.04 MEASUREMENT AND PAYMENT

A. Dewatering: Dewatering will be included in the contract price as noted in Section 01025 Measurement and Payment. Dewatering efforts do not have a separate line item and are included in the associated construction items as noted in Section 01025. Includes all equipment, power, fuel, labor, Professional Geotechnical Engineer (registered in State of Georgia) design of Dewatering Plan and temporary dewatering systems, and all other items necessary to satisfactorily dewater construction areas.

PART 2 – PRODUCTS

2.01 GENERAL

A. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate in the excavations. The equipment used for dewatering systems shall be standard dewatering equipment of proven ability as designed and manufactured by firms having experience in the design and production of such equipment. The equipment furnished shall be designed, constructed and installed in accordance with the best practices and methods.

B. The Contractor shall engage a Professional Geotechnical Engineer registered in the State of Georgia to design signed and sealed temporary dewatering systems for the project in compliance with the Dewatering Plan. The Contractor shall submit to JWSC (and CSX as necessary) for review, a conceptual plan for the dewatering systems prior to commencing work. The dewatering systems installed shall be in conformity with the overall construction plan, and certification of this shall be provided by the Geotechnical Professional Engineer. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be necessary to assure that the systems will perform satisfactorily. Dewatering systems shall be designed in such a manner as to preserve the undisturbed bearing capacity of the subgrade soils at proposed structures and to preserve the integrity of adjacent structures.

PART 3 – EXECUTION

3.01 DEWATERING

A. The Contractor shall provide adequate equipment for the removal of storm or subsurface waters which may accumulate in the excavation.

B. If subsurface water is encountered, the Contractor shall utilize suitable equipment to adequately dewater the excavation so that it will be dry for work and pipe laying. A wellpoint system or other Engineer approved dewatering method shall be utilized if necessary to maintain the excavation in a dry condition for preparation of the trench bottom and for pipe laying. The water table should be maintained at least 2 feet below the required depth of excavation. The dewatering system should not be decommissioned until sufficient deadweight exists on the structures to prevent uplift or an uplift protection system, if necessary, is in place.

C. Dewatering by trench pumping will not be permitted if migration of fine grained natural material from bottom, side walls, or bedding material will occur.

3.02 DISPOSAL

A. Water pumped from the trench or other excavation shall be disposed of in storm sewers having adequate capacity, canals, or suitable disposal pits.

B. Contractor is responsible for acquiring any permits required to discharge the water and shall protect waterways from turbidity during the operation by the use of Best Management Practices.

C. In areas where adequate disposal sites are not available, partially backfilled trenches may be used for water disposal only when the Contractor's plan for trench disposal is approved in writing by the Engineer. The Contractor's plan shall include temporary culverts, barricades and other protective measures to prevent damage to property or injury to any person or persons.

D. No flooding of streets, roadways, driveways, or private property will be permitted. Engines driving dewatering pumps shall be equipped with residential type mufflers. Where practical and feasible, electric "drops" should be used in lieu of portable generators.

END OF SECTION

INDEX TO

SECTION 02200 – EARTHWORK

SECTION 02200

EARTHWORK

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope of Work: This section includes materials, testing, and earthwork for excavations, fills, and embankments.

1.02 RELATED DOCUMENTS

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

B. *August 23, 2019, Terracon Geotechnical Engineering Investigation, Glynco Linear Force Water Main, Brunswick, Glynn County, Georgia, Terracon Project No. ES195146.*

C. JWSC Standards for Water and Sewer Design and Construction

D. Related Sections:

1. Dewatering: Section 02140.

2. Excavating, Backfilling, and Compacting: Section 02220.

3. Loaming, Seeding and Mulching: Section 02922.

4. Solid Sodding: Section 02934.

1.03 STATUTORY REQUIREMENTS

A. All excavation, trenching, sheeting, bracing, etc., shall comply with the requirements of OSHA excavation safety standards (29 CFR Part 1926.650 Subpart P) and State of Georgia and local requirements. Where conflict between OSHA, State and local regulations exists, the most stringent requirements shall apply.

1.04 SUMMARY

A. Contractor shall furnish all labor, materials, equipment and incidentals required and perform all excavation work and grading; place and compact backfill and fill; and dispose of unsuitable, waste and surplus materials as shown on the Drawings and as specified herein.

B. Contractor shall provide the services of a Licensed Professional Engineer registered in the State of Georgia to prepare temporary excavation support system designs and submittals, as necessary.

C. Contractor shall furnish and install temporary excavation support systems, including sheeting, shoring and bracing, as necessary, to insure the safety of

personnel and protect adjacent structures, piping, etc., in accordance with Federal, State and local laws, regulations and requirements.

D. All work shall be performed in accordance with the geotechnical recommendations as listed in 1.02 B above. Where the requirements of this section conflict with the recommendations of the geotechnical recommendations, the more stringent requirements shall be employed.

1.05 SUBMITTALS

A. Excavation support system designs shall be prepared by a Licensed Professional Engineer, registered in the State of Georgia having a minimum of five (5) years of professional experience in the design and construction of excavation support systems. Contractor shall submit an original and electronic version in PDF format of the Licensed Professional Engineer's certification, stating that the excavation support systems designs have been prepared by the Professional Engineer and that the Professional Engineer will be responsible for their execution.

B. Submit two (2) copies of a report from an approved testing laboratory verifying that any off-site borrow material conforms to the gradation specified.

1.06 REFERENCE STANDARDS

A. Where reference is made to American Society for Testing and Materials (ASTM) standards, the revision in effect at the time of bid opening shall apply.

1.07 QUALITY ASSURANCE

A. At all structures, prior to the placement of bedding material, concrete work mats, structural fill or structural concrete, coordinate with the soils testing laboratory to verify the suitability of the existing subgrade soil and to perform in-place soil density tests as required to verify that the bearing capacity of the subgrade is sufficient.

B. Prior to and during the placement of backfill and fill, coordinate with the soils testing laboratory to perform in-place soil density tests to verify that the backfill/fill material has been compacted in accordance with the compaction requirements specified elsewhere. The Engineer may designate areas to be tested.

1.08 DEFINITIONS

A. Where the phrase "in-the-dry" is used in this Section, it shall be defined to mean a soil condition such that the in-place moisture content of the soil at that time is no more than two (2) percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction.

B. Where used in this Section, "structures" refers to all buildings, tanks, wet wells, manholes and below grade vaults or structures.

1.09 TESTING REQUIREMENTS

A. Determination of laboratory moisture-density relationship and maximum density

shall be by the Modified Proctor Method of ASTM D-1557. At least one (1) test per soil type shall be made.

B. In place soil density shall be determined either by use of a Nuclear Density Meter per ASTM D-2922 or by use of the Drive Sleeve Method per ASTM D-2937. In place field densities shall be taken at least one (1) every 2,500 square feet at not greater than one (1) foot vertical intervals for all areas of potential building construction. Field Density Tests are to be located no further than 300 feet apart on center with a minimum of one (1) per roadway and one (1) per 5,000 square feet of parking/maneuvering area. One (1) density test is required for each pad or isolated footing and for every 20 linear feet of strip/wall footing length. For each tank mat foundation at least four (4) in place field densities shall be taken. In place field densities shall be taken at least one (1) every 300 feet of utility trench and not further than one (1) foot vertically or per lift, whichever is less.

C. Fill material from offsite shall be tested using a minus 200 sieve wash to check grain size. At least one (1) such test shall be run per 500 cubic yards of material brought from offsite.

D. Compaction shall be deemed to comply with the Specifications if no tests fall below the specified relative compaction. The Contractor shall pay the costs of any retesting of work not conforming to the Specifications.

E. "Relative compaction" is the ratio, expressed as a percentage, of the in-place density to the laboratory maximum density.

F. Density tests will be made for determination of specified compaction by an independent testing laboratory provided by the Contractor as approved by the Engineer. Tests will be made in locations reviewed and approved by the Engineer. If any tests are unsatisfactory, the Contractor shall re-excavate and re-compact the fill or backfill until the desired compaction is obtained. Additional compaction tests will be taken to each side of an unsatisfactory test at locations approved by the Engineer to determine the extent of re-excavation and re-compaction necessary.

PART 2 – PRODUCTS (NOT USED)

PART 3 - EXECUTION

3.01 PREPARATION

A. Test Pits

1. Perform exploratory excavation work (test pits) for the purpose of verifying the location of underground utilities and structures and to check for unknown utilities and structures, prior to commencing excavation work.

2. Test pits shall be backfilled as soon as the desired information has been obtained. Backfilled surfaces shall be stabilized in accordance with approved erosion and sedimentation control plans and specifications.

B. Dewatering and Drainage Systems

1. Temporary dewatering and drainage systems shall be in place and operational prior to beginning excavation work. All dewatering systems shall be in accordance with Section 02140: Dewatering.

3.02 EXCAVATION SUPPORT

A. Furnish, install, monitor and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc.) as required by Federal, State or local laws, ordinances, regulations and safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and to protect adjacent structures from undermining, settlement or other damage. Take care to prevent the formation of voids outside of sheeting. If voids occur behind sheeting, immediately backfill and compact the voids with common fill material. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete.

B. Install excavation supports outside the neat lines of foundations. Supports shall be plumb and securely braced and tied in position. Excavation support shall be adequate to withstand all pressures to which the supports will be subjected. Any movement or bulging of supports shall be corrected to provide the necessary clearances, dimensions and structural integrity.

C. Excavation Supports Left in Place

1. Excavation supports that are required to remain in place, if applicable, are indicated on the Drawings.

2. The Owner or Engineer may direct that certain excavation supports remain in place, or be cut off at any specific elevation. Supports directed by the Owner or Engineer to be left in place and not so designated on the Drawings or otherwise specified herein to remain in place, will be paid for in accordance with the Terms and Conditions of the contract. If the Contractor believes that such a directive increases Contractor's cost and would thereby entitle Contractor to a change in contract cost, Contractor shall notify the Engineer in accordance with the applicable article(s) in the Terms and Conditions pertaining to changes in the work.

3. The right of the Owner or Engineer to direct that certain excavation supports remain in place shall not be construed as creating any obligation on the Owner or Engineer to give such direction, nor shall failure to give such direction relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient excavation supports to prevent any movement of the ground or damage to adjacent structures.

D. Excavation supports shall be carefully removed in such manner so as not to endanger the Work or other adjacent structures, roadways, utilities, or property. All voids left or caused by withdrawal of supports shall be immediately filled with sand and compacted.

3.03 STRUCTURAL EXCAVATION PROCEDURES

A. Excavations for structures shall be suitably wide for construction of the structures, including excavation supports, dewatering and drainage systems and working clearances.

B. Excavation shall be performed in-the-dry and shall be accomplished by methods which preserve the undisturbed state of subgrade soils. Drainage and dewatering systems shall be in place and operational prior to beginning excavation work. In no case shall the earth be plowed, scraped or excavated by any means so near to the finished subgrade that would disturb the finished subgrade. Hand excavation of the final 3 to 6-in may be required to obtain a satisfactory, undisturbed subgrade. Subgrade soils which become soft, loose, "quick", or otherwise unsatisfactory for support of structures as a result of inadequate excavation, dewatering, or other construction methods shall be removed and replaced with lean concrete, compacted structural fill or suitable crushed rock, subject to prior approval by the Engineer, at no additional cost to the Owner.

C. When excavations have reached the required subgrade, notify the soils testing laboratory to verify the suitability of the existing subgrade soils for the anticipated foundation and structural loadings. If the existing subgrade soils are determined to be unsuitable, follow the requirements of paragraph 3.03 D and the geotechnical report identified in 1.02 B.

D. Subgrade Preparation

1. To reduce the potential for post construction settlements of pipelines which bear in clayey soils (area of Soil Boring HA1, HA2, HA6, and HA10, depth between 1.5 to 4.5 feet) the following is recommended:

   a. At least one (1) foot of clayey soils (SC) below the pipeline inverts be over-excavated and replaced with compacted structural backfill to final bearing elevations.

   b. If encountered at the structures bearing level, organic soils (A-8) should be completely removed below the structures and replaced with compacted structural fill.

   c. Compacted structural fill should then be placed around and above structures and pipelines to final grade.

   d. Alternatively, to reduce the amount of structural fill and over-excavation, a medium duty woven geotextile such as MIRAFI 600X, or equivalent, may be used as a barrier between compacted fill and clayey materials. If a woven geotextile is used, the amount of over-excavation can be waived for the pipeline. The geotextile should be placed in the excavation bottom and sides above the clayey soils creating a barrier between the clayey soils and structural backfill to preclude contamination of the backfill. A compacted structural fill material should then be used to backfill to the final bearing elevation and around and above structures and pipelines to final grade.

E. Over-excavation beyond the limits and depths required by the Contract Documents shall be replaced at no additional cost to the Owner by structural fill or other approved material subject to the prior approval of the Engineer.

3.04 GENERAL FILLING AND BACKFILLING PROCEDURES

A. Fill and backfill materials shall be placed in lifts to suit the specified compaction requirements to the lines and grades required, making allowances for settlement and placement of cover materials (i.e. topsoil, sod, etc). Soft spots or uncompacted areas shall be corrected.

B. Fill and backfill materials shall not be placed on frozen surfaces, or surfaces covered by snow or ice. Fill and backfill material shall be free of snow, ice and frozen earth.

C. Compaction in open areas may be accomplished by any of the following methods: compaction equipment, fully loaded ten-wheel trucks, tractor dozers weighing at least 30,000 lbs and operated at full speed, or heavy vibratory rollers. Compaction in confined areas (including areas within a 45-degree angle extending upward and outward from the base of a wall) and in areas where the use of large equipment is impractical, shall be accomplished by hand operated vibratory equipment or mechanical tampers. Lift thickness shall not exceed 6-inches (measured before compaction) when hand operated equipment is used.

D. Fill and backfill shall not be placed and compacted when the materials are too wet to properly compact (i.e. the in-place moisture content of the soil at that time is no more than three (3) percentage points above the optimum moisture content of that soil as determined by the laboratory test of the moisture-density relation appropriate to the specified level of compaction).

3.05 FILL AND BACKFILL PROCEDURES

A. Fill and backfill material placed immediately adjacent to and within 10-ft of all structures shall be select fill. All structure water-tightness tests and dampproofing/waterproofing shall be completed prior to placing fill or backfill around structures. Place and compact select fill in even lifts of 6-inches (compacted thickness) uniformly around the structure.

B. Common fill may be used in areas beyond those designated for select fill unless shown or specified otherwise. Common fill shall be placed in even lifts having a maximum thickness (measured before compaction) of 12-inches.

C. Fill required beneath building slabs or slabs on grade (except sidewalks) shall be structural fill. Place and compact structural fill in even lifts of 6-inches (compacted thickness).

3.06 EMBANKMENT FILL PROCEDURES

A. Prior to placing embankment fill materials, all organic materials (including peat and loam) and loose inorganic silt material (loess) shall be removed from areas beneath the embankments. If the subgrade slopes are excessive, the subgrade shall be stepped to produce a stable, horizontal surface for the placement of embankment materials. The existing subgrade shall then be scarified to a depth

of at least 6-inches.

B. Embankment fill shall consist of common fill material and shall be placed and compacted in even lifts of 12-inches (compacted thickness).

C. Rock may be used in embankment fill only with prior, written approval of the Engineer.

3.07 IMPERVIOUS FILL

A. Impervious fill shall be placed in controlled, even lifts having a maximum thickness (measured before compaction) of 6-inches. Compaction shall be sufficient to attain a permeability of less than 1x10-7 cm/sec.

B. Moisture content of impervious fill to be compacted shall be maintained at or near its optimum moisture content (minus 2 to plus 3 percent).

3.08 COMPACTION REQUIREMENTS

A. Compaction shall be performed in accordance with Section 02220: Excavating, Backfilling, and Compacting.

3.09 DISPOSAL OF UNSUITABLE, WASTE AND/OR SURPLUS EXCAVATED MATERIAL

A. Unsuitable, waste and surplus excavated material shall be removed and disposed of off-site. Materials may be temporarily stockpiled in an area within the limits of construction that does not disrupt construction activities, create any nuisances or safety hazards, or otherwise restrict access to the work site, as approved by Owner.

3.10 GRADING

A. Grading shall be performed to the lines and grades shown on the Construction Drawings. All objectionable material encountered within the limits indicated shall be removed and disposed of. Subgrades shall be completely and continuously drained and dewatered throughout the grading process. Install temporary drains, drainage ditches, etc., to intercept or divert surface water which may affect the execution or condition of grading work.

B. If at the time of grading it is not possible to place any material in its proper section of the Work, it shall be stockpiled in approved areas for later use. No extra payment will be made for the stockpiling or double handling of excavated material.

C. Stones or rock fragments larger than 2-inches in their greatest dimensions will not be permitted within the top 6-inches of the finished grade of fills and embankments.

D. In cut areas, all loose or protruding rocks in slopes shall be removed to line or finished grade of the slope. All cut and fill slopes shall be uniformly dressed to the slope, cross-section and alignment shown on the Construction Drawings unless otherwise directed by the Engineer.

END OF SECTION

INDEX TO

SECTION 02210 – SOIL EROSION CONTROL

SECTION 02210

SOIL EROSION CONTROL

PART 1 – GENERAL

1.1 RELATED DOCUMENTS

A. Drawings and general provisions of the Contract, including General and Special Conditions apply to this section.

1.2 DESCRIPTION OF WORK

A. Extent of soil erosion control work includes all measures necessary to meet the requirements of this section.

Erosion and sediment control measures shall be installed prior to any construction activity.

Soil erosion and sediment control measures shall include all temporary and permanent means of protection and trapping soils of the construction site during land disturbing activity. Activity covered in this contract shall meet standards of NPDES General Permit for the state where work is performed.

1.3 PURPOSES

A. Contractor is to achieve the following goals:

1. Minimize soil exposure by proper timing of grading and construction.
2. Retain existing vegetation whenever feasible.
3. Vegetate and mulch denuded areas as soon as possible.
4. Divert runoff away from denuded areas.
5. Minimize length and steepness of slopes when it is practical.
6. Reduce runoff velocities with sediment barriers or by increasing roughness with stone.
7. Trap sediment on site.
8. Inspect and maintain erosion control measures.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of soil erosion control systems products of types and sizes required, whose materials have been in satisfactory use for not less than 5 years.

B. Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion control.

Georgia Projects

C. The 24-hour contact for erosion and sedimentation control measures is:

Name: Mr. Keith Strong

Address: Thomas & Hutton
50 Park of Commerce Way
Savannah, GA 31405

Phone: (912) 667-9793

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion control materials and products.

1.6 MEASUREMENT AND PAYMENT

A. No unit measurements will be made for soil erosion control. Payment will be made at the lump sum price as shown on the bid proposal. The cost of soil erosion control shall include all equipment, labor and materials necessary to comply with the State of Georgia Erosion and Sediment Control Program.

PART 2 – PRODUCTS

2.1 GRASSING MATERIALS

A. Refer to Section 02922 – Loaming, Seeding, and Mulching and Section 02934 – Solid Sodding.

1. General: All grass seed shall be free from noxious weeds, grade A recent crop, recleaned and treated with appropriate fungicide at time of mixture. Deliver to site in original sealed containers with dealer's guarantee as to year grown, percentage of purity, percentage of germination and date of the test by which percentages of purity and germination were determined. All seed sown shall have a date of test within six months of the date of sowing.

2.2 HAY BALES

A. Standard size, densely baled straw or hay, wrapped with synthetic or wire bands (two minimum per bale).

2.3 SILT FENCE

A. Silt fence shall be a woven geotextile fabric sheet. Fabric shall be a synthetic polymer composed of at least 85% by weight propylene, ethylene, amide, ester, or vinylidene chloride, and shall contain stabilizer and/or inhibitors added to the base plastic to make filaments resistant to deterioration due to ultra-violet and/or heat exposure. Fabric should be finished so the filaments will retain their relative position with respect to each other. Fabric shall be free of defects, rips, holes, or flaws.

Fabric shall meet the following requirements:

Woven Fabrics	
Grab Strength	90 lbs.
Burst Strength	175 PSI
UV Resistance	80%

2.4 CHEMICALS FOR DUST CONTROL

A. Calcium Chloride, Anionic Asphalt Emulsion, latex Emulsion or Resin-in-Water Emulsion may be used for dust control.

2.5 RIP-RAP

A. Shall be hard quarry or field stone of such quality the pieces will not disintegrate on exposure to water, sunlight, or weather. Stone shall range in weight from a minimum of 25 pounds to a maximum of 125 pounds. At least 50 percent of the stone shall weigh more than 60 pounds. The stone shall have a minimum dimension of 12 inches.

2.6 PRODUCT REVIEW

A. Contractor shall provide the Engineer with a complete description of all products before ordering. Engineer will review all products before they are ordered.

PART 3 – EXECUTION

3.1 GENERAL

A. All disturbed soil areas except those to support paving shall be graded and protected from erosion by grassing. Disturbed areas must be grassed within 14 days of work ending unless work is to begin again before 21 days. Storm water conveyance systems shall have sediment barriers installed at all entrances, intersections, change in direction and discharge points.

3.2 GRASSING

A. Refer to Section 02922 – Loaming, Seeding, and Mulching and Section 02934 – Solid Sodding.

3.3 SEDIMENT BARRIERS

A. Hay Bales for Sheet Flow Applications:

1. Excavate a 4 inch deep trench the width of a bale and length of proposed barrier. Barrier should be parallel to the slope. Place barrier 5 to 6 feet away from toe of slope, unless otherwise instructed.

2. Place bales in the trench with their ends tightly abutting. Corner abutment is not acceptable. A tight fit is important to prevent sediment from escaping through spaces between the bales.

3. Backfill the trench with previously excavated soil and compact it. Backfill soil should conform to ground level on downhill side of barrier and should be built up to 4 inches above ground on uphill side of bales.

4. Inspect and repair or replace damaged bales promptly. Remove hay bales when uphill sloped areas have been permanently stabilized.

B. Hay Bales for Ditch Check Applications:

1. Install hay bales as described for sheet flow with the following exceptions:

a. Place bales in a single row, lengthwise, oriented perpendicular to the flow, and with ends of adjacent bales tightly abutting one another.

b. Extend barrier to such a length so the bottoms of end bales are at a higher elevation than the top of lowest middle bale to assure sediment-laden runoff will flow either through or over barrier but not around it.

3.4 SILT FENCE

A. Silt fence shall be placed at approximate location shown and installed in accordance with the detail on the construction drawings. Contractor shall maintain silt fence as required by state regulations.

3.5 DUST CONTROL

A. Dust raised from vehicular traffic will be controlled by wetting down access road with water or by the use of a deliquescent chemical, such as calcium chloride, if relative humidity is over 30%. Chemicals shall be applied in accordance with manufacturer's recommendations.

B. Contractor shall use all means necessary to control dust on and near the work, or off-site borrow areas when dust is caused by operations during performance of work or if resulting from the condition in which any subcontractor leaves the site. Contractor shall thoroughly treat all surfaces required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of work on site.

3.6 SEDIMENT BASIN

A. As indicated on the construction drawings, a sediment basin equal in volume to 3,600 cubic feet per disturbed acre is required. The sediment basin/lagoon adjacent to the outfall for the site shall be constructed and stabilized prior to any additional land disturbed activity.

3.7 RIP-RAP

A. Rip-Rap shall be placed at the locations shown and installed in accordance with the detail on the construction drawings.

3.8 CONSTRUCTION EXIT

A. Construct exit at the location shown per detail on the construction drawings. Contractor shall maintain construction exit as required by state regulations.

3.9 INLET PROTECTION

A. Install inlet protection per detail on the construction drawings. Contractor shall maintain inlet protection as required by state regulations until all disturbed surfaces are stabilized.

END OF SECTION

INDEX TO

SECTION 02211 – EROSION, SEDIMENTATION, AND POLLUTION CONTROL (GA)

SECTION 02211

EROSION, SEDIMENTATION, AND POLLUTION CONTROL (GA)

PART 1 – GENERAL

1.1 SECTION INCLUDES

A. Soil erosion, sediment and pollution control measures shall include all temporary and permanent means of soil protection, trapping soils and containment of pollutants on the construction site during land disturbing activities. Activities covered in this section are regulated by the Manual for Erosion and Sediment Control in Georgia (latest revision) and Georgia's National Pollutant Discharge Elimination System Permit (NPDES), General Permit No. GAR100002 (Infrastructure Construction Projects).

B. Reporting

C. Sampling

1.2 RELATED SECTIONS

A. Section 02110 – Site Clearing

B. Section 02200 – Earthwork

C. Section 02660 – Water Distribution System

D. Section 02662 – Sanitary Sewer Systems

1.3 PURPOSES

A. The purpose of this section is to achieve the following goals:

1. Minimize soil exposure by proper timing of clearing, grading and construction.

2. Retain existing vegetation whenever feasible.

3. Vegetate and mulch disturbed areas as soon as possible.

4. Divert runoff away from disturbed areas.

5. Minimize length and steepness of slopes when it is practical.

6. Reduce runoff velocities with check dams or surface roughing.

7. Trap sediment on site.

8. Inspect and maintain erosion, sedimentation and pollution control measures.

9. Report on condition of Best Management Practices (BMPs).

10. Sample site run off per Georgia's NPDES Permit.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacture of soil erosion, sedimentation and pollution control systems products of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

Codes and Standards: Comply with all applicable Local, State and Federal Standards pertaining to soil erosion, sedimentation and pollution control.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instruction for soil erosion, sedimentation and pollution control materials and products.

1.6 MEASUREMENT AND PAYMENT

A. No unit measurements will be made for soil erosion control. Payment will be made at the lump sum price as shown on the bid proposal and described in Section 01025 Measurement and Payment. The cost of soil erosion control shall include all equipment, labor, maintenance, monitoring, reporting, and materials necessary to comply with the State of Georgia NPDES Permit.

PART 2 – PRODUCTS

2.1 VEGETATIVE MATERIALS

A. Mulch

1. Dry straw or hay.

2. Wood chips, sawdust or bark.

3. Cutback asphalt.

B. Temporary Seeding

1. Annual Ryegrass

2. Browntop Millet

C. Permanent Seeding

1. Reference Section 02922 – Loaming, Seeding and Mulching

D. Sod

1. Reference Section 02934 – Solid Sodding

E. Fertilizer

1. Reference Section 02922 – Loaming, Seeding and Mulching and Section 02934 – Solid Sodding.

2.2 STRUCTURAL MATERIALS

A. Check Dam

1. Stone (2" – 10")

2. Bales of densely baled hay or straw wrapped with synthetic or wire bands (two minimum per bale).

B. Construction Exit

1. Minimum 20' x 50' x 0.5' layer of 1.5" to 3.5" stone with a geotextile underliner.

C. Filter Ring

1. Minimum 2' high stone ring. Stone shall be no smaller than 3" to 5" when utilized at storm drain inlets and pond outlets with pipe diameters less than 12".

2. Minimum 2' high stone ring. Stone shall be no smaller than 10" to 15" when utilized at storm drain inlets and pond outlets with pipe diameters greater than 12".

D. Sediment Barrier

1. Bales of densely baled hay or straw wrapped with synthetic or wire bands (two minimum per bale).

2. Silt Fence – Shall be a woven geotextile fabric sheet of plastic yarn composed of a long chain synthetic polymer with at least 85% by weight propylene, ethylene, amide, ester or vinylidene chloride, and shall contain stabilizers and/or inhibitors added to the base plastic to make the filaments resistant to deterioration due to ultra-violet and/or heat exposure. The fabric shall be finished so the filaments will retain their relative position with respect to each other. The fabric shall be free of defects, rips, holes or flaws. The manufacturer shall have either an approved color mark yarn in the fabric or label the fabricated silt fence with both the manufacturer and fabric name every 100'.

The fabric shall meet the following requirements:

Grab Strength	90 lbs.
Mullen Burst Strength	150 lbs.
UV Resistance	80 %

E. Inlet Sediment Trap

1. Silt fence (Type C) supported by steel posts.

2. Baffle Box – Constructed of 2" x 4" boards spaced a maximum of 1" apart or plywood with weep holes 2" in diameter.

3. Sod Inlet Protection – Four (4) one (1) foot wide strips of sod on each side of the inlet.

4. Curb Inlet Protection – Eight (8) inch concrete blocks wrapped in filter fabric, placed in front of a curb inlet.

F. Storm Drain Outlet Protection

1. Geotextile fabric equivalent to Mirafi 140N.

2. Rip-rap.

2.3 CHEMICAL MATERIALS

A. Dust Control – Calcium Chloride, Anionic Asphalt Emulsion, Latex Emulsion or Resin-in-Water Emulsion.

B. Anionic Polyacrylamide (PAM) – Consult state and local laws concerning the regulations of this chemical.

PART 3 – EXECUTION

3.1 GENERAL

A. All disturbed soil areas except those to support paving shall be graded and protected from erosion with vegetative materials. Sedimentation discharge from the construction site into natural drainage ways and storm drainage systems shall be prevented by means of vegetative measures and temporary structural practices. These vegetative measures and structural practices are known as Best Management Practices (BMPs). Rainfall, pollution control measures and construction exit condition shall be monitored and reported on each day when construction activities take place. Erosion and sedimentation control measures shall be monitored and reported on every seven (7) days and within 24 hours of a qualifying rainfall event of 0.5-inches or more. Sampling of construction site discharging water shall be sampled within 45 minutes of a qualifying rainfall event and analyzed immediately or no later than 48 hours after collection. The above reports shall be submitted to the Georgia EPD by the fifteenth day of the month following the reporting period.

B. The Contractor (Operator) is considered a "Primary Permittee" and shall submit a Notice of Intent (NOI) in accordance with General Permit Number GAR100002 at least one (1) week prior to the commencement of construction activities. The Contractor shall retain a copy of the Erosion, Sedimentation and Pollution Control Plan and the Comprehensive Monitoring Program required by the above permit at the construction site or be readily available at a designated alternate location from the date of project initiation to the date of final stabilization. Copies of all Notice of Intent, Notice of Termination, plans, monitoring reports and all other records required by the above permit shall be retained by the Contractor for a period of at least three (3) years from the date the site is finally stabilized. Copies of the Notice of Intent (NOI), Notice of Termination (NOT) and General Permit Number GAR1000002 are available at the noted Georgia EPD website: https://epd.georgia.gov/forms-and-permits/watershed-protection-branch-forms-permits/storm-water-forms/npdes-construction

3.2 ON-SITE OBSERVATION

A. The Engineer is required by General Permit Number GAR100002 to check the installation of the Erosion, Sedimentation and Pollution Control measures within one (1) week after the initial construction activities commence. The Contractor shall notify the Engineer within 24 hours of the control measures installation for the above site visit. The Engineer, within the above parameters, shall check subsequent installation of control measures.

3.3 VEGETATIVE PRACTICES

A. Mulch

1. Dry straw or hay shall be applied at a depth of 2 to 4 inches by hand or mechanical equipment providing complete soil coverage. Straw or hay shall be anchored immediately after application. Straw or hay can be anchored with a disk harrow, packer disk or emulsified asphalt.

2. Wood chips, sawdust or bark shall be applied at a depth of 2 to 3 inches by hand or mechanical equipment providing complete soil coverage. Netting of the appropriate size shall be used to anchor the above materials.

3. Cutback asphalt shall be applied at 1,200 gallons per acre or ¼ gallon per square yard.

B. Seeding

1. Seed shall be applied uniformly by hand, cyclone seeder, drill, cultipacker seeder or hydraulic seeder. Drill or cultipacker seeders shall place seed 1/4" to 1/2" deep. Soil shall be raked lightly to cover seed with soil if seeded by hand.

2. During times of drought, water shall be applied at a rate not causing runoff and erosion. The soil shall be thoroughly wetted to depth insuring

germination of the seed. Subsequent applications of water shall be made when needed.

3. Refer to Section 02922 – Loaming, Seeding and Mulching for additional seeding requirements.

C. Sodding

1. Bring soil surface to final grade. Clear surface of trash, woody debris stones and dirt clods larger than 1". Mix fertilizer into soil surface. Apply sod to soil when surface is not muddy or frozen. Lay sod with tight joints and in straight lines. Do not overlap joints. Stagger joints and do not stretch sod. On slopes steeper than 3:1, sod shall be anchored with pins or other approved methods. Installed sod shall be rolled or tamped to provide good contact between sod and soil. Irrigate sod and soil to a depth of 4" immediately after installation. Irrigation shall be used to supplement rainfall for a minimum of 2-3 weeks.

2. Refer to Section 02934 – Solid Sodding for additional sodding requirements.

3.4 STRUCTURAL MEASURES

A. Check Dam

1. Stone – Shall be constructed of graded size 2-10 inch stone underlayed with a geotextile fabric. Mechanical or hand placement shall be required to insure complete coverage of entire width of ditch or swale and center of dam is lower than edges. Sediment shall be removed when it reaches a depth of one-half the original dam height or before.

2. Haybale – Shall be staked and embedded a minimum of 4" and may be used as temporary check dams in concentrated flow areas while vegetation is becoming established. They should not be used where the drainage area exceeds one acre. Sediment shall be removed when it reaches a depth of one-half the original dam height or before.

B. Construction Exit

1. A stone stabilized pad shall be located at any point where traffic will be leaving the construction site to a public right-of-way, street, alley, sidewalk, parking area or any other area where there is a transition from bare soil to a paved area. The pad shall be constructed of 1.5" to 3.5" stone, having a minimum thickness of 6" and not less than 20' wide and 50' long. The pad shall be underlayed with a geotextile fabric. The pad shall be maintained in a condition, which will prevent tracking or flow of mud onto public rights-of-way. This may require periodic top dressing with 1.5" to 3.5" stone. All materials spilled, dropped, washed or tracked from vehicles or site onto roadways or into storm drains must be removed immediately.

C. Filter Ring

1. Shall surround all sides of the structure receiving runoff from disturbed areas. It shall be placed a minimum of 4' from the structure. It may also be used below storm drains discharging into detention ponds, creating a centralized area for sediment accumulation. When utilized below a storm drain outlet, it shall be placed such that it does not create a condition causing water to back-up into the storm drain and inhibit the function of the storm drain system. The larger stone can be faced with smaller filter stone on the upstream side for added sediment filtering capabilities. Mechanical or hand placement of stone shall be required to uniformly surround the structure.

2. Filter ring must be kept clear of trash and debris. This requires continuous monitoring and maintenance, which includes sediment removal when one-half full. Filter rings are temporary and should be removed when the site has been stabilized.

D. Sediment Barrier

1. Hay or straw bales may be used in areas of low sheet flow rates. They shall not be use if the project duration is expected to exceed three (3) months. Bales shall be placed in a single row, lengthwise, and embedded in the soil to a depth of 4". Bales must be securely anchored in place by stakes or bars driven through the bales or by other acceptable means to prevent displacement. Bales shall be placed so the binding wire or twine around the bale will not touch the soil. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed. The slope lengths contributing runoff to a bale barrier cannot exceed those listed below.

Land Slope (Percent)	Maximum Slope Length Above Bale (Feet)
< 2	75
2 to 5	50
5 to 10	35
10 to 20	20
> 20	10

2. Silt fence may be used in areas of higher sheet flow rates. The drainage area shall not exceed ¼ acre for every 100' of silt fence. **Silt fence shall not be installed across streams, ditches, waterways or other concentrated flow areas.** Silt fence shall be installed according to this specification, as shown on the construction drawings or as directed by the Engineer. See details on the construction drawings for installation requirements.

   a) Type A – A 36" wide filter fabric silt fence shall be used on construction sites where the life of the project is greater than or equal to six (6) months.

b) Type B – A 22" wide filter fabric silt fence shall be limited to use on minor projects, such as residential home sites or small commercial developments where permanent stabilization will be achieved in less than six (6) months.

c) Type C – A 36" wide filter fabric silt fence with wire reinforcement shall be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10'. Along stream buffers and other sensitive areas, two (2) rows of Type C silt fence or one (1) row of Type C silt fence backed by hay bales shall be used.

3. Where all runoff is to be stored behind the silt fence (where no stormwater disposal system is present), the slope lengths contributing runoff to a silt fence barrier cannot exceed those listed below.

Land Slope (Percent)	Maximum Slope Length Above Fence (Feet)
< 2	100
2 to 5	75
5 to 10	50
10 to 20	25
> 20*	15

*In areas where the slope is greater than 20%, a flat area length of 10' between the toe of the slope and the fence shall be provided.

4. Sediment shall be removed once it has accumulated to one-half the original height of the barrier. Filter fabric shall be replaced whenever it has deteriorated to such an extent that the effectiveness of the fabric is reduced (approximately six months). Barriers shall remain in place until disturbed areas have been permanently stabilized. All sediment accumulated at the barrier shall be removed and properly disposed of before the barrier is removed.

E. Inlet Sediment Trap

1. Shall be installed at or around all storm drain inlets receiving runoff from disturbed areas. Sediment traps must be self draining unless they are otherwise protected in an approved manner that will not present a safety hazard. The drainage area entering the inlet sediment trap shall be no greater than one acre. Sediment traps may be constructed on natural ground surface, on an excavated surface or on machine compacted fill provided they have a non-erodible outlet.

2. Type C silt fence supported by steel posts may be used where the inlet drains a relatively flat area (slope no greater than 5%) and shall not apply to inlets receiving concentrated flows, such as in street or highway medians. The stakes shall be spaced evenly around the perimeter of the

inlet a maximum of 3' apart and securely driven into the ground, approximately 18" deep. The fabric shall be entrenched 12" and backfilled with crushed stone or compacted soil. Fabric and wire shall be securely fastened to the posts and fabric ends must be overlapped a minimum of 18" or wrapped together around a post to provide a continuous fabric barrier around the inlet. The trap shall be inspected daily and after each rain. Repairs are to be made as needed. Sediment shall be removed once it has accumulated to one-half the height of the trap. **Sediment shall not be washed into the inlet.** It shall be removed from the sediment trap and disposed of and stabilized so it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment shall be removed and either salvaged or disposed of properly. The disturbed area shall be brought to proper grade, smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

3. A baffle box shall be used for inlets receiving runoff with a higher volume or velocity. The box shall be constructed of 2" x 4" boards spaced a maximum of 1" apart or of plywood with weep holes 2" in diameter. The weep holes shall be placed approximately 6" on center vertically and horizontally. The entire box shall be wrapped in Type C filter fabric that is entrenched 12" and backfilled. Gravel shall be placed around the box to a depth of 2" to 4". The trap shall be inspected daily and after each rain. Repairs are to be made as needed. Sediment shall be removed once it has accumulated to one-half the height of the trap. **Sediment shall not be washed into the inlet.** It shall be removed from the sediment trap and disposed of and stabilized so it will not enter the inlet again. When the contributing drainage area has been permanently stabilized, all materials and any sediment shall be removed and either salvaged or disposed of properly. The disturbed area shall be brought to proper grade, smoothed and compacted. Appropriately stabilize all disturbed areas around the inlet.

4. Sod Inlet Protection shall be used only at the time of permanent seeding, to protect the inlet from sediment and mulch material until permanent vegetation has become established. The sod shall be placed to form a turf mat covering the soil for a distance of 4' from each side of the inlet structure. Sod strips shall be staggered so adjacent strip ends are not aligned. Re-sod areas where an adequate stand of sod is not obtained. New sod should be mowed sparingly. Grass height should not be less than 2" to 3".

5. Curb Inlet Protection shall be used on curb inlets receiving runoff from disturbed areas once pavement has been installed. Place 8" concrete blocks wrapped in filter fabric in front of the curb inlet opening. A gap of approximately 4" shall be left between the inlet filter and the inlet to allow for overflow and prevention of hazardous ponding in the roadway. **This method of inlet protection shall be removed if a safety hazard is created.** Sediment shall be removed from curb inlet protection immediately.

F. Storm Drain Outlet Protection

1. Outlet protection aprons shall be constructed at all storm drain outlets, road culverts, paved channel outlets discharging into natural or constructed channels. Apron will extend from end of the conduit, channel or structure to the point of entry into an existing stream or publicly maintained drainage system. Apron length, width and stone size shall conform to details on the construction drawings. Apron shall be constructed with no slope along its length. Invert elevation of the downstream end of apron shall be equal to the elevation of the receiving channel invert. There shall be no overfall at the end of apron. Apron shall be located so there are no bends in the horizontal alignment.

2. Subgrade for geotextile fabric and rip-rap shall follow required lines and grades shown on the construction drawings. Compact any subgrade fill required to the density of surrounding undisturbed material. Low areas in subgrade on undisturbed soil may also be filled by increasing rip-rap thickness. Geotextile fabric shall be protected from punching or tearing during installation. Repair any damage by removing rip-rap and placing another piece of fabric over the damaged area. All connecting joints shall overlap a minimum of 1'. If damage is extensive, replace entire geotextile fabric. Rip-rap shall be placed by equipment or hand. Minimum thickness of rip-rap shall be 1.5 times the maximum stone diameter. Immediately after construction, stabilize all disturbed areas around apron with vegetation.

3. Check outlet apron after heavy rains to see if any erosion around or below the rip-rap has taken or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

3.5 CHEMICAL MEASURES

A. Dust Control

1. Dust raised from vehicular traffic shall be controlled by wetting down roads with water or by the use of chemicals. Chemicals shall be applied in accordance with the manufacturer's recommendations.

B. Soil Binding

1. This temporary practice is intended for direct soil surface application to sites where the timely establishment of vegetation may not be feasible or where vegetative cover is absent or inadequate. **This temporary practice is not intended for application to surface waters of the state.** It is intended for application within construction storm water ditches and storm drains which, feed into previously constructed sediment ponds or basins.

2. Anionic Polyacrylamide (PAM) is available in emulsions, powders, gel bars and logs. It is required that other Best Management Practices be used in combination with anionic PAM. The use of seed and mulch for additional erosion protection beyond the life of anionic PAM is recommended. Use 50' setbacks when applying anionic PAM near natural water bodies. Never add water to PAM, add PAM slowly to water. If water is added to PAM, globs can form which can clog dispensers. This signifies incomplete

dissolving of PAM and therefore increases the risk of under application. Application rates shall conform to manufacturer's guidelines. **The maximum application rate of PAM, in pure form, shall not exceed 200pounds/acre/year.** Contractors using anionic PAM shall obtain and follow all Material Safety Data Sheet requirements and manufacturer's recommendations. Gel bars and logs of anionic PAM mixtures may be used in ditch systems. This application shall meet the same testing requirements as anionic PAM emulsions and powders. Maintenance will consist of reapplying anionic PAM to disturbed areas, including high traffic areas, which interfere in the performance of this practice.

3.6 MONITORING AND REPORTING

A. Each day, when any type of construction activity takes place on the construction site, Contractor's qualified personnel shall monitor and record rainfall, inspect all areas where petroleum products are stored, used or handled for spills and leaks from vehicles and equipment and check all locations where vehicles enter or exit the site for evidence of off site sediment tracking. These inspections shall be conducted until a Notice of Termination (NOT) is submitted. For linear construction where a phased activity is conducted, this paragraph applies to the active phase(s) of work.

B. Once every seven (7) calendar days and within 24 hours of the end of a storm 0.5 inches or greater, Contractor's qualified personnel shall inspect disturbed areas of the construction site that have not undergone final stabilization, areas used for storage of materials that are exposed to precipitation that have not undergone final stabilization and structural control measures (BMPs). Erosion and sediment control measures identified in the Erosion, Sedimentation and Pollution Control Plan shall be observed to ensure they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). These inspections must be conducted until a Notice of Termination is submitted. For linear construction where a phase activity is conducted, this paragraph applies to the active phase(s) of work.

C. Contractor's qualified personnel shall inspect a least once per month during the term of the General Permit, areas of the construction site having undergone final stabilization. These areas shall be inspected for evidence of, or the potential for, pollutants entering the drainage system and receiving water(s). Erosion and sediment control measure shall be observed to ensure they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving water(s). For linear construction, monthly inspections in accordance with this paragraph shall be made for those phases on which final stabilization has been completed.

D. Contractor shall prepare a report summarizing the scope of inspections, name(s) of qualified personnel making the inspections, date(s) of inspections, major observations relating to the implementation of the Erosion, Sedimentation and Pollution Control Plan and any actions taken. This report shall be retained on the construction site or be readily available at a designated alternate location until the entire site or portion of a construction project that was phased, has undergone final stabilization and a Notice of Termination (NOT) is submitted to

EPD. Such reports shall identify any incidents of non-compliance. Where the report does not identify any incidents of non-compliance, the report shall contain a certification that the facility is in compliance with the Erosion, Sedimentation and Pollution Control Plan and the General Permit. The report shall be signed in accordance with the General Permit.

3.7 SAMPLING AND ANALYSIS

A. Contractor must manually or automatically sample in accordance with the Comprehensive Monitoring Plan (CMP) at least once for each rainfall event described below. For a qualifying event, samples must be taken within forty-five (45) minutes of:

1. The accumulation of the minimum amount of rainfall, if the storm water discharge to a monitored receiving water or from a monitored outfall has begun at or prior to the accumulation.

2. The beginning of any storm water discharge to a monitored receiving water or from a monitored outfall, if the discharge begins after the accumulation of the minimum amount of rainfall.

However, where manual and automatic sampling are impossible (as defined in the permit), or are beyond the Contractor's control, the Contractor shall take samples as soon as possible, but in no case more than twelve (12) hours after the beginning of the storm water discharge.

B. Sampling shall occur for the following events:

1. The first rainfall event greater than or equal to 0.5 inches in 24 hours after the first implementation of BMPs.

2. In addition to (1) above, any rainfall event greater than or equal to 1.0 inches in 24 hours but no more than one (1) event per calendar month until a Notice of Termination (NOT) is submitted with final sampling data.

3. In addition to (1) and (2) above, any rainfall event greater than or equal to 2.0 inches in 24 hours until a Notice of Termination (NOT) is submitted with final sampling data.

4. Following final stabilization, at least one rainfall event greater than or equal to 0.5 inches in 24 hours.

5. In addition to (1), (2), (3) and (4) above, where BMPs have not been properly designed, installed or maintained in accordance with the General Permit, any rainfall event greater than or equal to 0.5 inches in 24 hours. This sampling must continue through the first rainfall event after BMPs have been properly designed, installed and maintained in accordance with the General Permit.

6. For linear construction, if at any time during the life of the project, BMPs have not been properly designed, installed or maintained for the construction activities that discharge into a receiving water which is not

being sampled, the Contractor shall sample that receiving water for the first rainfall event greater than or equal to 0.5 inches thereafter and for every rainfall event greater than or equal to 0.5 inches until BMPs are properly designed, installed and maintained.

C. Sampling shall be collected by "grab samples" and the analysis of these samples must be conducted in accordance with methodology and test procedures established in the General Permit. Sample containers shall be labeled prior to collecting the samples. Samples shall be well mixed before transferring to a secondary container. Large mouth, well cleaned and rinsed glass or plastic jars shall be used for collecting samples. The jars shall be cleaned thoroughly to avoid contamination. Manual or automatic sampling shall be utilized. Samples required by the General Permit shall be analyzed immediately, but in no case later than 48 hours after collection. However, samples from automatic samplers must be collected no later than the next business day after their accumulation, unless flow through automated analysis is utilized. Samples are not required to be cooled. Samples taken for the purpose of compliance with the General Permit shall be representative of the monitored activity and representative of the water quality of the receiving water(s) and/or the storm water outfalls using the following minimum guidelines:

1. The upstream sample for each receiving water(s) must be taken immediately upstream of the confluence of the first storm water discharge from the permitted construction site but downstream of any other storm water discharges not associated with the site. Where appropriate, several upstream samples from across the receiving water(s) may need to be taken and the average turbidity of these samples used for an upstream turbidity value.

2. The downstream sample for each receiving water(s) must be taken downstream of the confluence of the last storm water discharge from the construction site but upstream of any other storm water discharge not associated with the site. Where appropriate, several downstream samples from across the receiving water(s) may need to be taken and the average turbidity of these samples used for a downstream turbidity value.

3. Samples shall be taken from the horizontal and vertical center of the receiving water(s) or the storm water outfall channel(s).

4. Care shall be taken to avoid stirring the bottom sediments in the receiving water(s) or in the outfall storm water channel(s).

5. Sampling container shall be held so the opening faces upstream.

6. Samples shall be kept from floating debris.

D. For all construction sites and common developments other than linear construction projects, the Contractor shall sample all receiving water(s), or all outfall(s) or a combination of receiving water(s) and outfall(s). For linear construction projects, the Contractor must sample all perennial and intermittent streams and other water bodies shown on an USGS topographic map and all

other field verified perennial and intermittent streams and other water bodies, or all outfalls into such streams and other water bodies, or a combination thereof.

E. Contractor shall provide and implement all safety equipment and procedures necessary for sampling during hazardous weather conditions and in the event of biological, chemical or physical hazards

F. Contractor shall submit a summary of the monitoring results to the EPD at the address shown in the General Permit by the fifteenth day of the month following the reporting period. For a monitoring period during which no qualifying rainfall events occur, a monitoring report must be submitted stating such. Monitoring periods are calendar months beginning with the first month after the effective date of the General Permit. Monitoring reports shall be signed in accordance with the General Permit and submitted to EPD until such time as a NOT is submitted.

G. Contractor must retain copies of all monitoring results and monitoring information reported. In addition to other record keeping requirements, the monitoring information shall include:

1. Date, exact place and time of sampling or measurements.

2. Name(s) of the individual(s) who performed the sampling and measurements.

3. Date(s) analyses were performed.

4. Time(s) analyses were initiated.

5. Name(s) of the individual(s) who performed the analyses.

6. References and written procedures, when available, for the analytical techniques or methods used. A quality control/quality assurance program must be included in the written procedures.

7. The results of such analyses, including the bench sheets, instrument readouts, computer disks or tapes, used to determine these results.

END OF SECTION

INDEX TO

SECTION 02220 – EXCAVATION, BACKFILLING, AND COMPACTING

SECTION 02220

EXCAVATING, BACKFILLING AND COMPACTING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work included under this Section consists of clearing, excavating, grading and backfilling as required for the construction of the buildings, structures, piping and appurtenances as shown on the Drawings and specified herein.

B. Related Work Described Elsewhere:

1. JWSC Standards for Water and Sewer Design and Construction

2. Dewatering: Section 02140.

3. Site Clearing: Section 02110.

4. Earthwork: Section 02220.

5. *August 23, 2019, Terracon Geotechnical Engineering Investigation, Glynco Linear Force Water Main, Brunswick, Glynn County, Georgia, Terracon Project No. ES195146.*

C. Definitions:

1. Maximum Density: Maximum weight in pounds per cubic foot of a specific material.

2. Optimum Moisture: Percentage of water in a specific material at maximum density.

3. Rock Excavation: Excavation of any hard natural substance which requires the use of explosives and/or special impact tools such as jack hammers, sledges, chisels or similar devices specifically designed for use in cutting or breaking rock, but exclusive of trench excavating machinery.

4. Suitable: Suitable materials for fills shall be a non-cohesive, non-plastic granular local sand and shall be free from vegetation, organic material, marl, silt or muck and shall generally consist of soils classified SP per ASTM D-2487. The Contractor shall furnish all additional fill material required. Where shown on the Drawings, back fill shall be No. 57 stone meeting all applicable Georgia Department of Transportation standards. All fill and backfill material shall be subject to approval of the Engineer.

5. Unsuitable: Unsuitable materials are highly organic soil (peat or muck) or loose to very loose clayey soils classified as Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487 or Groups A-2-6, A-2-7, A-4, A-5, A-6, A-7, and A-8 according to AASHTO M 145, or a combination of these groups.

a. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.

D. Plan for Earthwork: The Contractor shall be responsible for having determined to his satisfaction, prior to the submission of his bid, the conformation of the ground, the character and quality of the substrata, the types and quantities of materials to be encountered, the nature of the groundwater conditions, the prosecution of the work, the general and local conditions and all other matters which can in any way affect the work under this Contract. Prior to commencing the excavation, the Contractor shall submit a plan of his proposed operations to the Engineer for review. The Contractor shall consider, and his plan for excavation shall reflect, the equipment and methods to be employed in the excavation. No claims for extras based on substrata or groundwater table conditions will be allowed.

1.02 QUALITY ASSURANCE

A. A Testing Laboratory employed by the Contractor and approved by the Engineer will make such tests as are specified. The Contractor shall schedule his work so as to permit a reasonable time for testing before placing succeeding lifts and shall keep the laboratory informed of his progress. Costs for all testing shall be paid by the Contractor, including any and all tests which have to be repeated because of the failure of the tested material to meet specifications. Testing Laboratory or Contractor shall provide a map of all test locations.

B. Determination of laboratory moisture-density relationship and maximum density shall be by modified Proctor method of ASTM D-1557. At least one (1) test per soil type shall be made.

C. In place soil density shall be determined either by use of the Drive Sleeve Method per ASTM D-2937 or by use of a Nuclear Density Meter per ASTM D-2922. In place field densities shall be taken at least one (1) every 2,500 square feet at not greater than one (1) foot vertical intervals for all areas of potential building construction. Field Density Tests are to be located no further than 300 feet apart on center with a minimum of one (1) per roadway and one (1) per 5,000 square feet of parking/maneuvering area. One (1) density test is required for each pad or isolated footing and for every 20 linear feet of strip/wall footing length. For each tank mat foundation at least four (4) in place field densities shall be taken. In place field densities shall be taken at least one (1) every 300 feet of utility trench and not further than one (1) foot vertically or per lift, whichever is less.

D. Fill material from offsite shall be tested using a minus 200 sieve wash to check grain size. At least one (1) such test shall be run per 500 cubic yards of material brought from offsite.

E. Compaction shall be deemed to comply with the Specifications if no tests fall below the specified relative compaction. The Contractor shall pay the costs of any retesting of work not conforming to the Specifications.

1.03 JOB CONDITIONS

A. If, in the opinion of the Engineer, conditions encountered during construction

warrant a change in structure elevation, or in the depth of removal of unsuitable material from that indicated on the Drawings, an adjustment will be made in the contract price by the unit cost, as provided per the Terms and Conditions of the Contract and the Schedule of Values.

1.04 PROTECTION

A. Pre-Construction Survey:

1. Prior to commencing excavation or dewatering, the Contractor shall conduct a survey of those existing structures which may be subject to settlement or distress resulting from excavation or dewatering operations.

2. The Contractor shall monitor the structures surveyed to ascertain evidence of settlement or distress. If settlement or distress becomes evident the Contractor shall be required to repair the structures to the previous condition to the satisfaction of the Engineer. Costs shall be paid by the Contractor.

B. Excavation Support

1. Furnish, install, monitor and maintain excavation support (e.g., shoring, sheeting, bracing, trench boxes, etc) as required by Federal, State or local laws, ordinances, regulations and safety requirements. Support the sides of excavation, to prevent any movement which could in any way reduce the width of the excavation below that necessary for proper construction and protect adjacent structures from undermining, settlement or other damage. Take care to prevent the formation of voids outside of sheeting. If voids occur behind sheeting, immediately backfill and compact the voids with common fill material. Voids in locations that cannot be properly compacted upon backfilling shall be filled with lean concrete.

2. Install excavation supports outside the neat lines of foundations. Supports shall be plumb and securely braced and tied in position. Excavation support shall be adequate to withstand all pressures to which the supports will be subjected. Any movement or bulging of supports shall be corrected to provide the necessary clearances, dimensions and structural integrity.

3. Excavation Supports Left in Place

a. Excavation supports that are required to remain in place, if applicable, are indicated on the Drawings.

b. The Owner or Engineer may direct that certain excavation supports remain in place, or be cut off at any specific elevation. Supports directed by the Owner or Engineer to be left in place and not so designated on the Drawings or otherwise specified herein to remain in place, will be paid for in accordance with Terms and Conditions of the Contract. If the Contractor believes that such a directive increases Contractor's cost and would thereby entitle Contractor to a change in contract cost, Contractor shall notify the Engineer in accordance with the applicable article(s) in the Terms and Conditions of the Contract pertaining to changes in the work.

c. The right of the Owner or Engineer to direct that certain excavation supports remain in place shall not be construed as creating any obligation on the Owner or Engineer to give such direction, nor shall failure to give such direction relieve the Contractor from liability for damages to persons or property occurring from or upon the work occasioned by negligence or otherwise, growing out of a failure on the part of the Contractor to leave in place sufficient excavation supports to prevent any movement of the ground or damage to adjacent structures.

4. Excavation supports shall be carefully removed in such manner so as not to endanger the Work or other adjacent structures, utilities, or property. All voids left or caused by withdrawal of supports shall be immediately filled with sand and compacted.

C. Pumping and Drainage:

1. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove all water entering excavations, and shall keep such excavations dry so as to obtain a satisfactory undisturbed suborder foundation condition until the fills, structures or pipes to be built thereon have been completed to such extent that they will not be floated or otherwise damaged by allowing water levels to return to natural levels. The Contractor shall engage a Geotechnical Professional Engineer registered in the State of Georgia, to design the temporary dewatering systems for all structures in accordance with Division 2 Section 02140 Dewatering. The dewatering system installed shall be in conformity with the overall construction plan, and certification of this shall be provided by the Geotechnical Professional Engineer. The Contractor shall be required to monitor the performance of the dewatering systems during the progress of the work and require such modifications as may be required to assure that the systems are performing satisfactorily.

2. Dewatering shall at all times be conducted in such a manner as to preserve the undisturbed bearing capacity of the suborder soils at proposed bottom of excavation and to preserve the integrity of adjacent structures. Well or sump installation shall be constructed with proper sand filters to prevent drawing of finer grained soil from the surrounding ground.

3. Water entering the excavation from surface runoff shall be collected in shallow ditches around the perimeter of the excavation, drained to sumps, and pumped from the excavation to maintain a bottom free from standing water.

4. The Contractor shall take all additional precautions to prevent uplift of any structure during construction.

5. The conveying of water in open ditches or trenches will not be allowed. Permission to use any storm sewers, or drains, for water disposal purposes shall be obtained from the authority having jurisdiction. Any requirements and costs for such use shall be the responsibility of the Contractor. However, the Contractor shall not cause flooding by overloading or blocking up the flow in the drainage facilities, and he shall leave the facilities unrestricted

and as clean as originally found. Any damage to facilities shall be repaired or restored as directed by the authority having jurisdiction, at no cost to the Owner.

6. Flotation shall be prevented by the Contractor by maintaining a positive and continuous operation of the dewatering system. The Contractor shall be fully responsible and liable for all damages which may result from failure of this system.

7. Removal of dewatering equipment shall be accomplished after the system is no longer required; the material and equipment constituting the system shall be removed by the Contractor.

8. The Contractor shall take all necessary precautions to preclude the accidental discharge of fuel, oil, etc. in order to prevent adverse effects on groundwater quality.

D. Trench Safety Practices:

1. The Contractor shall comply with the Federal Department of Labor, Bureau of Labor Standards, 29 CFR, 1926.650 Subpart P. All trench work shall be in compliance with requirements of the State of Georgia.

2. The Contractor shall submit written assurance with the associated cost that the trench excavator shall comply with all applicable trench safety standards.

1.05 SUBMITTALS

A. The Contractor shall submit sieve analysis for all soils and Testing Laboratory data in accordance with Special Conditions and JWSC Standards for Water and Sewer Design and Construction.

1.06 MEASUREMENT AND PAYMENT

A. Except as noted (such as for unsuitable soils) in Section 01025 Measurement and Payment, no payment will be made separately for Excavation, Backfilling, and Compaction. The cost thereof is included in the unit or lump sum price set forth for the items to which the excavation and backfill is incidental or appurtenant.

PART 2 - PRODUCTS

2.01 MATERIALS

A. General:

1. All fill and backfill material shall be subject to the approval of the Engineer.

2. All fill and backfill material shall be free of organic material, trash, or other objectionable material. Excess or unsuitable material shall be removed from the job site by the Contractor.

B. Common Fill Material: Common fill shall be sand and shall not contain stones, rock, concrete or other rubble larger than 2 inches in diameter. It shall have physical properties which allow it to be easily spread and compacted.

C. Structural Fill: Structural fill shall be reasonably well graded sand to gravelly sand having the following gradation:

U.S. Sieve Size	Percent Passing by Weight
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

To minimize capillary rise under the slabs on grade, the upper one (1) foot of soil in building pad areas shall consist of soils classified SP per ASTM D-2487 and shall have less than 2 percent passing the No. 200 sieve.

D. Select Fill material shall meet the following soil and gravel classifications as covered in ASTM D2321 and restated below:

1. Class I Soils*: Manufactured angular, granular material, 1/4 to 1-1/2 inches (6 to 4 mm) size, including materials having significance such as crushed stone or rock, broken coral, crushed slag, cinders, or crushed shells. Sieve analysis for crushed stone is given below separately.

   a. Crushed Stone: Crushed stone shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C-33 stone size No. 89 and with particle size limits as follows:

U.S. Sieve Size	Percent Passing by Weight
1/2	100
3/8	90-100
No. 4	20-55
No. 8	5-30
No. 16	0-10
No. 50	0-5

2. Class II - Coarse sands and gravels with maximum particle size of one and one half (1-1/2") inch, including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry. Soil Types GW, GP, SW, and SP (Unified Soil Classification System) are included in this class. In accordance with ASTM D-2487, less than 5 percent pass No. 200 sieve.

   a. GW: Well-graded gravels and gravel-sand mixtures, little or no fines. 50 percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

b. GP: Poorly graded gravels and gravel-sand mixtures, little or no fines. 50 percent or more retained on No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

c. SW: Well-graded sands and gravelly sands, little or no fines. More than 50 percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

d. SP: Poorly graded sands and gravelly sands, little or no fines. More than 50 percent passes No. 4 sieve. More than 95 percent retained on No. 200 sieve. Clean.

E. Coarse Sand: Sand shall consist of clean mineral aggregate with particle size limits as follows:

U.S. Sieve Size	Percent Passing by Weight
3/8 inch	100
No. 10	85-100
No. 40	20-40
No. 200	0-12

F. Other Material: All other material, not specifically described, but required for proper completion of the work shall be selected by the Contractor and approved by the Engineer.

PART 3 - EXECUTION

3.01 PREPARATION

A. Clearing:

1. The site shall be cleared in accordance with Division 2 Section 02110 Site Clearing.

2. The construction areas shall be cleared of all obstructions and vegetation including large roots and undergrowth, within 10 feet of the lines of the excavation.

3. Strip and stockpile topsoil on the site at the location to be determined by the Engineer.

3.02 EXCAVATION

A. General: Excavations for roadways, structures and utilities must be carefully executed in order to avoid interruption of any existing utilities and to minimize disruption of traffic flows.

B. Excavating for Roadways/Structures/Utilities:

1. Excavation shall be made to such dimensions as will give suitable room for building the foundations and the structures, for bracing and supporting, for pumping and draining, and for all other work required.

    a. Excavation for precast or prefabricated structures shall be carried to an elevation 2 feet lower than the proposed outside bottom of the structure to provide space for the selected backfill material. Prior to placing the selected backfill the excavation shall be sounded, if not dewatered, using a rigid pole to indicate to the satisfaction of the Owner that excavation has been carried to the proper depth and is reasonably uniform over the area to be occupied by the structure.

    b. Excavation for structures constructed or cast in place in dewatered excavations shall be carried down to the bottom of the structure where dewatering methods are such that a dry excavation bottom is exposed and the naturally occurring material at this elevation leveled and left ready to receive construction. Material disturbed below the foundation elevation in dewatered excavation shall be replaced with 3000 psi concrete.

    c. Footings: Cast-in-place concrete footing sides shall be formed immediately after excavation. Forming for footing sides is specified elsewhere.

2. Immediately document the location, elevation, size, material type and function of all new subsurface installations, and utilities encountered during the course of construction.

3. Excavation equipment operators and other concerned parties shall be familiar with subsurface obstructions as shown on the Drawings and should anticipate the encounter of unknown obstructions during the course of work.

4. Encounters with subsurface obstructions shall be hand excavated.

5. Excavation and dewatering shall be accomplished by methods which preserve the undisturbed state of suborder soils. Suborder soils which become soft, loose, "quick" or otherwise unsatisfactory for support of structures as a result of inadequate dewatering or other construction methods, shall be removed and replaced by crushed stone as required by the Engineer at the Contractor's expense.

6. The bottom of excavations shall be rendered firm and dry before placing any structure. Excavated material not suitable for backfill shall be removed from the site and disposed of by the Contractor.

7. All pavements shall be cut prior to removal, with saws and approved power tools.

8. Excavated material shall be stockpiled in such a manner as to prevent nuisance conditions. Surface drainage shall not be hindered.

9. All locations and elevations as required herein must be permanently documented by the Contractor, on the As-Built Drawings prior to the

Engineer approval of the Application for Payment for that work.

3.03 DRAINAGE

A. The Contractor shall at all times during construction provide and maintain proper equipment and facilities to remove promptly and dispose of properly all water entering excavations, and keep such excavations dry so as to obtain a satisfactory undisturbed suborder foundation condition. The dewatering method used shall prevent disturbance of earth below grade.

B. All water pumped or drained from the work shall be disposed of in a suitable manner without undue interference with other work, without damage to surrounding property, and in accordance with pertinent rules and regulations.

C. No construction, including pipe laying, shall be allowed in water. No water shall be allowed to contact masonry or concrete within 24 hours after being placed. The Contractor shall constantly guard against damage due to water and take full responsibility for all damage resulting from his failure to do so.

D. The Contractor will be required at his expense to excavate below grade and refill with approved fill material if the Owner determines that adequate drainage has not been provided.

3.04 UNDERCUT

A. If the bottom of any excavation is below that shown on the Drawings or specified because of Contractor error, convenience, or unsuitable suborder due to the Contractor's excavating method, he shall refill to normal grade with structural fill at his own cost. Fill material and compaction method shall be as directed by the Engineer.

3.05 FILL AND COMPACTION

A. Compact and backfill excavations according to the following schedule. (Proctor Standard shall be ASTM D-698, Modified Proctor Standard shall be ASTM D-1557):

B. STRUCTURES AND ROADWORK

Area	Material	Compaction
Backfill beneath Structures (footings and/or slab Excavations)	Structural Fill	6 inch lifts, compacted backfill beneath to 98 percent by Modified Proctor Method Maximum density. Fill should not be placed over any in-place soils until those deposits have been compacted to 98 percent Modified Proctor maximum

density.

Backfill beneath Roadways, Parking, and Service Drives *	Structural Fill	12 inch lifts, compacted backfill beneath to 100 percent by Standard Proctor Method Maximum density. Fill should not be placed over any in-place soils until those deposits have been compacted to 100 percent Standard Proctor maximum density.

*The upper one (1) foot of soils supporting slabs on grade or sidewalks should be compacted to 100 percent maximum dry density.

Utility Trenches	Select Fill/ Structural Fill (beneath Roadways)	6 inch lifts (to 1 ft above pipe), compacted backfill beneath to 98 Percent by Modified Proctor Method Maximum density. Fill should not be placed over any in-place soils until those deposits have been compacted as indicated.
Around structures	Select Fill	6 inch lifts, 95 percent of Modified Proctor maximum density by Proctor Method. Use light rubber-tired or vibratory plate compactors.
Non-structural Areas	Common Fill	12 inch lifts, 90 percent of Modified Proctor Method

B. Pipe shall be laid in open trenches unless otherwise indicated on the Drawings or elsewhere in the Contract Documents.

C. Excavations shall be backfilled to the original grade or as indicated on the Drawings. Deviation from this grade because of settling shall be corrected. Backfill operation shall be performed to comply with all rules and regulations and in such a manner that it does not create a nuisance or safety hazard.

D. Embankments shall be constructed true to lines, grades and cross sections shown on the Drawings or ordered by the Owner and Engineer. Embankments shall be placed in successive layers of not more than 12 inches in thickness, loose measure, for the full width of the embankment. As far as practical, traffic over the work during the construction phase shall be distributed so as to cover the maximum surface area of each layer.

E. If the Contractor requests approval to backfill material utilizing lifts and/or methods other than those specified here, such request shall be in writing to the Engineer. Approval will be considered only after the Contractor has performed tests, at the Contractor's expense, to identify the material used and density achieved throughout the backfill area utilizing the method of backfill requested. The Owner's approval will be in writing.

END OF SECTION

INDEX TO

SECTION 02660 – WATER DISTRIBUTION SYSTEMS

SECTION 02660

WATER DISTRIBUTION SYSTEM

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Installation of water distribution system piping, valves, and appurtenances.

B. Reference BGJWSC Water and Sewer Standards, Section 2 Water Distribution Systems, for general requirements.

PART 2 – PRODUCTS

2.1 General

A. Reference BGJWSC Water and Sewer Standards, Section 2 Water Distribution Systems, for water distribution product requirements.

PART 3 – EXECUTION

3.1 Installation and Testing

A. Reference BGJWSC Water and Sewer Standards, Section 2 Water Distribution Systems, for water distribution system installation and testing requirements.

END OF SECTION

INDEX TO

SECTION 02662 – SANITARY SEWER SYSTEMS

SECTION 02662

SANITARY SEWER SYSTEMS

PART 1 – GENERAL

1.1 SCOPE OF WORK

A. Installation of sanitary sewer systems including gravity sewer piping, manholes, forcemains, valves, and appurtenances.

B. Reference BGJWSC Water and Sewer Standards, Section 3 Gravity Sewer Systems, for general requirements of gravity sewer components.

C. Reference BGJWSC Water and Sewer Standards, Section 4 Sanitary Sewer Lift Stations and Force Mains, for general requirements of forcemain systems, valves and appurtenances.

D. In addition to BGJWSC Water and Sewer Standards, reference CSX Design and Construction Standard Specifications, Pipeline Occupancies (latest version) and Construction Drawings for additional requirements of steel casing pipe installation under CSX railroad right-of-way by Jack-and-Bore. https://www.csx.com/index.cfm/library/files/customers/property-real-estate/permitting/pipeline-design-construction-specifications/

PART 2 – PRODUCTS

2.1 GENERAL

A. Reference BGJWSC Water and Sewer Standards, Section 3 Gravity Sewer Systems, for gravity sewer components product requirements.

B. Reference BGJWSC Water and Sewer Standards, Section 4 Sanitary Sewer Lift Stations and Force Mains, for forcemain systems, valves and appurtenances product requirements.

PART 3 – EXECUTION

3.1 INSTALLATION AND TESTING

A. Reference BGJWSC Water and Sewer Standards, Section 3 Gravity Sewer Systems, for gravity sewer components installation and testing requirements.

B. Reference BGJWSC Water and Sewer Standards, Section 4 Sanitary Sewer Lift Stations and Force Mains, for forcemain systems, valves and appurtenances installation and testing requirements.

C. Jack-and-Bore Operations under CSX railroad right-of-way.

1. No work withing the CSX Transportation (CSXT) right-of-way shall be conducted until JWSC has completed negotiation of the CSX Utility Encroachment Permit and all work activities have been scheduled with CSX.
2. Casing/carrier pipes placed under CSX tracks shall not be less than 5.5 feet from base of rail to top of pipe at its shallowest point.
3. Contractor responsible for providing design plans and computations for the jacking and receiving pits stabilization. Plans and computations shall be sealed by a licensed Professional Engineer, registered in the State of Georgia. Must be submitted to CSXT prior to the start of construction and must obtain approval from CSXT's Chief Engineer, Design and Construction, prior to beginning and work on or which may affect CSXT property. Sheeting shall be designed to support all lateral forces causes by the earth, railroad and other surcharge loads.
4. Contractor responsible for providing all necessary dewatering operations for Jack-and-Bore operations. Dewatering Plan shall be sealed by a licensed Professional Engineer, registered in the State of Georgia.

END OF SECTION

INDEX TO

SECTION 02922 – LOAMING, SEEDING AND MULCHING

SECTION 02922

LOAMING, SEEDING, AND MULCHING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The Contractor shall furnish all labor, materials, equipment, incidentals necessary and place loam finish grade, seed, and maintain all seeded areas as specified herein including all areas disturbed by the Contractor's operations.

B. Related Work Described Elsewhere:

1. Earthwork: Section 02200.
2. Construction Drawings – Erosion Control Plans.

1.02 WARRANTY

A. All restoration and re-vegetation work shall be subject to the one (1) year warranty period of the Contract as specified in the Special Conditions of the Contract herein.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Loam (topsoil) shall be fertile, natural soil, typical of the locality, free from large stones, roots, sticks, peat, weeds and sod and obtained from naturally well drained areas. It shall not be excessively acid or alkaline nor contain toxic material harmful to plant growth. Topsoil stockpiled under other Sections of this Division may be used, but the Contractor shall furnish additional loam at his own expense, if required. All areas disturbed by the Contractor's operations which are not to be sodded shall be seeded as specified herein, in addition to those areas delineated on the plans for seeding.

B. Fertilizer shall be complete commercial fertilizer, 6-12-12 (First and Second Year) and 10-10-10 (Maintenance Year), reference Erosion Control Plans, or as recommended by the seed supplier. It shall be delivered to the site in the original unopened containers each showing the manufacturer's guaranteed analysis. Store fertilizer so that when used it shall be dry and free flowing.

C. Lime shall be ground limestone.

D. Seed shall be from the same or previous year's crop; each variety of seed shall have a percentage of germination not less than 90, a percentage of purity not less than 85, and shall have not more than a one (1) percent weed content.

D. Temporary seed shall be Rye, Sudangrass, or Pearl Millet based on the planting date

and shall be applied at the rate indicated in the Erosion Control drawings and notes. Permanent seed for final stabilization shall be Pensacola Bahia and shall be applied at the rate indicated in the Erosion Control drawings and notes.

F. Seed shall be delivered in sealed containers bearing the dealer's guaranteed analysis.

G. Mulch shall be clean small-grain straw.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Loam shall be placed to a minimum depth of 4 inches.

B. Lime shall be applied at the rate necessary to achieve a pH of 6 to 7.

C. Fertilizer shall be applied at the rate of 800 pounds per acre.

D. The subgrade of all areas to be loamed and seeded shall be raked and all rubbish, sticks, roots, and stones larger than 2 inches shall be removed. Loam shall be spread and lightly compacted to finished grade. Compacted loam shall not be less than the depth specified. No loam shall be spread in water or while frozen or muddy.

E. After the loam is placed and before it is raked to true lines and rolled, limestone shall be spread evenly over loam surface and thoroughly incorporated with loam. Lime shall be added in sufficient quantity to provide a soil pH of 6 to 7.

F. Fertilizer shall be uniformly spread and immediately mixed with the upper 2 inches of topsoil.

G. Immediately following this presentation the seed shall be uniformly applied and lightly raked into the surface. Lightly roll the surface and water with fine spray.

H. All seeded areas shall be mulched with clean small-grain straw at a rate of 1-1/2 to 2 tons per acre. Latex acrylic copolymer, or organic tackifier shall be a commercial product specifically manufactured for use as straw mulch tackifier. An asphalt tackifier shall only be used when temperatures are too low to allow the use of a latex acrylic copolymer and only with prior written approval from the Engineer. Mechanical tacking will be considered on a case-by-case basis as approved by the Engineer.

I. The Contractor shall keep all seeded areas watered and in good condition, reseeding if and when necessary, until a good, healthy, uniform growth is established over the entire area seeded, and shall maintain these areas in an approved condition until final acceptance of the Contract.

J. On slopes, the Contractor shall protect against washouts by an approved method. Any washout which occurs shall be regraded and reseeded at the Contractor's expense until good sod is established.

K. The Contractor shall maintain the areas in grass in a neat manner by watering, mowing, raking clippings and leaves, and appurtenances until the project is completed.

END OF SECTION

INDEX TO

SECTION 02934 – SOLID SODDING

SECTION 02934

SOLID SODDING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work: The work specified in this Section consists of establishing a stand of grass, within the areas indicated on the Drawings or Specifications, by furnishing and placing grass sod. Also included are fertilizing, watering and maintenance as required to assure a healthy stand of grass.

B. Related Work Described Elsewhere:

1. Earthwork: Section 02200.
2. Construction Drawings – Erosion Control Plans.

1.02 SUBMITTALS

A. A certification of sod quality by the producer shall be delivered to the Engineer ten (10) days prior to use.

1.03 WARRANTY

A. All restoration and re-vegetation work shall be subject to the one (1) year warranty period of the Contract as specified in the Special Conditions of the Contract herein.

PART 2 - PRODUCTS

2.01 GRASS SOD

A. Grass sod shall be matched to existing lawn and shall be well matted with grass roots. The sod shall be taken in rectangles, preferably 12 inch by 24 inch, shall be a minimum 2 inches in thickness and shall be live, fresh and uninjured at the time of planting. Sod type shall be as required by Glynn County within their respective areas. If no specific requirement is made, supplied sod shall be Bahia grass.

B. It shall be reasonably free of weeds and other grasses and shall have a soil mat of sufficient thickness adhering firmly to the roots to withstand all necessary handling. The sod shall be planted as soon as possible after being dug and shall be shaded and kept moist until it is planted.

2.02 FERTILIZER

A. Commercial fertilizer shall comply with the state fertilizer laws.

B. The numerical designations for fertilizer indicate the minimum percentages (respectively) of (1) total nitrogen, (2) available phosphoric acid and (3) water-soluble potash contained in the fertilizer.

C. The chemical designation of the fertilizer shall be 6-12-12 (First and Second Year) and 10-10-10 (Maintenance Year), reference Erosion Control Plans, or as recommended by the sod supplier. At least 50 percent of the nitrogen shall be derived from organic sources. At least 50 percent of the phosphoric acid shall be from normal super phosphate or an equivalent source which will provide a minimum of two units of sulfur.

The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container.

2.03 WATER FOR GRASSING

A. The water used in the sodding operations shall be obtained from potable water sources. Contractor shall be responsible for transporting water from the source of supply and applying it to the sodded area.

PART 3 - EXECUTION

3.01 PREPARATION OF GROUND

A. The area over which the sod is to be placed shall be scarified or loosened to a depth of at least four (4) inches and then raked smooth and free from debris. Where the soil is sufficiently loose and clean, the Engineer, at his discretion, may authorize the elimination of ground preparation.

3.02 APPLICATION OF FERTILIZER

A. Before applying fertilizer, the soil pH shall be brought to a range of 6.0 to 7.0.

B. The fertilizer shall be spread uniformly over the area to be sodded at the rate recommended by the fertilizer manufacturer, by a spreading device capable of uniformly distributing the material at the specified rate. Immediately after spreading, the fertilizer shall be mixed with the soil to a depth of approximately 4 inches.

C. On steep slopes, where the use of a machine for spreading or mixing is not practicable, the fertilizer shall be spread by hand and raked in and thoroughly mixed with the soil to a depth of approximately 2 inches.

3.03 PLACING SOD

A. The sod shall be placed on the prepared surface, with edges in close contact and shall be firmly and smoothly embedded by light tamping with appropriate tools.

B. Where sodding is used in drainage ditches, or on slopes of 4:1 or greater, the setting of the pieces shall be staggered so as to avoid a continuous seam along the line of low. Along the edges of such staggered areas, the offsets of individual strips shall not exceed 6 inches. In order to prevent erosion caused by vertical edges at the outer limits, the outer pieces of sod shall be tamped so as to produce a feather-edge effect.

C. On slopes greater than 2:1, the Contractor shall, if necessary, prevent the sod from sliding by means of wooden pegs driven through the sod blocks into firm earth, at suitable intervals.

D. Sod which has been cut for more than 72 hours shall not be used unless specifically authorized by the Engineer after his inspection thereof. Sod which is not planted within 24 hours after cutting shall be stacked in an approved manner and maintained and properly moistened. Any pieces of sod which, after placing, show an appearance of extreme dryness shall be removed and replaced by fresh, uninjured pieces.

E. Sodding shall not be performed when weather and soil conditions are, in the Engineer's opinion, unsuitable for proper results.

3.04 WATERING

A. The areas on which the sod is to be placed shall contain sufficient moisture, as determined by the Engineer, for optimum results. After being placed, the sod shall be kept in a moist condition to the full depth of the rooting zone for at least 2 weeks. Thereafter, the Contractor shall apply water as needed until the sod roots and starts to grow for a minimum of 60 days (or until final acceptance, whichever is latest).

3.05 MAINTENANCE

A. The Contractor shall, at his expense, maintain the sodded areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include repairing of any damaged areas and replacing areas in which the establishment of the grass stand does not appear to be developing satisfactorily.

B. Replanting or repair necessary due to the Contractor's negligence, carelessness or failure to provide routine maintenance shall be at the Contractor's expense.

END OF SECTION

INDEX TO

SECTION 02960 – TEMPORARY SEWER BYPASS SYSTEMS

SECTION 02960

TEMPORARY SEWER BYPASS SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall design the systems and furnish all tools, supplies, materials, labor, equipment, fuel, and maintenance necessary for the installation, testing, placing into operation, maintaining, and monitoring of temporary bypass systems for the purpose of diverting sewer flow around components of the JWSC existing sewer system. At no point during the setup, installation, operation, or demobilization of the temporary bypass systems shall interruption of the sewer flow upstream or downstream of the bypassing location be caused. Should such interruption or backup of existing sewer infrastructure occur, Contractor shall provide all equipment and vacuum/pumper trucks which may be necessary to reduce the potential for sewer spills and maintain the up and downstream flows, and properly dispose of all collected sewage.

1. Temporary sewer bypass systems will be required upstream of PS4036 near B&W Grade Road during the contract period for installation of segments of new 30-inch gravity sewer, new 8-feet diameter manhole, and tie-in of 30-inch gravity sewer and 24-inch forcemain.
2. Contractor shall monitor, log and report pumping flow data to JWSC.
3. Temporary sewer bypass operations will be required for the following activities:
    a. To establish bypass pumping operations from the existing manhole upstream of PS4036 in the yard of 1250 B&W Grade Road to the existing manhole in the PS4036 site at 1253 B&W Grade Road, bypassing the existing 30-inch gravity sewer pipe.

B. The design, installation, operation, and monitoring of the temporary bypass pumping systems shall be the Contractor's responsibility. The Contractor shall employ the services of a vendor who can demonstrate to the JWSC and Engineer that it specializes in the design and operation of temporary bypass pumping systems. The vendor shall provide at least five (5) references of projects of a similar size and complexity as this project performed by the vendor's firm within the past ten (10) years.

C. The bypass systems shall meet the requirements of all Federal, State, and Local codes and regulatory agencies having jurisdiction.

1.02 DEFINITIONS

A. "Interruption of pumping operations" is defined as any activity that will result in a change in the current method of operation. Contractor shall request such "interruption of pumping operations" from JWSC no less than ninety-six (96) hours

in advance. JWSC may defer the request as allowed by Article 2.01 A. 4. of this Section.

B. "Partial Utilization", "Substantial Completion", and "Warranty Period for Items in Continuous Service": Refer to the "Contract Documents" for definition.

C. The terms "open, close, start, stop, operate, verify, energize, de-energize, transfer, switchover, etc." when used in conjunction with permanent equipment that is in-service or about to be placed in-service are understood to mean: JWSC's operation or maintenance staff shall perform the operation upon written request from the Contractor.

D. The term "operational test" refers to the period of specified duration that the installed system is tested to verify operational integrity of a system prior to placing the system in-service. Operational testing requires that representatives of the equipment manufacturers be on-site for timely identification and resolution of system issues.

E. "Low Flow Period" refers to the time of day when the sewer flow rate in the system reaches the diurnal minimum. It typically occurs between the hours of 3 AM and 7 AM but shall be verified by JWSC.

1.03 SUBMITTALS

A. Bypass Systems Plan: The Contractor shall submit to the JWSC/Engineer detailed Drawings and shop drawings outlining all provisions and precautions to be taken by the Contractor regarding the handling of existing sewer flows. The Bypass Systems Plan shall be signed and sealed by a Professional Engineer registered in the State of Georgia. The Bypass Systems Plan shall be specific and complete, including such items as schedules, locations, elevations, capacities of equipment, materials, connections, fuel storage, and all other incidental items necessary to provide satisfactory bypassing operations and backups for each of the proposed activities identified in paragraph 1.01 A. 2. The Bypass Systems Plan shall provide sufficient detail to ensure proper protection of PS4036, the existing forcemains and gravity sewer, and other relevant JWSC facilities, including protection of the access and bypass pumping locations. **No bypassing activities or construction shall begin until all provisions and requirements have been reviewed and approved by the JWSC and Engineer.** The Bypass Systems Plan shall include, but is not limited to, the following details for each of the proposed activities identified in paragraph 1.01 A..:

1. Detailed drawings showing all required equipment and staging areas for pumps, tanks, fuel storage, and piping within the project site, at PS4036 and/or Glynn County right-of-way areas;

2. Plugging methods and types of plugs;

3. Number, size, material, location and method of installation of suction piping;

4. Number, size, material, method of installation and location of installation of discharge piping;

5. Bypass pump sizes, capacity, number of each size to be on site and fuel/electrical requirements;

6. Pump curves showing pump operating range are to be submitted;

7. Fuel storage information and tank size;

8. Thrust and restraint block sizes and locations as necessary in accordance with manufacturer/supplier of LineStops, Insert Valves, and other equipment to be installed within piping;

9. Sections showing suction and discharge bypass piping depth, embedment, select fill and special backfill, and any equipment necessary to maintain vehicular and construction equipment in driveways and parking areas; modification of existing structures including manholes to allow for efficient installation of bypass pumping equipment and operation.

10. Method of noise control for each bypass pump. The project site is located within a residential area.

11. Any temporary pipe supports and anchoring required;

12. Design for access to bypass system operation locations indicated on the Drawings and specified herein;

13. Calculations and selection of bypass pump pipe size(s); including static lift, friction losses, and flow velocity (pump curves showing pump operating range shall be submitted);

14. Schedule for installation of and maintenance of bypass pumping lines.

15. Emergency plan for adverse weather and flooding for various phases of the Work and bypass system operation locations.

16. Contractors plan for providing continuous monitoring of the bypass pumping operations including qualifications of any onsite monitoring persons and specifications of any electronic monitoring operations.

17. Necessary restoration including repairs to existing structures which were modified to install and operate bypass pumping equipment.

18. Standby power generator size and location (for electric pumps).

B. Sequence of Bypass System Operations

1. The Contractor shall develop a Sequence of Bypass System Operations regarding staging of piping connections and equipment. Under no circumstances shall the proposed Sequence of Bypass System Operations lead to an interruption of the

pump stations or sewer collection system directly upstream of the bypass location or of the downstream operations at PS4036 during the project.

2. Contractor shall submit the proposed Sequence of Bypass System Operations to the JWSC and Engineer for review and approval in conjunction with the Bypass Systems Plan. The Sequence of Bypass Systems Operations shall define work to be performed, including the following items:

   a. Definition of the start date, duration and end date for each of the segments of the work at each bypass location.

   b. For each segment of work, define activities to be performed by or witnessed by JWSC and date on which these activities are to be performed.

   c. Scheduling/timing of manufacturer's field services, as specified.

3. Provide complete list of equipment and material that is required to perform each segment of work.

1.04 SCHEDULE OF BYPASS OPERATIONS

Contractor shall provide bypassing operations for the following activities/locations identified in 1.01 A. as noted below:

A. To establish bypass pumping operations from the existing manhole upstream of PS4036 in the yard of 1250 B&W Grade Road to the existing manhole in the PS4036 site at 1253 B&W Grade Road, bypassing the existing 30-inch gravity sewer pipe.

   1. The establishment of these bypass systems shall be conducted as necessary to prepare for and complete the installation of segments of new 30-inch gravity sewer, new 8-feet diameter manhole, and tie-in of the 30-inch gravity sewer and 20-inch forcemain to manhole upstream of PS4036.
   2. These bypass systems shall remain in operation, at a minimum, until the gravity sewer and forcemain connections to the new manhole has been made.

1.05 MEASUREMENT AND PAYMENT

A. Payment for Temporary Bypass Sewer Systems shall not be made separately. The cost thereof is included in the unit or lump sum price set forth for the items to which the temporary bypass sewer system operations are necessary. Reference Section 01025 Measurement and Payment for additional information.

PART 2 – PRODUCTS

2.01 PUMPING EQUIPMENT

A. General:

1. It is essential to the operation of the JWSC's sewer system that there be no interruption in the conveyance of wastewater to and from any of the proposed bypass system locations throughout the duration of the project. To this end, the Contractor shall provide, maintain, operate, and monitor all temporary facilities such as dams, plugs, pumping equipment (both primary and back-up units as required), conduits, all necessary fuel, and all other labor and equipment necessary to intercept the sewer flow before it reaches the point where it would interfere with the construction work, carry it past the work and return it to the existing sewer system downstream of the work.

2. It is the Contractor's responsibility to provide equipment that is adequate for the performance of the temporary bypassing operations under this Contract within the time specified. All equipment shall be kept in satisfactory operating condition, shall be capable of safely and efficiently performing the required operations, and shall be subject to review by the JWSC's Representative at any time within the duration of the Contract. All operations hereunder shall conform to the applicable requirements of the OSHA Standards for construction.

3. Should the Contractor fail to maintain the continuous operation of the bypass systems and operations, JWSC shall repair/operate the bypass systems to include materials, sewage hauling and any other activities required and shall look to recover costs incurred during its operation/repair of the temporary bypass system or other pump stations affected from monies owed the Contractor for other portions of the project work.

4. Operational requirements take precedence over Contractor activities. Therefore, interruption of the influent flow of wastewater to PS4036 will not be allowed and all bypassing operations shall be coordinated with and are subject to the operational requirements of JWSC.

5. The Contractor shall provide for utilities and services for its own operations. The Contractor shall furnish, install and maintain all temporary utilities during the contract period including removal upon completion of the project work.

6. Pumps used shall be fully automatic self-priming units that do not require the use of foot-valves or vacuum pumps in the priming system.

7. The pumps may be electric or diesel/fuel powered.

8. All pumps must have solar batteries and solar battery chargers for the bypass pump starters, both provided by the same manufacturer.

8. Each pump shall be fully enclosed with sound attenuated panels by the pump manufacturer (<69 db at 30 feet) due to the proximity to housing units.

9. All pumps used shall be constructed to allow dry running for long periods of time to accommodate the cyclical nature of the flows.

10. All pumps shall be High Pressure Solids Handling Self-Priming Pumps as manufactured by Godwin Critically Silenced Dri-Prime Pumps by Xylem, or JWSC/Engineer approved equal.

11. Furnish each pump with the necessary stop/start and liquid level controls.

12. Each bypass location utilizing pumping systems shall have 100% supplemental pumping capability in standby for the entire required bypass capacity.

14. Contractor shall not be permitted to stop or impede the sewer system flows under any circumstances except as otherwise defined and approved by JWSC and Engineer. The Contractor shall maintain sewer flow around the work area in a manner that will not cause surcharging of sewers, damage to sewers and that will protect public and private property from damage and flooding.

15. The Contractor shall protect water resources, wetlands and other natural resources.

B. Temporary Bypass System Requirements: The Contractor shall be responsible for the construction, mobilization/demobilization, maintenance, operation, and monitoring of the temporary bypass facilities as described herein and indicated on the Drawings. Bypass systems shall be operated 24 hours per day once placed into operation until JWSC approves demobilization of system. **100% supplemental pumping capability shall be provided at each bypass location/installation in standby. Standby pump shall be piped and completely online, isolated only by a valve from the primary system. All Flow and TDH information shall be verified and approved prior to installing temporary bypass systems.**

1. 30-inch Gravity Sewer Bypass Upstream of PS4036

To establish bypass pumping operations from the existing manhole upstream of PS4036 in the yard of 1250 B&W Grade Road to the existing manhole in the PS4036 site at 1253 B&W Grade Road, bypassing the existing 30-inch gravity sewer pipe. Bypass operations are necessary in order to prepare for and complete the installation of segments of new 30-inch gravity sewer, new 8-feet diameter manhole, and tie-in of the 30-inch gravity sewer and 24-inch forcemain to manhole upstream of PS4036.

Primary Operating Condition	
Estimated Peak Flow and required minimum capacity: 5000 GPM	Distance from suction to discharge locations: 250 LF Depth of Suction MH: ~ 18.0 Ft. Bypass System Designer to determine TDH conditions.

Contractor shall calculate system head conditions based on their proposed suction and discharge piping systems and locations, for both typical operation and peak conditions with primary and standby pump operation. Contractor shall utilize the number of pumps necessary to

satisfactorily move flow from/to the identified suction and discharge points without potential for backup in the existing gravity sewer system. Total peak flow bypass pumping capability for the bypass system shall be 5000 GPM.

C. Additional Bypass Requirements

1. All backup/standby pumps shall be piped into the suction and discharge piping/headers and shall be on-line and ready for use in the event they are needed.

2. All bypass pumps (lead, lag, backup) shall have a performance curve that meets the performance curve for the operating conditions indicated in 2.01 B 1. with pump established on ground elevation as shown on the drawings.

3. Contractor shall provide continuous monitoring of the bypass pumping operations whether by qualified onsite monitoring persons or by electronic monitoring operations to ensure continuous operation of the system.

4. The bypass pumps shall be quiet models producing no more than 69 dBA at a distance of 30 feet.

5. Provide all pipeline plugs, LineStops, Insert Valves, pumps of adequate size to handle peak flows, and temporary suction and discharge piping and fittings to ensure that the total current flow capacities indicated can be safely diverted during the project.

6. The Contractor shall make all arrangements for temporary bypass pumping operations during the time when the sewer infrastructure is shut down/offline for any reason.

7. Discharge Piping shall be constructed of steel, ductile iron, or polyethylene pipe with positive, restrained joints. Under no circumstances will aluminum “irrigation” type piping or glued PVC pipe be allowed. Discharge hose will only be allowed in short sections and by specific permission from the JWSC/Engineer.

8. Operation: The bypass pumps shall have variable capacity by controlling the speed of the diesel engine. Each pump shall have a separate control panel.

9. Provide vacuum and pressure gauges on the suction and discharge headers.

10. Provide liquid level controls to automatically change the speed of the pumps to suit the incoming flow conditions.

11. Control Sequence – Contractor shall coordinate with JWSC operations staff to determine appropriate set points and controls for temporary bypass pumping operations including lead and lag pumps.

12. All fuel required for the bypass pumps is the responsibility of the Contractor. Pumps are to have adequate fuel at all times while onsite.

PART 3 – EXECUTION

3.01 PREPARATION

A. The Contractor shall be responsible for locating any existing utilities in the area where the Contractor selects to locate the bypass equipment, pumps and pipelines. The Contractor shall locate the bypass pipelines to minimize any disturbance to existing utilities and shall obtain approval of the pipeline locations from JWSC and the Engineer. All costs associated with relocating utilities and obtaining all approvals shall be paid by the Contractor. Driveway access and parking areas shall not be impeded by bypass piping.

B. During bypass operations, the Contractor shall protect PS4036, gravity sewers, and all infrastructure from damage inflicted by the Contractor's equipment and operations. The Contractor shall be responsible for all physical damage to existing infrastructure caused by human or mechanical failure.

C. During bypass pumping, Contractor shall not allow sewage to be leaked, dumped, or spilled in or onto any area outside of the existing sanitary sewer system.

D. In the event of accidental spill or overflow, Contractor shall immediately stop the discharge and take action to clean up and disinfect the spill. Promptly notify JWSC and Engineer so that required reporting can be made. Refer to the Special Conditions for additional requirements.

E. In the event of accidental spill or overflow, the Contractor is responsible for any damages that may have occurred to public or private property including cleaning, disinfection, and other corrections to the satisfaction of the Engineer at no cost to the Owner.

3.02 INSTALLATION AND REMOVAL

A. The Contractor shall pipe sections or make connections to the existing suction and discharge structures and shall construct temporary bypass pumping structures only at the access locations indicated on the Drawings, as approved in the Bypass Systems Plan and Sequence, and as may be required to provide an adequate suction and discharge conduit, unless otherwise approved by JWSC and Engineer.

B. Plugging or blocking of sewer flows shall be performed with the use of plugs and/or LineStops (if appropriate and approved) which shall be installed by contractors approved by JWSC. When plugging or blocking is no longer needed for performance of the work, the plugs shall be removed in a manner that permits the sewer flow to slowly return to normal without surge, surcharging, or causing other major disturbances downstream.

C. The installation of bypass pipelines is prohibited in all wetland areas. When the bypass pipelines cross driveways or local streets, the Contractor must place the bypass pipelines in trenches and cover with traffic rated plates or temporary pavement.

D. At the conclusion of the bypass system operations, when all of the relevant modifications are complete, tested, and ready for operation, the Contractor shall demonstrate the new system in automatic mode for 72 hours. At the completion of the demonstration period, and upon receipt of JWSC's/Engineer's written approval, the Contractor shall remove all the piping and bypass pumping equipment, restore all property to pre-construction condition and restore all pavement.

3.03 CONTROL REQUIREMENTS

A. Contractor shall provide back-up power (i.e. generator) for all electric by-pass pumps required to complete the work. Contractor shall provide alarms for all by-pass pumps used to complete the work. The JWSC is not obligated to supply any equipment.

B. Contractor shall provide continuous bypass monitoring for bypass pumps and backup bypass pumping system.

C. Contractor shall provide 110 V power and phone service for operation of the autodialer during bypass pump operation.

D. Contractor shall provide a high-level mercury float switch in the suction manhole for the bypass pumps. The mercury float switch shall be enclosed in a smooth, chemical resistant urethane or polypropylene casing suspended on its own cable. The cable shall be of proper length to reach from the float switch in the manhole to the autodialer location without splices. The autodialer location shall be designated by the JWSC. Contractor shall bury the cable for the float switch in the trench with the bypass suction lines.

3.04 QUALITY CONTROL AND MAINTENANCE

A. Testing: Contractor shall perform leakage and pressure tests of the bypass pumping discharge piping using clean water prior to actual operation. The Engineer and JWSC shall be given 24 hours notice prior to testing.

B. Inspection: Contractor shall inspect the bypass pumping system a minimum of twice daily, typically at the beginning and end of the work day, to ensure that the system is working correctly.

C. Maintenance Service: Contractor shall insure that the temporary bypass system is properly maintained and a responsible operator shall inspect the bypass pumping and other equipment a minimum of once daily during all times when pumps are operating.

D. Monitoring: The Contractor shall be responsible for monitoring the bypass operations 24 hours per day, 7 days per week. Any electronic monitoring in lieu of

onsite monitoring must be detailed in the comprehensive written Bypass Systems Plan and approved by JWSC and Engineer.

E. Extra Materials: Spare parts for pumps and piping shall be kept on site as required. Adequate diesel fuel storage for pumps shall be provided to maintain constant operations of the pumps.

3.05 COORDINATION

A. The Contractor shall submit a Sequence of Bypass Operations in accordance with 1.03 B. which details the interruptions to be made which the Contractor shall be fully responsible for. One week prior to connections being made to existing structures or pipes, a coordination meeting shall be held between the Contractor, Engineer, and JWSC to discuss the approved construction plan.

B. Schedule of construction, interconnecting details, and other revisions necessary for proper interfacing of the Work shall be subsequently modified by Contractor accounting for results of said coordination meeting. The JWSC and Engineer shall be notified 24 hours prior to any actual interruptions or connections being made. No bypassing operations shall begin prior to securing JWSC's approval of respective connection plan and work schedule.

3.06 EMERGENCY CONTACT REQUIREMENTS

A. Contractor shall provide two (2) emergency phone numbers that will be programmed into the auto dialer during operation of the bypass. The first two alarm calls will be made to the contractor, and the second two alarm calls will be sent to the JWSC. The contractor must call **Jason Vo at 912-324-9905** to acknowledge receipt of each alarm call.

END OF SECTION

INDEX TO

SECTION 15000 – MECHANICAL – GENERAL REQUIREMENTS

SECTION 15000

MECHANICAL - GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

1. All equipment furnished and installed under this contract shall conform to the general stipulations set forth in this section and with the JWSC Water and Sewer Standards for Design and Construction.

2. Contractor shall coordinate all details of equipment with other related parts of the Work, including verification that all structures, piping, wiring, and equipment components are compatible. Contractor shall be responsible for all structural and other alternations in the Work required to accommodate equipment differing in dimensions or other characteristics from that contemplated in the Contract Drawings or Specifications.

B. Contract Drawings and Specifications: The Contract Drawings and Specifications shall be considered as complementary, one to the other, so that materials and work indicated, called for, or implied by the one and not by the other shall be supplied and installed as though specifically called for by both. The Contract Drawings are to be considered diagrammatic, not necessarily showing in detail or to scale all of the equipment or minor items. In the event of discrepancies between the Contract Drawings and Specifications, or between either of these and any regulations or ordinances governing work of these specifications, the bidder shall notify the Engineer in ample time to permit revisions.

1.02 QUALITY ASSURANCE

A. Materials and Equipment: Unless otherwise specified, all materials and equipment furnished for permanent installation in the work shall conform to applicable standards and specifications and shall be new, unused, and undamaged when installed or otherwise incorporated in the work. No such material or equipment shall be used by the Contractor for any purpose other than that intended or specified, unless such use is specifically authorized in writing by the Owner. No material shall be delivered to the work site without prior acceptance of drawings and data by the Engineer.

B. Equivalent Materials and Equipment:

1. Whenever a material or article is specified or described by using the name of a proprietary product or the name of a particular manufacturer or vendor, the specific item mentioned shall be understood as establishing the type, function, and quality desired. Other manufacturers' products will be accepted, if so noted, provided sufficient information is submitted to allow the Engineer to determine that the products proposed are equivalent to those named. Such items shall be submitted for review in

accordance with Special Conditions section.

C. Governing Standards: Equipment and appurtenances shall be designed in conformity with ANSI, ASME, ASTM, IEEE, NEMA, OSHA, AGMA, and other generally accepted applicable standards. They shall be of rugged construction and of sufficient strength to withstand all stresses which may occur during fabrication, testing, transportation, installation, and all conditions or operations. All bearings and moving parts shall be adequately protected against wear by bushings or other acceptable means. Provisions shall be made for adequate lubrication with readily accessible means.

D. Tolerances: Machinery parts shall conform to the dimensions indicated on the drawings within allowable tolerances. Protruding members such as joints, corners, and gear covers shall be finished in appearance. All exposed welds shall be ground smooth and the corners of structural shapes shall be rounded or chamfered.

E. Clearances: Ample clearances shall be provided for inspection and adjustment. All equipment shall fit the allotted space and shall leave reasonable access room for servicing and repairs. Greater space and room required by substituted equipment shall be provided by the Contractor and at his expense.

F. Testing:

1. When the equipment is specified to be factory tested, the results of the tests shall be submitted to the Engineer and approval of the test results shall be obtained before shipment of the equipment.

2. When an item of equipment, including controls and instrumentation, has been completely erected, the Contractor shall notify the Engineer, who will designate a time to make such tests as required, and operate the item to the satisfaction of the Engineer. All testing shall be done in the presence of the Engineer. "Completely erected" shall mean that the installation is erected, all necessary adjustments have been made, all required utility connections have been made, required lubricants and hydraulic fluid have been added and the unit has been cleaned and painted.

G. Pressure Test:

1. After installation, all of the pressurized piping shall be pressure tested. Piping shall be tested in accordance with Section 15044: Pressure Testing of Piping.

2. All tests shall be made in the presence of and to the satisfaction of the Owner's Representative and Engineer and also, to the satisfaction of any local or state inspector having jurisdiction.

a. Unless otherwise indicated in the Special Conditions or specific technical specifications, provide not less than three days' notice to the Owner's Representative, Engineer and the authority having jurisdiction when it is proposed to make the tests.

b. Any piping or equipment that has been left unprotected and subject to mechanical or other injury in the opinion of the Engineer shall be retested in part or in whole as directed by the Engineer.

c. The piping systems may be tested in sections as the work progresses but no joint or portion of the system shall be left untested.

3. All elements within the system that may be damaged by the testing operation shall be removed or otherwise protected during the operation.

4. All defects and leaks observed during the tests shall be corrected and made tight in an approved manner and the tests repeated until the system is proven tight.

5. Repair all damage done to existing or adjacent work or materials due to or on account of the tests at no cost to Owner.

6. Provide test pumps, gauges, or other instruments and equipment required for the performance of all tests. Provide all temporary bracing, test plugs, additional restraint, and thrust blocking which may be required for test pressures above normal working pressures.

7. All tests shall be maintained for as long a time as required to detect all defects and leaks but not outside of the minimum/maximum durations specified for each type of pipe or piping system.

H. Failure of Test:

1. Defects: Any defects in the equipment, or deviations from the guarantees or requirements of the Specifications, shall be promptly corrected by the Contractor by replacements or otherwise. The decision of the Engineer as to whether or not the Contractor has fulfilled his obligations under the Contract shall be final and conclusive. If the Contractor fails to correct any defects or deviations, or if the replaced equipment when tested shall fail again to meet the guarantees or specified requirements, the Owner, notwithstanding his having made partial payment for work and materials which have entered into the manufacture for such equipment, may reject that equipment and order the Contractor to remove it from the premises at the Contractor's expense.

2. Rejection of Equipment: In case the Owner rejects a particular item of equipment, then the Contractor hereby agrees to repay to the Owner all sums of money paid to him to deliver to the Contractor a bill of sale of all his rights, title, and interest in and to the rejected equipment provided, however that the equipment shall not be removed from the premises until the Owner obtains from other sources other equipment to take the place of that rejected. The bill of sale shall not abrogate the Owner's right to recover damages for delays, losses or other conditions arising out of the basic Contract. The Owner hereby agrees to obtain the alternate equipment within a reasonable time and the Contractor agrees that the Owner may use the original equipment furnished by him without rental or

other charge until the other equipment is obtained.

I. Responsibility During Tests: The Contractor shall be fully responsible for the proper operation of equipment during tests and instruction periods and shall neither have nor make any claim for damage which may occur to equipment prior to the time when the Owner formally takes over the operation thereof.

J. Acceptance of Materials:

1. Only new materials and equipment shall be incorporated in the work. All materials and equipment furnished by the Contractor shall be subject to the inspection and acceptance of the Owner. No material shall be delivered to the work without prior submittal approval of the Engineer.

2. The Contractor shall submit to the Engineer data relating to materials and equipment he proposes to furnish for the work. Such data shall be in sufficient detail to enable the Engineer to identify the particular product and to form an opinion as to its conformity to the specifications.

3. Facilities and labor for handling and inspection of all materials and equipment shall be furnished by the Contractor. If the Engineer requires, either prior to beginning or during the progress of the work, the Contractor shall submit samples of materials for such special test as may be necessary to demonstrate that they conform to the specification. Such sample shall be furnished, stored, packed, and shipped as directed at the Contractor's expense. Except as otherwise noted, the Owner will make arrangements for and pay for tests.

4. The Contractor shall submit data and samples sufficiently early to permit consideration and acceptance before materials are necessary for incorporation in the work.

K. Safety Requirements: In addition to the components shown and specified, all machinery and equipment shall be safeguarded in accordance with the safety features required by the current codes and regulations of ANSI, OSHA, and local industrial codes.

1.03 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Packaging: All equipment shall be suitably packaged to facilitate handling and protect against damage during transit and storage. All equipment shall be boxed, crated, or otherwise completely enclosed and protected during shipment, handling, and storage. All equipment shall be protected from exposure to the elements and shall be kept thoroughly dry at all times.

B. Protection: All machined surfaces and shafting shall be cleaned and protected from corrosion by the proper type and mount of coating necessary to assure protection during shipment and prior to installation. Painted surfaces shall be protected against impact, abrasion, discoloration, and other damage. All painted surfaces which are damaged prior to acceptance of equipment shall be repainted to the satisfaction of Engineer.

C. Lubrication: Grease and lubricating oil shall be applied to all bearings and similar items as necessary to prevent damage during shipment and storage.

D. Marking: Each item of equipment shall be tagged or marked as identified in the delivery schedule or on the Shop Drawings. Complete packing lists and bills of material shall be included with each shipment.

E. Fabricated sub-assemblies, if any, shall be shipped in convenient sections as permitted by carrier regulations and shall be properly match-marked for ease of field erection.

F. Responsibility:

1. The Contractor shall be responsible for all material, equipment, and supplies sold and delivered to the site under this Contract until final inspection of the work and acceptance thereof by the Owner. In the event any such material, equipment, and supplies are lost, stolen, damaged, or destroyed prior to final inspection and acceptance, the Contractor shall replace same without additional cost to the Owner.

2. Should the Contractor fail to take proper action on storage and handling of equipment supplied under this Contract within seven (7) days after written notice to do so has been given, the Owner retains the right to correct all deficiencies noted in previously transmitted written notice and deduct the cost associated with these corrections from the Contractor's Contract. These costs may be comprised of expenditures for labor, equipment usage, administrative, clerical, engineering, and any other costs associated with making the necessary corrections.

G. Delivery: The Contractor shall arrange deliveries of products in accordance with construction schedules and coordinate to avoid conflict with work and condition at the site.

1. The Contractor shall deliver products in undamaged condition, in manufacturer's original containers or packaging, with identifying labels intact and legible.

2. Immediately on delivery, the Contractor shall inspect shipments to assure compliance with requirements of Contract Documents and accepted submittals, and that products are properly protected and undamaged.

3. Under no circumstances shall the Contractor deliver equipment to the site more than one month prior to installation without written authorization from the Engineer.

H. Storage and Protection of Products:

1. The Contractor shall furnish a covered, weather-protected storage structure providing a clean, dry non-corrosive environment for all mechanical equipment, valves, architectural items, electrical and instrumentation equipment, and special equipment to be incorporated into this project. Storage of equipment shall be in strict accordance with

the "Instructions for Storage" of each equipment supplier and manufacturer including connection of space heaters, and placing of storage lubricants in equipment. Corroded, damaged, or deteriorated equipment and parts shall be replaced before acceptance of the project. Equipment and materials not properly stored will not be included in a payment estimate.

a. The Contractor shall store products subject to damage by the elements in weather-tight enclosures.

b. The Contractor shall maintain temperature and humidity within the ranges required by manufacturer's instructions.

c. The Contractor shall store fabricated products above the ground, on blocking or skids, to prevent soiling or staining. The Contractor shall cover products which are subject to deterioration with impervious sheet coverings and provide adequate ventilation to avoid condensation.

d. The Contractor shall store loose granular materials in a well-drained area on solid surfaces to prevent mixing with foreign matter.

2. All materials and equipment to be incorporated in the work shall be handled and stored by the Contractor before, during, and after shipment in a manner to prevent warping, twisting, bending, breaking, chipping, rusting, and any injury, theft, or damage of any kind whatsoever to the material or equipment.

3. Cement, sand, and lime shall be stored under a roof and off the ground, and shall be kept completely dry at all times. All structural and miscellaneous steel and reinforcing steel shall be stored off the ground or otherwise to prevent accumulations of dirt, or grease, and in a position to prevent accumulations of standing water, staining, chipping, or cracking. Brick, block, and similar masonry products shall be handled and stored in a manner to reduce breakage, chipping, cracking and spalling to a minimum.

4. All materials which, in the opinion of the Engineer/Owner's Representative, have become damaged and are unfit for the use intended or specified, shall be promptly removed from the site of the work, and the Contractor shall receive no compensation for the damaged material or its removal.

5. The Contractor shall arrange storage in a manner to provide easy access for inspection. The Contractor shall make periodic inspections of stored products to assure products are maintained under specified conditions, and free from damage or deterioration.

6. Protection After Installation: The Contractor shall provide substantial coverings as necessary to protect installed products from damage from traffic and subsequent construction operations. The Contractor shall remove covering when no longer needed.

1.04 WARRANTY AND GUARANTEES

The manufacturer's warranty period shall be concurrent with the Contractor's correction period for one (1) year (unless otherwise indicated in the technical specifications or other Contract Documents) after the time of final completion and acceptance.

1.05 MAINTENANCE MATERIALS

All grease, oil, and fuel required for testing of equipment shall be furnished with the respective equipment. The Owner shall be furnished with a year's supply of required lubricants including grease and oil of the type recommended by the manufacturer with each item of equipment supplied.

PART 2 - PRODUCTS

2.01 FABRICATION AND MANUFACTURE

A. Workmanship and Materials:

1. Contractor shall guarantee all equipment against faulty or inadequate design, improper assembly or erection, defective workmanship or materials, and leakage, breakage or other failure. Materials shall be suitable for service conditions.

2. All equipment shall be designed, fabricated, and assembled in accordance with recognized and acceptable engineering and shop practice. Individual parts shall be manufactured to standard sizes and gages so that repair parts, furnished at any time, can be installed in the field. Like parts of duplicate units shall be interchangeable. Equipment shall not have been in service at any time prior to delivery, except as required by tests.

3. Except where otherwise specified, structural and miscellaneous fabricated steel used in equipment shall conform to AISC standards. All structural members shall be designed for shock or vibratory loads. Unless otherwise specified, all steel which will be submerged, all or in part, during normal operation of the equipment shall be at least ¼-inch thick.

B. Lubrication:

1. Equipment shall be adequately lubricated by systems which require attention no more frequently than weekly during continuous operation. Lubrications systems shall not require attention during startup or shutdown and shall not waste lubricants.

2. Lubricants of the type recommended by the equipment manufacturer shall be furnished by the Contractor in sufficient quantity to fill all lubricant reservoirs and to replace all consumption during testing, startup, and operation prior to acceptance of equipment by Owner. Unless otherwise specified or permitted, the use of synthetic lubricants will not be acceptable.

3. Lubrication facilities shall be convenient and accessible. Oil drains and fill openings shall be easily accessible from the normal operating area or platform. Drains shall allow for convenient collection of waste oil in containers from the normal operating area or platform without removing the unit from its normal installed position.

C. Safety Guards: All belt or chain drives, fan blades, couplings, and other moving or rotating parts shall be covered on all sides by a safety guard. Safety guards shall be fabricated from 16 USS gage or heavier galvanized or aluminum-clad sheet steel or ½-inch mesh galvanized expanded metal. Each guard shall be designed for easy installation and removal. All necessary supports and accessories shall be provided for each guard. Supports and accessories, including bolts, shall be galvanized. All safety guards in outdoor locations shall be designed to prevent the entrance of rain and dripping water.

D. Equipment Foundation Supports:

1. All foundations, platforms and hangers required for the proper installation of equipment shall be furnished and installed by the Contractor.

2. Unless otherwise indicated or specified, all equipment shall be installed on reinforced concrete bases at least 6 inches high. Cast iron or welded steel baseplates shall be provided for pumps, compressors, and other equipment. Each unit and its drive assembly shall be supported on a single baseplate of neat design. Baseplates shall have pads for anchoring all components and adequate grout holes. Baseplates for pumps shall have a means for collecting leakage and a threaded drain connection. Baseplates shall be anchored to the concrete base with suitable anchor bolts and the space beneath filled with grout. All open equipment bases shall be filled with non-shrinking grout sloped to drain to the perimeter of the base.

3. The Contractor shall furnish, install and protect all necessary guides, bearing plates, anchor and attachment bolts, and all other appurtenances required for the installation of equipment. These shall be of ample size and strength for the purpose intended.

4. Equipment suppliers shall furnish suitable anchor bolts for each item of equipment. Anchor bolts, together with templates or setting drawings, shall be delivered sufficiently early to permit setting the anchor bolts when the structural concrete is placed. Unless otherwise indicated or specified, anchor bolts for items of equipment mounted on baseplates shall be long enough to permit 1-1/2 inches of grout beneath the baseplate and to provide adequate anchorage into structural concrete.

5. Structural steel supports and miscellaneous steel required for supporting and/or hanging equipment and piping furnished under this Section shall be provided and installed by Contractor.

6. All foundations, anchor pads, piers, thrust blocks, inertia blocks and structural steel supports shall be built to template and reinforced as

required for loads imposed on them.

7. The Contractor shall assume all responsibility for sizes, locations and design of all foundations, anchor pads, pier, thrust blocks, inertia blocks, curbs and structural steel supports.

E. Shop Painting:

1. All steel and iron surfaces shall be protected by suitable paint or coatings applied in the shop. Surfaces which will be inaccessible after assembly shall be protected for the life of the equipment. Exposed surfaces shall be finished smooth, thoroughly cleaned, and filled as necessary to provide a smooth uniform base for painting. Electric motors, speed reducers, starters, and other self-contained or enclosed components shall be shop primed or finished with a high-grade oil-resistant enamel suitable for coating in the field with an alkyd enamel. Coatings shall be suitable for the environment where the equipment is installed.

2. Surfaces to be painted after installation shall be prepared for painting as recommended by the paint manufacturer for the intended service, and then shop painted with one or more coats of the specified primer. Unless otherwise specified, the shop primer for steel and iron surfaces shall be Cook "391-N-167 Barrier Coat", Koppers "No. 10 Inhibitive Primer", or approved equal.

3. Machined, polished, and nonferrous surfaces which are not to be painted shall be coated with rust-preventive compound, Houghton "Rust Veto 344", Rust-Oleum "R-9", or approved equal.

F. Nameplates: Contractor shall provide equipment identification nameplates for each item of equipment. Unless otherwise indicated, nameplates shall be 1/8-inch Type 304 stainless steel and shall be permanently fastened. Plates shall be fastened using round head metallic drive screws, or where metallic drive screws are impractical, with stainless steel pop rivets. Metallic drive screws shall be brass or stainless steel, Type V and No. 8 by 3/8-inch long. Names and/or equipment designations shall be engraved on the plates and the engraving painted with a primer and black paint system compatible with stainless steel. Contractor shall submit a list of proposed names and designations for review prior to fabrication of nameplates. At a minimum, each nameplate shall include equipment manufacturers name, year of manufacture, serial number and principal rating data.

G. Pipe Identification: Underground pipe: All non-metallic water and forcemain piping has have locate wire systems installed in accordance with Owner's standards and technical specifications. Detection tape shall be installed for all water and force main piping in accordance with Owner's standards.

2.02 ACCESSORIES

Special Tools and Accessories: Equipment requiring periodic repair and adjustment shall be furnished complete with all special tools, instruments, and accessories required for proper maintenance. Equipment requiring special devices for lifting or handling shall be

furnished complete with those devices.

PART 3 - EXECUTION

3.01 INSTALLATION AND OPERATION

A. Installation: Equipment shall not be installed or operated except by, or with the guidance of, qualified personnel having the knowledge and experience necessary for proper results. When so specified, or when employees of Contractor or his subcontractors are not qualified, such personnel shall be field representatives of the manufacturer of the equipment or materials being installed.

1. The Contractor shall have on site sufficient proper construction equipment and machinery of ample capacity to facilitate the work and to handle all emergencies normally encountered in work of this character. To minimize field erection problems, mechanical units shall be factory assembled when practical.

2. Equipment shall be erected in a neat and workmanlike manner on the foundations and supports at the locations and elevations shown on the Drawings, unless otherwise directed by the Engineer during installation.

3. All equipment shall be installed in such a manner as to provide access for routine maintenance including lubrication.

4. For equipment such as pumping units, which require field alignment and connections, the Contractor shall provide the services of the equipment manufacturer's qualified mechanic, millwright, machinist, or authorized representative, to align the pump and motor prior to making piping connections or anchoring the pump base.

5. Equipment of a portable nature which require no installation shall be delivered to a location designated by the Owner.

B. Tolerances: Precision gauges and levels shall be used in setting all equipment. All piping and equipment shall be perfectly aligned, horizontally and vertically. Tolerances for piping and equipment installation shall be ½-inch to 30 ft horizontal and vertically. All valves and operators shall be installed in the position shown on the Contract Drawings or as directed by the Engineer, if not shown.

C. Alignment and Level: The equipment shall be brought to proper level by shims (1/4 inch maximum). After the machine has been leveled and aligned, the nuts on the anchor bolts shall be tightened to bind the machine firmly into place against the wedges or shims.

D. Grouting: The grout shall be tamped into position with a board, steel bar, or other tool. Tamping should not be so hard as to raise or otherwise displace the plate.

E. Contact of Dissimilar Metals: Where the contact of dissimilar metal may cause electrolysis and where aluminum will contact concrete, mortar, or plaster, the contact surface of the metals shall be separated using not less than one coat of

zinc chromate primer and one heavy coat of aluminum pigmented asphalt paint on each surface.

F. Cutting and Patching: All cutting and patching necessary for the work shall be performed by the Contractor.

G. Operation: All equipment installed under this Contract, including that furnished by Owner or others under separate contract, shall be placed into successful operation according to the written instructions of the manufacturer or the instructions of the manufacturer's field representative. All required adjustments, tests, operation checks, and other startup activity shall be provided.

3.02 OBSERVATION OF PERFORMANCE TESTS

Where the specifications require observation of performance tests by the Owner's Representative or Engineer such tests shall comply with the quality assurance paragraph in this section.

3.03 MANUFACTURER'S FIELD SERVICES

Services Furnished Under This Contract:

1. An experienced, competent, and authorized representative of the manufacturer of each item of equipment shall visit the site of the Work and inspect, check, adjust if necessary, and approve the equipment installation. In each case, the manufacturer's representative shall be present when the equipment is placed in operation. The manufacturer's representative shall re-visit the job site as often as necessary until all trouble is corrected and the equipment installation and operation are satisfactory in the opinion of Engineer/Owner's Representative at no additional cost to Owner. The authorized representative shall also utilize the site visit to instruct the Owner's staff in the proper operation of the equipment.

2. Each manufacturer's representative shall furnish to Owner and Engineer, a letter of certification stating that the equipment has been properly installed and lubricated; is in accurate alignment; is free from any undue stress imposed by connecting piping or anchor bolts; and has been operated under full load conditions and that it operated satisfactorily.

3. All costs for field services shall be included in the contract amount for such item.

END OF SECTION

INDEX TO

SECTION 15044 – PRESSURE TESTING OF PIPING

SECTION 15044

PRESSURE TESTING OF PIPING

PART 1 - GENERAL

1.01 DESCRIPTION

A. Scope of Work:

Hydrostatic testing shall be conducted for all pressurized piping systems. Pressure and leakage testing shall be performed in accordance with the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications.

1.02 MEASUREMENT AND PAYMENT

A. Payment for Pressure Testing of Piping shall not be made separately. The cost thereof is included in the unit or lump sum price set forth for the items to which the pressure testing of piping is necessary. Reference Section 01025 Measurement and Payment for additional information.

PART 2 - PRODUCTS

2.01 GENERAL:

A. Testing fluid shall be potable water.

2.02 MATERIALS AND EQUIPMENT

A. Unless otherwise indicated, Contractor shall provide pressure gauges, pipes, bulkheads, pumps, and meters to perform the hydrostatic testing.

PART 3 - EXECUTION

3.01 TESTING

A. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and the relevant sections of the technical specifications as noted below.

1. Reference Section 2.5.3.8 of the JWSC Standards for hydrostatic testing of water mains.

2. Reference Section 4.7.7 of the JWSC Standards for hydrostatic testing of force mains.

3. For hydrostatic testing of HDPE piping reference Section 15075. HDPE piping shall be tested separately from PVC

4. and DIP piping.

END OF SECTION

INDEX TO

SECTION 15062 – DUCTILE IRON PIPE AND FITTINGS

SECTION 15062

DUCTILE IRON PIPE AND FITTINGS

PART I - GENERAL

1.01 DESCRIPTION

A. Scope of Work

1. The work under this section includes the furnishing, installation, and testing of all Ductile Iron pipe and fittings and appurtenant materials and equipment as indicated on the Construction Drawings and/or as specified herein. All work shall conform to the requirements of the JWSC Standards for Water and Sewer Design and Construction and as described in this Section.

1.02 QUALITY ASSURANCE

A. Reference Standards

1. Ductile iron pipe centrifugally cast in metal or sand lined molds: ANSI A 21.51.

2. Ductile iron pipe thickness: ANSI A 21.50.

3. Cement mortar lining for water: ANSI21.4.

4. Cast and ductile iron fittings: ANSI A 21.10.

5. C.I. pipe flanges and fittings: ANSI B 16.1.

6. Threaded flanges: CIPRA standard.

B. Qualifications: All ductile iron pipe and fittings shall be furnished by manufacturers who are fully experienced, reputable, and qualified in the manufacture of the materials to be furnished. The pipe and fittings shall be designed, constructed, installed in accordance with the best practices and methods and shall comply with these Specifications as applicable.

C. Manufacturer: Acceptable Ductile Iron Pipe and Fitting manufacturers shall be as listed in JWSC Water and Sewer Standards Appendix 2A (water) and Appendix 4A (forcemains).

1.03 SUBMITTALS

A. Shop Drawings, including layouts within, and under buildings and structures shall be submitted to the Engineer for approval in accordance with Special Conditions. Shop Drawings shall be prepared by the pipe manufacturer.

B. Tabulated layout schedule, as appropriate for project.

C. Details of special elbows and fittings.

D. Calculations and/or test data demonstrating that the proposed retrained joint arrangement can transmit the required forces.

E. Copy of the manufacturer's quality control check of pipe material and production.

F. Provide an affidavit of compliance with AWWA standards referenced in this specification.

1.04 MEASUREMENT AND PAYMENT

A. Payment for Ductile Iron Pipe and Fittings will be made under the unit price items designated for ductile iron pipe or fittings. Reference Section 01025 Measurement and Payment.

1.05 PRODUCT DELIVERY, STORAGE AND HANDLING

A. All pipe shall be shipped and stored at the jobsite with wood lagging between pipes such that pipes do not make contact with one another.

B. Exercise extra care when handling cement lined pipe because damage to the lining will render it unfit for use.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Pipe - Ductile Iron Pipe Conforming to ANSI A21.51 and AWWA C151:

1. Unless otherwise shown on the Construction Drawings or Contract Documents, the minimum thickness of ductile iron pipe shall be Pressure Class 350 for piping 3 in. through 12. in., and Pressure Class 250 for piping 14 in. and larger.

2. Pipe for use with sleeve type couplings shall have plain ends (without bells or beads) cast or machined at right angles to the axis.

3. Pipe for use with split type couplings shall have ends with cast or machined shoulders or grooves that meet the requirements of the coupling manufacturer.

4. Pipe shall be supplied in lengths not in excess of 20 feet having rubber-ring type push-on joints, standard mechanical joints or restrained joints where required for underground piping and flanged joint piping, for all above ground piping as shown on the Drawings.

B. Coatings and Linings:

1. Interior Coatings and Linings:

a. Pipe for finished potable water use shall be cement-mortar lined and seal coated, conforming to ANSI A21.4 and AWWA C104.

b. Pipe and fittings for non-potable use, except as otherwise noted, shall have a ceramic epoxy coating installed on the interior of the pipe. The coating shall be Tnemec Series 431 Perma-Shield PL or Engineer approved equal. Coating thickness shall be 40 mils minimum dry film thickness.

2. Exterior Coating: All ductile iron pipe and fittings shall be externally coated with a bituminous coating per ANSI A21.51.

C. Fittings:

1. All ductile iron pipe fittings shall match the pressure class rating of the adjacent piping.

2. Grooved-end fittings shall conform to AWWA C110 and ANSI B16.1 with grooved ends conforming to AWWA C606, radius cut rigid joints. Fitting material shall conform to ASTM A 48, Class 30, or ASTM A 126, Class B.

D. Joints (as shown on the Construction Drawing and/or as specified):

1. General: Joints in "runs" of aboveground piping or piping located in vaults and structures shall be rigid radius grooved end or flanged. Joints in "runs" of buried piping shall be of the push-on or mechanical-joint type per AWWA C111 except where flanged joints are required to connect to valves, meters, and other equipment.

2. Grooved-End Couplings:

a. Grooved-end couplings shall be malleable iron, ASTM A 47 (Grade 32510), or ductile iron, ASTM A 536 (Grade 65-45-12).

b. Bolts: ASTM A 183, 110,000 psi tensile strength.

c. Gaskets: Halogenated butyl rubber or EPDM for water service and Buna-N for sewage service, conforming to ASTM D 2000

d. Couplings: AWWA C606 for rigid radius ductile-iron pipe. Couplings shall be Victaulic Style 31, Gustin-Bacon No. 500, or equal.

e. Grooved-end adapter flanges for piping having an operating pressure of 150 psi and less shall be Victaulic Style 341, or equal. Flange dimensions shall conform to ANSI B16.1 Class 125.

3. Flanges:

a. Flanges shall be Class 125 per ANSI B16.1 unless otherwise specifically noted. Determine the pressure rating of the fittings based on the test pressures shown in Section 15044: Pressure Testing of Piping.

b. Gaskets: Fullface, 1/8 inch thick, neoprene: Johns-Manville, John Crane Co. , or Engineer approved equal. Gaskets shall be suitable for a water pressure of 350 psi at a temperature of 180 degrees Fahrenheit (°F). Gaskets shall comply with Appendix A of AWWA C110.

c. Bolts and Nuts for Flanges

1) Bolts and nuts for flanges located indoors, in enclosed vaults and structures, buried and submerged and located outdoors above ground or in open vaults in structures shall be Type 316 stainless steel conforming to ASTM A 193, Grade B&M for bolts, and ASTM A 194, Grade M for nuts. Bolts shall comply with Appendix A of AWWA C110.

2) Provide washers for each nut. Washers shall be of the same material as the nuts.

d. Provide specially drilled flanges when required for connection to existing piping or special equipment.

e. Factory assemble screwed on flanges shall be long-hub type screwed tightly on pipe by machine at the foundry prior to facing and drilling. Flange faces shall be coated with a rust inhibitor immediately after facing and drilling. Field assembled screwed on flanges are prohibited.

4. Push-on and mechanical joint (ANSI A21.11):

a. The plain ends of push-on pipe shall be factory, machined to a true circle and chamfered to facilitate fitting the gasket.

b. Provide gaskets manufactured from a composition material suitable for exposure to the liquid to be contained within the pipe.

c. Each joint shall be complete with rubber gasket, cast iron gland and all required bolts and nuts.

D. Thrust restraint:

1. Thrust blocks: Shall not be permitted unless specifically indicated on the Drawings.

2. Restrained joints:

a. Pipe joints shall be mechanically restrained type as accepted by the Engineer. Restrained joints that require field welding or requiring set screws will not be acceptable, except restrained joints for mechanical joints shall be Megalug by Ebba Iron, or Engineer approved equal. Standard retainer glands are not considered equal

b. Pipe joints shall be restrained on each side of the fitting for a continuous distance in accordance with DIPRA "Thrust Restraint Design for Ductile Iron Pipe". Distance restrained shall be based on sand-silt soil type, 3.0 feet of cover and Type 5 laying condition.

C. Bolts and nuts for restrained joints shall be Corten, low alloy, high strength steel.

2.02 PIPING ACCESSORIES

A. Outlets:

1. For outlets larger than 2 inches, provide a tee with a flanged outlet.

2. Provide outlets 2 inches and smaller by tapping and attaching a service clamp. Service clamps shall be as specified herein.

PART 3 - EXECUTION

3.01 INSPECTION AND TESTING

A. All pipe shall be inspected and tested at the foundry.

B. The Owner shall have the right to have any or all piping, fittings or special castings inspected and tested by an independent testing agency at the foundry or elsewhere. Such inspection and testing will be at the Owner's expense.

C. Mark as rejected and immediately remove from the job site, all pipe lengths showing a crack, damaged lining, or receiving a severe blow that may cause an incipient fracture, even though no such fractures can be seen.

D. Removal of cracked portions:

1. Any pipe showing a distinct crack, but no incipient fracture beyond the limits of the visible crack, may be cut off and the sound portion installed. Cut the pipe at least 12 inches from the visible limits of the crack. Cutting of pipe shall be done by skilled workmen, and in such a manner as to not damage the pipe. Every cut shall be square and smooth, with no damage to the pipe lining. Cut surfaces, shall be recoated as specified for the pipe.

2. Cutting and installing cracked pipe shall only be performed when approved by the Engineer, and shall be at the expense of the Contractor.

E. Carefully inspect and hammer test all pipe and fittings prior to installation.

3.02 INSTALLATION

A. Assembling joints:

1. Push-on joints:

a. Insert the gasket into the groove of the ball.

b. Uniformly apply a thin film of special lubricant over the inner surface of the gasket that will contact the spigot end of the pipe.

c. Insert the chamfered end of the plain pipe into the gasket and push until it seats against the bottom of the socket.

2. Bolted joints:

a. Remove rust preventative coatings from machined surfaces prior to assembly.

b. Thoroughly clean and carefully smooth all burrs and other defects from pipe ends, sockets, sleeves, housings and gaskets.

3. Grooved end joints:

a. Install grooved end pipe and fittings in accordance with the coupling manufacturer's recommendations and the following.

b. Clean loose scale, rust, oil, grease, and dirt from the pipe or fitting groove before installing coupling. Apply the coupling manufacturer's gasket lubricant to the gasket exterior, including lips, pipe ends, and housing interiors.

c. Fasten coupling alternately and evenly until coupling halves are seated. Use torques as recommended by the coupling manufacturer.

4. Flanged Joints:

a. Bolt holes of flanges shall straddle the horizontal and vertical centerlines of the pipe. Clean flanges by wire brushing before installing flanged fittings. Clean flange bolts and nuts by wire brushing, lubricate bolts with oil and graphite.

b. Insert the nuts and bolts (or studs) finger tighten, and progressively tighten diametrically opposite bolts uniformly around the flange to the proper tension.

c. Execute care when tightening joints to prevent undue strain upon valves, pumps and other equipment.

d. If flanges leak under pressure testing, loosen or remove the nuts and bolts, reset or replace the gasket, reinstall or retighten the bolts and nuts, and retest the joints. Joints shall be watertight.

5. Mechanical Joints:

a. Thoroughly clean, with a wire brush, surfaces that will be in contact with the gaskets.

b. Lubricate the gasket, bell and spigot by washing with soapy water.

c. Slip the gland and gasket, in that order, over the spigot and insert the spigot into the bell until properly sealed.

d. Evenly seat the gasket in the bell at all points, center the spigot, and firmly press the gland against the gasket.

e. Insert the bolts, install the nuts finger tight, and progressively tighten diametrically opposite nuts uniformly around the joints to the proper tension with a torque wrench.

6. Bell and spigot joints:

   a. Thoroughly clean the bell and spigots and remove excess tar and other obstructions.

   b. Insert the spigot firmly into place and hold securely until the joint has been properly completed.

B. Fabrication:

1. Tapped connections:

   a. Make all tapped connections as shown on the Drawings or as directed by the Engineer.

   b. Make all connections watertight and of adequate strength to prevent pullout.

   c. Drill and tap normal to the longitudinal axis of the pipe.

2. Cutting:

   a. Perform all cutting with machines having rolling wheel cutters or knives designed to cut ductile iron. The use of a hammer and chisel to cut pipe is prohibited.

   b. After cutting, examine all cut ends for possible cracks.

   c. Carefully chamfer all cut ends to be used with push-on joints to prevent damage to gaskets when pipe is installed.

C. Installing Buried Piping:

1. Inspect each pipe and fitting before lowering the buried pipe or fitting into the trench. Inspect the interior and exterior protective coatings. Clean ends of pipe thoroughly. Remove foreign matter and dirt from inside of pipe and keep clean during and after laying.

2. Handle pipe in a manner to avoid any damage to the pipe. Do not drop or dump pipe into trenches under any circumstances.

3. When installing piping in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.

4. Grade the bottom of the trench by hand to the line and grade to which the pipe is to be laid, with allowance for pipe thickness. Remove hard spots that would prevent a uniform thickness of bedding. Before laying each section of the pipe, check the grade with a straightedge and correct any irregularities found. The trench bottom shall form a continuous and uniform bearing and support for the pipe at every point between bell holes, except that the grade may be disturbed for the removal of lifting tackle.

5. At the location of each joint, dig bell (joint) holes of dimensions in the bottom of the trench and at the sides to permit visual inspection of the entire project.

6. Keep the trench in a dewatered condition during pipelaying in accordance with Section 02200: Earthwork, and Section 02220; Excavating, Backfilling and Compacting.

7. When the pipelaying is not in progress, including the noon hours, close the open ends of pipe. Do not permit trench water, animals, or foreign material to enter the pipe.

D. Installing Interior Piping

1. All piping and fittings shall be installed true to alignment and rigidly supported thrust anchors shall be provided where required. Any damage to linings shall be repaired to the satisfaction of the Engineer before the pipe is installed. Each length of pipe shall be cleaned out before erection.

2. Sleeves shall be installed of proper size for all pipes passing through floors or walls as shown on the Drawings. Where indicated on the Drawings, or required for liquid or gas-tightness, the pipe shall be sealed with mechanical seal equal to Link-Seal as manufactured by GPT Industries., or Engineer approved equal.

3. Concrete inserts for hangers and supports shall be furnished and installed in the concrete as it is placed. The inserts shall be, in accordance with the requirements of the piping layout and jointing method and their locations shall be verified from approved piping layout drawings and the structural drawings.

4. Except as otherwise shown on the Construction Drawings either split type couplings or flange joints may be used. Prior to approval of jointing, method layouts for hanger and supports shall be submitted to the Engineer for approval.

5. Flanged joints shall be made with bolts, bolt studs with a nut on each end, or studs with nuts where the flange is tapped.

6. All pipe and appurtenances connected to equipment shall be supported in such a manner as to prevent any strain being imposed on the equipment. When manufacturers have indicated requirements that piping loads shall not be transmitted to their equipment, a certification shall be submitted stating that such requirements have been complied with.

E. Pipe deflection:

1. Push-on and mechanical joints:

   a. The maximum permissible deflection of alignment at joints shall be 80% of the manufacturer's allowable deflection.

2. Flexible joints: The maximum deflection in any direction shall not exceed

80% of the manufacturer's instructions and recommendations.

F. Hydrostatic Testing: Test in accordance with Section 15044: Pressure Testing of Pipe.

END OF SECTION

INDEX TO

SECTION 15075 – HORIZONTAL DIRECTIONAL DRILLING

SECTION 15075

HORIZONTAL DIRECTIONAL DRILLING

PART 1. GENERAL

1.01 SCOPE OF WORK:

The work specified in this section consists of furnishing and installing underground utilities using the horizontal directional drilling (HDD) method of installation for pipe 12 inches and larger inside diameter (ID), also commonly referred to as directional boring or guided horizontal boring. This work shall include all services, equipment, materials, and labor for the complete and proper installation, testing, restoration of underground utilities and environmental protection and restoration.

1.02 QUALITY ASSURANCE:

The requirements set forth in this document specify a wide range of procedural precautions necessary to ensure that the very basic, essential aspects of a proper directional bore installation are adequately controlled. Strict adherence shall be required under specifically covered conditions outlined in this specification or within any associated permit (i.e.: railroad, US ACOE, EPD, DOT, Etc.). Adherence to the specifications contained herein, or the JWSC Representative's approval on any aspect of any directional bore operation covered by this specification, shall in no way relieve the Contractor of their ultimate responsibility for the satisfactory completion of the work authorized under the Contract. The HDD contractor shall be responsible for the repair of all damage to private and/or public property (at no expense to JWSC). Repair work shall meet all local and state rules and requirements.

1.03 QUALIFICATIONS:

The work specified in this Section requires significant previous experience and expertise in similar work to avoid negative impacts to public safety and the environment. Therefore, the Contractor performing the work shall be qualified, in JWSC's judgment, to complete the horizontal directional drilling work specified herein. **The Contractor shall submit substantiating evidence of qualifications, in accordance with the provisions of this Section and the Instructions to Bidders.** Failure to submit the required documentation may cause the Contractor to be declared unqualified to perform the scope of work for the project. **Contractor or subcontractor responsible for horizontal directional drilling operations shall perform all horizontal directional drilling operations including pipe joining/fusing**. In order to qualify to perform work specified in this Section the Contractor must provide evidence satisfactory to JWSC, as noted in the Instructions to Bidders with bid response.

1.04 PROJECT SCHEDULE AND COOPERATION:

The project schedule shall be established on the basis of working a normal work schedule as defined in the Special Conditions, or otherwise indicated in the Construction Drawings. Unless approved or requested otherwise by JWSC, normal or general items of work, such as bacteriological testing, leakage and pressure testing, locate wire testing, density testing and final inspections, shall be scheduled during the normal work schedule. Due to operational

and manpower limitations on the JWSC systems, JWSC may require the contractor to perform work outside of the normal work schedule. These operational and manpower limitations may include line filling and flushing operation, tie-in work, (cut-in work or other work) and other phases of the work which may impact the continued (non-interruptible) service to existing JWSC customers. The contractor shall plan and anticipate the cost impact of these systems limitations and provide such work or services at no additional cost to JWSC.

1.05 WARRANTY:

The Contractor shall supply to JWSC a one (1) year unconditional warranty. The warranty shall include materials and installation and shall constitute complete replacement and delivery to the site of materials and installation of same to replace defective materials or defective workmanship with new materials/workmanship conforming to the specifications.

The pipe manufacturer shall provide a warranty to the Contractor that the pipe conforms to these specifications and that the pipe shall be free from defects in materials and workmanship for a period of one (1) year from the date of final completion of the installation. The manufacturer's warranty shall be in a form acceptable to and for the benefit of JWSC and shall be submitted by the contractor as a condition of final payment. The manufacturer's warranty to the contractor shall in no way relieve the contractor from its unconditional warranty to JWSC.

The contractor shall warrant to JWSC that the methods used on the contract, where covered by patents or license agreements, are furnished in accordance with such agreements and that the prices included herein cover all applicable royalties and fees in accordance with such license agreements. The contractor shall defend, indemnify, and hold JWSC harmless from and against any and all costs, loss, damage or expense arising out of, or in any way connected with, any claim of infringement of patent, trademark, or violation of license agreement.

1.06 REFERENCED STANDARDS:

A. The work shall conform to applicable provisions of the JWSC Standards for Water and Sewer Design and Construction, and the following standards, latest editions, except as modified herein.

B. American Water Works Association (AWWA) Standards:

AWWA C900 Polyvinyl Chloride Pressure Pipe and Fabricated Fittings, 4 inch through 60 inch.

AWWA C906 Polyethylene (PE) Pressure Pipe and Fittings, 4 inch through 63 inch, for Water Distribution American Society for Testing and Materials (ASTM) Standards.

ASTM D638 Standard Test Method for Tensile Properties of Plastics.

ASTM D2122 Standard Method of Determining Dimensions of Thermoplastics Pipe and Fittings.

ASTM D2683 Standard Specification for Socket-Type Polyethylene Fittings for Outside Diameter-Controlled Polyethylene Pipe and Tubing.

ASTM D2837 Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials.

ASTM D3035 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter.

ASTM E3261 Standard Specification for Butt Heat Fusion Polyethylene Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.

ASTM D3350 Standard Specification for Polyethylene Plastic Pipe and Fittings Materials.

ASTM F412 Standard Terminology Relating to Plastic Piping Systems.

ASTM F714 Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter.

ASTM F2620 Standard Practice for Heat Fusion Joining of Polyethylene Pipe and Fittings.

1.07 PERMITS:

The Contractor shall verify the existence of all necessary permits before commencing any work on the project.

1.08 SUBMITTALS (For HDD Portions of Project Only):

A. Work Plan: Prior to beginning work, the Contractor must submit to the JWSC Representative a work plan detailing the procedure and schedule to be used to execute the project. Horizontal directional drilling shall not commence until the contractor has received written approval of all work plan submittals from JWSC.

1. Methods: The Contractor shall provide complete descriptions of proposed plans, procedures, and personnel, as well as supporting calculations, for the following:

   a. Drilling operations, addressing: Procedures for pilot hole drilling and reaming. Procedures for tracking and controlling the drilling head location. Procedures for preparing as-builts.
   b. Drilling fluid management plan.
   c. Spoils handling and disposal plan.
   d. Pipe storage and handling, addressing: Means and methods for protecting pipe and ensuring temperature control in accordance with the Contractor's installation calculations.
   e. Pipeline assembly and installation, addressing: Procedures for pipe joining, pipeline pullback, and pullback monitoring.
   f. Prevention of inadvertent fluid losses and spills, and contingencies for rapid containment and cleanup, addressing: Measures to mitigate risk of inadvertent fluid returns to surface. Procedures for monitoring and controlling drilling fluid flows and pressures. Equipment, resources, and procedures for identifying, containing, and cleaning up fluid losses and spills.
   g. Quality control and testing procedures.
   h. Safety plan.

2. Schedule: The Contractor shall provide a schedule for all horizontal directional drilling activities commencing with the site preparation and terminating on completion of testing and final acceptance of the installed pipe. The schedule shall address anticipated subsurface conditions and overall project requirements.

3. Equipment

   a. The contractor shall provide the make, model, and technical specifications for each of the following:
      1. Horizontal directional drill rig.
      2. Drilling system components.
      3. Downhole drilling assembly and reaming equipment.
      4. Downhole pressure sub.
      5 Guidance and control system.
      6. Pulling head.
      7. Swivel.
      8. Rollers.
      9. Solids separation and drill fluid recirculation systems.
      10. Pipe fusion equipment.
      11. Pipe fusion data logger.
      12. Pipe handling equipment.
      13. Pigs and pigging equipment.

   b. The Contractor shall provide the following specific equipment information:
      1. Calibration certification for the pilot bore guidance and control system.
      2. Calibration certification for the heat fusion datalogger.

4. Supplemental Work Plan Requirements: The Contractor shall provide the following additional work plan submittals. The submission requirements for additional work plan submittals including number of copies and delivery of submittals shall follow the requirements outlined in the Submittals Section of the Special Conditions. Horizontal directional drilling shall not commence until the Contractor has received written approval of all supplemental work plan submittals.

   a. The Contractor shall submit acknowledgement of use of the Maintenance of Traffic plans in the Construction Drawings or shall submit alternate detailed Maintenance of Traffic plans for entry and exit pit sites and all areas of construction which will impact typical roadway or pathway use. Approval of Glynn County will be required for ALL Maintenance of Traffic plans with the ROW Permit.
   b. Frac-Out and Surface Spill Contingency Plan: Plans for mitigating the potential for inadvertent drilling fluid losses to surface, and for

rapidly identifying and cleaning up spills near the investigation borings located along the project alignment. Investigation boreholes along the alignment have been backfilled as reported in the Geotechnical Report. The Contractor's work plans shall address the risk that investigation boreholes may contribute to the risk of drill fluid loss.

c. Contingency plan for rapidly identifying, locating, and containing any drilling fluid returns.

d. The Contractor shall submit a contingency plan to address procedures to be employed in the event any of the listed items occur.

1. Utility strike, obstruction, or inability to advance drill pipe.
2. Excessive deviation from proposed line and grade, as described within this Section.
3. Inability to move pipe through borehole during pullback.
4. Settlement or heave of roadways and structures within 50 feet of the alignment.

B. Calculations:

The Contractor shall submit final design calculations for JWSC's review and approval as soon as possible following Notice to Proceed, and in accordance with the Project Schedule section of the Special Conditions. Final design calculations shall support the Contractor's specific proposed means, methods, and products. The Contractor's final design calculations shall be prepared and sealed by a Licensed Professional Engineer registered to practice in the State of Georgia, and retained by the Contractor. Horizontal directional drilling shall not commence until the Contractor has received written approval of all design calculation submittals from JWSC.

At a minimum, design calculations shall demonstrate that the proposed pipe, equipment, and means and methods comply with the requirements of this Section and have been designed based on the design borepath, and installation means and methods, for anticipated installation and handling, hydrostatic, earth, and live loads, installation temperature and site conditions. Design calculations shall address the considerations and guidelines presented in ASTM F1962: Standard Guide for Use of Maxi-Horizontal Directional Drilling for Placement of Polyethylene Pipe or Conduit Under Obstacles, Including River Crossings

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The Contractor shall supply copies of all other calculations required to support the required submittals for horizontal directional drilling. At a minimum, the following calculations should be included:

1. Maximum allowable pipe loading limits.
2. Pullback load calculation based upon proposed drill path plan and profile.
3. Buoyancy effect calculations.
4. Effects of ballasting plan on pipe pullback forces.
5. Hydrofracture analysis. This should include a maximum annular pressure curve and the respective formation pressure versus depth based on the

proposed drill plan and profile.

6. Confirmation that design parameters do not exceed predicted installation stresses including factors such as tensile load, buckling and deformation.

C. Shop Drawing Submittals:

For all materials provided, Contractor shall provide copies of documentation (actual catalog data, brochures, drawings and descriptive literature) necessary to establish compliance with the Specifications in accordance with Submittals Section of the Special Conditions.

D. Construction Records:

1. Daily Reports: The Contractor shall maintain daily activity reports throughout all horizontal directional drilling operations, including pipe installation. A sample daily report shall be submitted to JWSC for approval prior to the commencement of drilling operations. Daily reports shall be submitted within 24 hours of completion, and shall include, for each drill rod added or withdrawn, or every 30 feet during drilling, pre-reaming, and pullback:

   a. Downhole tools and equipment in use.
   b. Description of ground conditions encountered.
   c. Description of drilling fluid.
   d. Drilling fluid pumping rate.
   e. Maximum and minimum downhole fluid pressures.
   f. Drilling head location - at least every 10 feet along the bore path.
   g. Drill stem torque.
   h. Details and perceived reasons for delays greater than one hour other than normal breaks and shift changes.
   i. Details of any unusual conditions or events.

2. Production and Record Drawings: The Contractor shall maintain at the construction site a complete set of field drawings for recording the as-built conditions. The Contractor shall plot as-built conditions on the field drawings, including the location in plan and elevation of the drill string, reaming head, and installed pipe, at the completion of each production shift. The Contractor shall compile and submit as-built data in accordance with the Project Record Documents requirements in the Special Conditions.

   a. As-Built data provided to the Engineer of Record for incorporation into the Record Drawings shall include Horizontal Directional Drill pipe installation information in plan and profile views in AutoCAD format with X, Y, and Z coordinates in Georgia State Plane East Zone Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD 88) conducted by a surveyor licensed in the State of Georgia. Directional Drill Bore Log shall be provided as part of the As-Built documentation and shall be in Georgia State Plane East Zone

Coordinates (Horizontal Datum NAD 83 and Vertical Datum NAVD 88) and be relative to the established surface survey bench mark and baseline stationing that is tied to existing, fixed and visible sight features. Directional Drill Bore Log shall show recorded X, Y, and Z locations of the drill head at minimum every 20 feet in the AutoCAD format documentation.

3. Testing and Quality Control and Assurance Documentation: The Contractor shall maintain records for all testing and quality control and assurance procedures. The following records shall be provided to JWSC or JWSC's Representative on the day that information is acquired by the Contractor:
   a Manufacturer's Field Reports.
   b. Test reports.
   c. Fusion reports. For each weld, provide an electronic and printed report of the downloaded information for each weld. Fusion reports shall be submitted for review and approval to Engineer/Owner prior to initiating pullback operations.

1.09 NOTIFICATION:

The JWSC Representative must be notified 48 hours (minimum) in advance of starting the drilling work. The Directional Bore shall not begin until the proper preparations (see Work Plan) for the operation have been completed.

1.10 MEASUREMENT AND PAYMENT

A. Payment for Horizontal Directional Drilling will be made under the unit price items designated for piping installed by horizontal directional drilling. Reference Section 01025 Measurement and Payment.

1.11 SITE PREPARATION:

A. Prior to any alterations to work-site, Contractor shall video record and photograph entire work area in accordance with Section 01380: Construction Photographs and Video. Two (2) copies of such documentation shall be given to the JWSC Representative and Engineer and one (1) copy shall remain with Contractor for a period of two (2) years following the completion of the project. Pre-construction videos and photographs shall be reviewed and approved by JWSC and Engineer prior to disturbing project site.

B. The Contractor shall coordinate utilities locates with Georgia811 (web site www.Georgia811.com). Once the locate service has field marked all utilities, the Contractor shall verify each utility (including any service laterals, i.e. water, wastewater, cable, gas, electric, telecommunications, etc.) and those within each paved area. Verification may be performed utilizing Ground Penetrating Radar, hand dig, or vacuum excavation. Prior to initiating drilling, the Contractor shall record on the drawings both the horizontal and vertical location of the utilities off

of a predetermined baseline. The Contractor shall utilize the Ground Penetrating Radar over the projected bore path whether utilities are located in the horizontal drill pathway or not, in order to reduce the opportunity of conflicting with any unforeseen obstructions.

C. Work site shall be graded and filled to provide a level working area. No alterations beyond what is required for operations are to be made. Contractor shall confine all activities to designated work areas.

D. Following drilling operations, Contractor will de-mobilize equipment and restore the work-site to original condition. All excavations will be backfilled and compacted in accordance with Section 02220 Excavating, Backfilling, Compacting and the Construction Details.

1.12 ENVIRONMENTAL PROTECTION:

Contractor shall place erosion and sediment control measures between all drilling operations and any drainage, wetland, waterway or other area designated for such protection by contract documents, permits, and state, federal and local regulations. Contractor shall place approved protection methods to limit intrusion upon project area. Additional environmental protection necessary to contain any hydraulic or drilling fluid spills shall be put in place, including berms, liners, turbidity curtains and other measures. Contractor shall adhere to all applicable environmental regulations including environmental condition stated in local, state and federal permits. Fuel may not be stored in bulk containers (greater than 25 gallons) within 200' of any water-body or wetland.

1.13 SAFETY:

Contractor shall adhere to all applicable state, federal and local safety regulations and all operations shall be conducted in a safe manner.

1.14 DOMESTIC WATER:

For the supply of domestic water during construction, the Contractor shall utilize a JWSC meter assembly (meter & backflow device) and pay for all water consumed.

PART 2. MATERIALS

2.01. HIGH DENSITY POLYETHYLENE (HDPE, PE) PIPE AND FITTINGS:

A. Materials:

Materials used for the manufacture of polyethylene pipe and fittings shall be PE4710 high density polyethylene meeting cell classification 345464C per ASTM D3350; and meeting Type III, Class B or Class C, Category 5, Grade P34 per ASTM D1248; and shall be listed in the name of the pipe and fitting Manufacturer in PPI

TR-4, Recommended Hydrostatic Strengths and Design Stresses for Thermoplastic Pipe and Fittings Compounds, with a standard grade rating of 1600 psi at 73°F per ASTM D-2837. The Manufacturer shall certify that the materials used to manufacture pipe and fittings meet these requirements.

B. Polyethylene Pipe

HDPE Pipe shall conform to AWWA C906, DR-11, Ductile Iron Pipe (DIP) size and NSF 61 Standard. For pipe sizes 24-inch and larger, the HDPE may be IPS size, DR 11. Polyethylene pipe shall be manufactured in accordance with ASTM F714, Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter and shall be so marked. Each production lot of pipe shall be tested for (from material or pipe) melt index, density, % carbon, dimensions and either quick burst or ring tensile strength (equipment permitting).

C. Nominal Pipe Sizes

Nominal pipe sizes only are indicated on the drawings and bid form. Outside diameter of pipe is generally 1 to 2-inches greater than the nominal pipe diameter.

D. Service Identification:

Permanent identification of piping service shall be provided by co-extruding multiple equally spaced color stripes into the pipe outside surface or by solid colored pipe shell. The striping material shall be the same material as the pipe material except for color. Colors for identifying piping service shall be in accordance with JWSC Standards for Water and Sewer Design and Construction.

E. Back-up Rings and Flange Bolts:

Flange adapters shall be fitted with lap joint flanges pressure rated equal to or greater than the mating pipe. Convoluted style backup rings preferred over the flat stock rings. The lap joint flange bore shall be chamfered to provide clearance to the flange adapter radius. Flange bolts and nuts shall be Grade 2 or higher.

F. Manufacturer's Quality Control:

The pipe and fitting manufacturer shall have an established quality control program responsible for inspecting incoming and outgoing materials. Incoming polyethylene materials shall be inspected for density, melt flow rated, and contamination. The cell classification properties of the material shall be certified by the supplier, and verified by Manufacturer's Quality Control.

G. Polyethylene Mechanical Joint (MJ) Adapters:

Mechanical connections of HDPE pipe to Ductile Iron or PVC piping, mechanical joint fittings, or valves shall be through a fusible polyethylene mechanical joint adapter with an integral, internal stainless steel insert. Mechanical joint adapter shall be of the same DR rating as the pipe. Adaptors shall include longer T-bolts or all thread rods with nuts at the mechanical joint bell.

2.02 FUSIBLE POLYVINYL CHLORIDE (FPVC) PIPE (IF APPROVED BY OWNER):

A. FPVC Pipe shall conform to AWWA C900, Ductile Iron Pipe Size (DIPS), DR18, and color coded. The pipe material shall be clean, virgin, National Sanitation Foundation No. 14, ASTM cell class 12454. FPVC shall be extruded with plain ends. The ends shall be square to the pipe and free of any bevel or chamfer. There shall be no bell or gasket of any kind incorporated into the pipe. Each length shall be clearly marked with the name of the manufacturer, location of the plant, pressure rating, nominal pipe diameter.

B. FPVC pipe shall not be bent beyond the manufacturer's recommended minimum allowable bend radius. The published allowable bend radius is applicable to all pipe alignments, including during handling and movement, as well as final positioning and installation.

C. FPVC pipe shall not be subjected to a pull force greater than 80% of the manufacturer's recommended allowable pull force for the pipe wall thickness and size. Allowable pull force is the tensile load that may be safely applied to the pipe and is a function of the tensile stress capacity of FPVC and the cross-sectional area of the FPVC pipe section. FPVC pipe shall meet the cell class tensile stress capacity of 7,000 psi when the compound is tested per ASTM 1784. Safety factor shall be 2.5.

2.03 DRILLING FLUIDS SHALL BE A BENTONITE SLURRY.

2.04 DELIVERY, STORAGE AND HANDLING OF MATERIALS:

A. Inspect materials delivered to the site for damage. All materials found during inspection or during the progress of work to have cracks, flaws, cracked linings, or other defects shall be rejected and removed from the job site without delay.

B. Unload and store opposite or near the place where the work will proceed with minimum handling. Store material under cover out of direct sun light. Do not store directly on the ground. Keep all materials free of dirt and debris. Storage and handling of pipe shall be in accordance with manufacturer's recommendations.

C. Contractor is responsible for obtaining, transporting and sorting any fluids, including water, to the work site.

D. Disposal of fluids is the responsibility of the Contractor. Disposal of fluids shall be done in a manner that is in compliance with all permits and applicable federal, state, or local environmental regulations. The bentonite drilling slurry, as appropriate, shall be recycled for reuse in the hole opening operation, or shall be hauled by the Contractor to an approved location or landfill for proper disposal. Contractor shall thoroughly clean entire area of any fluid residue upon completion of installation, and replace any and all plants, vegetation, and sod damaged, discolored or stained by drilling fluids. Contractor is responsible for the cost of disposal including but not limited to hauling and disposal charges.

1. Potential Disposal Site: Potential disposal site, previously used for disposal of drilling fluids - Seaboard Construction Company, Inc. Contractor to verify

availability for this project. Seaboard Construction (912) 265-6410.

2.05 EQUIPMENT REQUIREMENTS

A. GENERAL:

The directional drilling equipment shall consist of a directional drilling rig of sufficient capacity to perform the bore and pullback the pipe, a drilling fluid mixing, delivery and recovery system of sufficient capacity to successfully complete the drill, a drilling fluid recycling system to remove solids from the drilling fluid so that the fluid can be re-used, a guidance system to accurately guide boring operations, a vacuum truck of sufficient capacity to handle the drilling fluid volume, trained and competent personnel to operate the system. All equipment shall be in good, safety operating condition with sufficient supplies, materials and spare parts on hand to maintain the system in good working order for the duration of this project.

B. DRILLING SYSTEM

1. Drilling Rig:

The directional drilling machine shall consist of a power system to rotate, push and pull hollow drill pipe into the ground at a variable angle while delivering a pressurized fluid mixture to a guidable drill (bore) head. The power system shall be self-contained with sufficient pressure and volume to power drilling operations. Hydraulic system shall be free of leaks. Rig shall have a system to monitor and record maximum pull-back pressure during pull-back operations. The rig shall be grounded during drilling and pull-back operations. There shall be a system to detect electrical current from the drilling string and an audible alarm which automatically sounds when an electrical current is detected.

2. Drill Head:

The drill head shall be steerable and shall provide the necessary cutting surfaces and drilling fluid jets.

3. Mud Motors (if required):

Mud motors shall be of adequate power to turn the required drilling tools.

4. Drill Pipe:

Shall be constructed of high quality 4130 seamless tubing, grade D or better.

C. GUIDANCE SYSTEM:

Magnetic Guidance System (MGS) wireline, wireless or gyroscopic shall provide real time electronic data to the inspector on request. All daily data and project data shall be displayed on the "As Built". If deemed necessary, JWSC shall, at the

contractor's expense, require a third party to verify the drill path profile and location of the installed line to JWSC satisfaction. The guidance system shall be capable of tracking at all depths up to forty feet (40') below the maximum proposed depth and in any soil condition, including hard rock. It shall enable the driller to guide the drill head by providing immediate information on the tool face, azimuth (horizontal direction), and inclination (vertical direction). The guidance system shall be accurate to +/-2% of the vertical depth of the borehole at sensing position at depths up to one hundred feet and accurate within 1.5 meters horizontally.

The Guidance System shall be of a proven type and shall be operated by personnel trained and experienced with this system. The Operator shall be aware of any magnetic anomalies on the surface of the drill path and shall consider such influences in the operation of the guidance system if using a magnetic system.

1. Bore Tracking and Monitoring:

   At all times during the pilot bore the Contractor shall provide and maintain a bore tracking system that is capable of accurately locating the position of the drill head in the x, y, and z axes. The Contractor shall record these data at least once per drill pipe length.

   a. Downhole and Surface Grid Tracking System:

      Contractor shall monitor and record x, y, and z coordinates relative to an established surface survey bench mark. The data shall be continuously monitored and recorded at least once per drill pipe-length.

   b. Deviations between the recorded and design bore path shall be calculated and reported on the daily log. If the deviations exceed plus or minus 5 feet (horizontal or vertical deviation) from the design path, such occurrences shall be reported immediately to JWSC. The Contractor shall undertake all necessary measures to correct deviations and return to design line and grade.

   c. Drilling Fluid Pressures and Flow Rates:

      Drilling fluid pressures including drilling fluid pressure in the borehole annular space and flow rates shall be continuously monitored and recorded by the Contractor. These measurements shall be made during pilot bore drilling, reaming, and pullback operations.

D. DRILLING FLUID (MUD) SYSTEM:

1. Mixing System:

   A self-contained, closed, drilling fluid mixing system shall be of sufficient size to mix and deliver drilling fluid. Mixing system shall continually agitate the drilling fluid during operations.

2. Drilling Fluids:

Drilling fluid shall be composed of clean water, appropriate additives and clay. Water shall be from an authorized source with a minimum pH of 6.0. Water of a lower pH or with excessive calcium shall be treated with the appropriate amount of sodium carbonate or equal. The water and additives shall be mixed thoroughly and be absent of any clumps or clods. No potentially hazardous material may be used in drilling fluid.

3. Delivery System:

The delivery system shall have filters in-line to prevent solids from being pumped into the drill pipe. Connections between the pump and drill pipe shall be relatively leak-free. Used drilling fluid and drilling fluid spilled during drilling operations shall be contained and conveyed to the drilling fluid recycling system or disposed of properly. A berm, minimum of 12" high, shall be maintained around drill rigs, drilling fluid mixing system, entry and exit pits and drilling fluid cycling system to prevent spills into the surrounding environment. Pumps and or vacuum truck(s) of sufficient size shall be in place to convey excess drilling fluid from containment areas to storage, recycling, and disposal facilities.

4. Drilling Fluid Viscosity

In the event that inadvertent returns or returns loss of drilling fluid occurs during pilot hole drilling operations, Contractor shall cease drilling, wait at least 30 minutes, inject a quantity of drilling fluid with a viscosity exceeding 120 seconds as measured by a March funnel and then wait another 30 minutes. If mud fracture or returns loss continues, Contractor shall cease operations and notify JWSC Representative. JWSC Representative and Contractor shall discuss additional options and work will then proceed accordingly.

5. Drilling Fluid Recycling System:

The drilling fluid recycling system shall separate sand, dirt and other solids from the drilling fluid to render the drilling fluid re-usable. Spoils separated from the drilling fluid will be stockpiled for later use or disposal.

6. Control of Drilling Fluids:

The Contractor shall follow all requirements of the Frac-Out and Surface Spill Contingency Plan as submitted and approved and shall control operational pressures, drilling mud weights, drilling speeds, and any other operational factors required to avoid hydrofracture fluid losses to formations, and control drilling fluid spillage. This includes any spillages or returns at entry and exit locations or at any intermediate point. All inadvertent returns or spills shall be promptly contained and cleaned up. The Contractor shall maintain on-site mobile spoil removal equipment during all drilling, pre-reaming, reaming and pullback operations and shall be capable of quickly removing spoils. The Contractor shall immediately notify JWSC of any inadvertent returns or spills and immediately contain

and clean up the return or spill.

E. OTHER EQUIPMENT:

1. Pipe Rollers:

Pipe rollers shall be of sufficient size to fully support the weight of the pipe while being hydro-tested and during pull-back operations. Sufficient number of rollers shall be used to prevent excess sagging of pipe and to protect trees during pipe pullback operations. Sizing and maximum spacing and location of pipe rollers along pipe length shall adhere to pipe manufacturer's recommendations.

2. Pipe Rammers:

Hydraulic or pneumatic pipe rammers may only be used if necessary and with the authorization of JWSC Representative.

3. Restrictions:

Other devices or utility placement systems for providing horizontal thrust other than those defined above in the preceding sections shall not be used unless approved by the JWSC Representative prior to commencement of the work. Consideration for approval will be made on an individual basis for each specified location. The proposed device or system will be evaluated prior to approval or rejection on its potential ability to complete the utility placement satisfactorily without undue stoppage and to maintain line and grade within the tolerances prescribed by the particular conditions of the project.

F. DATA LOGGER.

1. General:

A data logger shall be used to record and document all butt weld fusion processes. A record shall be made of every fusion weld made. The data logger shall be of a rugged, handheld computer as the recording device connected to a data collection device. The data collection device shall record the heater temperature and fusion pressure profile over time. All data shall be recorded and transmitted to the handheld computer where the joint report will be stored, viewed, printed, or transferred to a desk top computer for archiving. The operator associated with the fusion process shall utilize the data logger report as one means to confirm a complete and proper weld. This data shall be made immediately available to the JWSC Representative, upon request. Unless approved otherwise by JWSC, a written or downloaded report for each fusion weld process shall be required and submitted to the JWSC Representative after the fusion weld process for review and approval prior to initiating pullback operations. If a potential defect fusion weld is suspected by JWSC or the Contractor, the work shall stop and a mutually acceptable (between the Contractor and JWSC) corrective action plan shall be executed.

2. Data logger:

Equipment shall be Mc Elroy Datalogger Model no. DL6303 DL 6304 or JWSC approved equal.

PART 3. EXECUTION

3.01 DRILLING PROCEDURES

A. DRILL PATH:

Prior to drilling Contractor shall utilize all verified locate information to determine drill pathway. Marked up drawings (see Site Preparation paragraph) shall be on site at all times, and referred to during the drill operation.

B. GUIDANCE SYSTEM:

Contractor shall provide and maintain instrumentation necessary to accurately locate the pilot hole (both horizontal and vertical displacements), measure pilot string torsional and axial forces and measure drilling fluid discharge rate and pressure. The JWSC Representative shall have access to instrumentation and readings at all times during operation.

C. PILOT HOLE:

The pilot hole shall be drilled along the path shown on the plans and profile drawings. Unless approved otherwise by JWSC, the pilot-hole tolerances shall be as follows:

1. Elevation:

As shown on the plans.

2. Alignment:

As indicated; at a minimum three (3) feet within the right-of-way, easement, wetland boundary, or other restrictive designations.

3. Curve Radius:

The pilot hole radius shall be no less than 80% of the maximum bending radius as recommended by the pipe manufacturer of the pipe being installed. In no case shall the bending radius be less than 30 pipe diameters, unless approved otherwise by JWSC.

4. Entry Point Location:

The exact pilot hole entry point shall be within ±5 feet of the location shown on the drawings without prior JWSC written permission for deviation.

5. Exit Point Location:

The exit point location shall be within ± 5 feet of the location shown on the drawings without prior JWSC written permission for deviation.

6. Limitations on Depth:

Pipe larger than bore hole path shall be specifically designed by the engineer and approved by JWSC. Where utilities cross under roads, the depth of cover shall comply with applicable authorizing agency and permit.

7. Water Main and Non-Water Main Separation Requirements:

The minimum separation requirements between water main and a non-water main shall be as required by Georgia EPD and in accordance with relevant permits. The current requirements are specified below:

a. Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge-to-edge.

b. When local conditions prevent a horizontal separation of 10 feet, the water main may be laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. It is advised that the sewer be constructed of materials and with joints that are equivalent to water main standards of construction and be pressure tested to assure water-tightness prior to backfilling.

D. PULL BACK:

After successfully reaming bore hole to the required diameter, Contractor will pull the pipe through the bore hole. In front of the pipe will be a swivel and appropriate tools per the contractor's approved Work Plan. Once pull-back operations have commenced, operations must continue without interruption until pipe is completely pulled into bore hole. During pull-back operations Contractor will not apply more than the maximum safe pipe pull force at any time. Maximum allowable tensile force imposed on the pull section shall be equal to 80% of the pipe manufacturer's safety pull (or tensile) strength.

1. Torsional stress shall be minimized by using a swivel to connect a pull section to the reaming assembly.

2. The pullback section of the pipeline shall be supported during pullback operations so that it moves freely and the pipe is not damaged.

3. External pressure shall be minimized during installation of the pullback

section in the reamed hole. Damaged pipe resulting from external pressure shall be replaced at no cost to the JWSC.

4. Buoyancy modification shall be at the discretion of the Contractor and shall be approved by the JWSC Representative. The Contractor shall be responsible for any damage to the pull section resulting from such modifications.

5. In the event that pipe becomes stuck, Contractor will cease pulling operations to allow any potential hydro-lock to subside and will commence pulling operations. If pipe remains stuck, Contractor will notify JWSC Representative. JWSC Representative and Contractor will discuss options and then work will proceed accordingly.

3.02 PIPE ASSEMBLY

A. GENERAL:

Pipe shall be welded/fused together in one length, if space permits. HDPE Pipe may be placed on pipe rollers before pulling into bore hole to minimize damage to the pipe. FPVC pipe shall be placed on pipe rollers, in accordance with manufacturer's recommendations, before pulling into bore hole to minimize damage to the pipe. It is critical that all original oxidized pipe surface be removed in order for fusion to take place. The scraping process requires that approximately 0.10" of the outer "skin" be removed in order to penetrate the oxidation and contamination barrier. Oxidized pipe surface simply will not bond.

B. ACCEPTABILITY OF DAMAGED PIPE:

Cuts or gouges that reduce the wall thickness by more than 10% are not acceptable and must be cut out and discarded.

C. BUTT FUSION LOG:

Each butt fusion shall be recorded and logged by an approved electronic monitoring device (Reference paragraph 2.04 F.2.) affixed to the fusion machine.

1. Joint data shall be submitted for review and approval to the Engineer/Owner prior to initiating pullback operations.
2. Joint data shall also be submitted as part of the As-Recorded information, in accordance with this specification.
3. Joint fusion reports shall reference station number and street name for geographical reference of installed location.

D. BUTT FUSION TESTING:

When requested by a JWSC inspector, butt fusion testing will be performed. The test fusion shall be allowed to cool completely, and then fusion test coupons shall be cut out. The test shall involve McElroy' "In Field Tensile Tester" which utilizes test coupons (conducted in accordance with manufacturer's recommendations) or JWSC pre-approved test methods and/or manufacturer.

E. MECHANICAL JOINING:

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

F. GENERAL REQUIREMENTS FOR OPEN-CUT CONSTRUCTION:

Mains shall be constructed of the materials specified and as shown on the drawings. Pipe and fittings shall be carefully handled to avoid damage, and if feasible, while they are suspended over the trench before lowering, they shall be inspected for defects and to detect cracks. Defective, damaged or unsound pipe or fittings shall be rejected. Each section of the pipe shall rest upon the pipe bed for the full length of its barrel. Any pipe which has its grade or joint disturbed after laying shall be taken up and re-laid. Only suitable soils shall be utilized in the backfill operation. All precautions shall be taken to prevent sand or other foreign material from entering the pipe during installation. If necessary, a heavy, tightly woven canvas bag of suitable size shall be placed over each end of the pipe before lowering into the trench and left there until the connection is made to the adjacent pipe. Any time the pipe installation is not in progress, the open ends of pipe shall be closed by a watertight plug or other method approved by the JWSC. Plugs shall remain in pipe ends until all water is removed from the trench. Any sand or foreign material that enters the pipe shall be removed from the pipe immediately. No pipe shall be installed when trench conditions (standing water, excess mud, etc.) or the weather (rain, etc.) is unsuitable for such work, except by permission of the JWSC. Any section of pipe already laid which is found to be defective or damaged shall be replaced with new pipe. Lines shall be located as shown on the drawings. The Contractor shall investigate well in advance of pipe laying any conflicts which may require readjustments in planned locations and advise the JWSC Representative of the results of these investigations so that the necessary modifications may be determined. Refer to JWSC Standards for Water and Sewer Design and Construction and other sections of the Technical Specifications for additional requirements.

3.03 SWABBING

A. The purpose of swabbing a new pipeline is to conserve water while thoroughly cleaning the pipeline of all foreign material, sand, gravel, construction debris and other items not found in a properly cleaned system. Prior to pressure testing of a new pipeline, swabbing shall be utilized as indicated below.

B. All new water and sewer force mains greater than 12" I.D. shall be hydraulically cleaned with a polypropylene swabbing device to remove dirt, sand and debris from main.

C. If swabbing access and egress points are not provided in the design drawings, it

will be the responsibility of the Contractor to provide temporary access and egress points for the cleaning, as required.

D. Passage of cleaning poly swabs through the system shall be constantly monitored, controlled and all poly swabs entered into the system shall be individually marked and identified so that the exiting of the poly swabs from the system can be confirmed.

E. Cleaning of the system shall be done in conjunction with, and prior to, the initial filling of the system for its hydrostatic test.

F. The Contractor shall insert flexible polyurethane foam swabs (two pounds per cubic foot density) complete with rear polyurethane drive seal, into the first section of pipe. The swabs shall remain there until the pipeline construction is completed. A JWSC representative shall be present for the swabbing process including swab insertion and retrieval.

G. The line to be cleaned shall only be connected to the existing distribution system at a single connection point.

H. Locate and open all new in-line valves beyond the point of connection on the pipeline to be cleaned during the swabbing operation.

I. At the receiver or exit point for the poly swab, the Contractor is responsible for creating a safe environment for collection of debris, water and the swab. Considerations shall be made for protecting surrounding personnel and property and safe retrieval of the swab.

J. Only with JWSC personnel on-site shall the supply valve from the existing distribution system be operated. Cleaning and flushing shall be accomplished by propelling the swab down the pipeline to the exit point with potable water. Flushing shall continue until the water is completely clear and swab(s) is/are retrieved.

1. Re-apply a series of individual swabs in varying diameters and/or densities as required, to attain proper cleanliness of pipeline.

2. Swabbing speed shall range between two and five feet per second.

K. After the swabbing process, pressure testing and disinfection, as appropriate, of the pipe shall be completed in accordance with the JWSC Standards for Water and Sewer Design and Construction and this specification.

3.04 TESTING

A. DISINFECTION TESTS:

1. Upon satisfactory completion of the hydrostatic testing, all new water lines and other pipe related installations which may have been contaminated by the work shall be disinfected prior to being placed in service. Disinfection shall follow the applicable provisions of AWWA Standard C651 – AWWA Standard for Disinfecting Water Mains, the Rules for Safe Drinking

Water as published by the Georgia Environmental Protection Division, and as outlined in the JWSC Standards for Water and Sewer Design and Construction.

B. HYDROSTATIC (PRESSURE AND LEAKAGE) TESTS:

1. Contractor shall test FPVC pipelines installed under this Contract in accordance with Section 15044: Pressure Testing of Piping.

2. Contractor shall test HDPE pipelines installed under this Contract in accordance with these specifications prior to acceptance of the pipeline by the JWSC. All field tests shall be made in the presence of the JWSC Representative. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by JWSC, all fusible or butt weld joints shall be tested, including MJ adapter fittings associated with the new construction. All piping to operate under liquid pressure shall be tested in sections of approved length. The pressure testing of an HDPE line section shall be tested separately from the PVC and DIP line sections. Where impractical, the HDPE test section shall include only a minimum amount of PVC and DIP within the test section. If at all possible, the PVC and DIP test sections shall be left exposed during the pressure test for visual leakage observation. For these tests, the Contractor shall furnish clean water, suitable temporary testing plugs or caps, and other necessary equipment, and all labor required. JWSC may elect to furnish suitable pressure gauges for these tests. If not, the Contractor will furnish suitable pressure gauges, calibrated by an approved testing laboratory, with increments no greater than 2 psi. Gauges used shall be of such size that pressures tested will not register less than 10% or more than 90% of the gauge capacity. All valved sections shall be hydrostatic tested to insure sealing (leak allowance) of all line valves. All HDD over 100 linear feet shall be air pressure tested (above ground) @ 5 PSI for a period of 15 minutes, prior to insertion. There shall be no pressure loss allowed.

2. Unless it has already been done, the section of pipe to be tested shall be filled with potable water and air shall be expelled from the pipe. If blow offs or other outlets are not available at high points for releasing air, the Contractor shall provide 1 inch (minimum taps and blow-off valves (at the 12:00 position), as necessary. The cost of constructing blow-off valves and plugging them, after a successful pressure test, shall be included in the unit price bid amount for the HDD installation.

3. Hydrostatic testing shall consist of 150 psig test pressures, based on the elevation of the highest point of the line or section under test. Pressure shall be applied by means of a pump connected to the pipe in a manner satisfactory to the JWSC Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor and shall be subject to the approval of the JWSC Representative.

5. Maximum duration for pressure test, including initial and final phase of the test, shall not exceed eight (8) hours. If the test is not completed due to leakage, equipment failure, etc., depressurize the test section, and then

allow it to "relax" for at least eight (8) hours before bringing the test section up to test pressure again.

6. Initial Phase of Pressure Testing: First, all air must be removed from the test section. The pressure test shall be completed after the line is backfilled. If possible, all flanged or mechanical joint valves and fittings shall be left exposed for visual leak inspection. If possible all PVC and DIP test sections shall be left exposed for visual leak inspection. Initially, the pressure within the test section should be raised to approximately 160 psi and then allowed to be idle (no additional make-up water/pressure to be injected), for approximately 3 hours. During this 3 hour period, the test section shall be allowed to stabilize and come to an equilibrium stage. No additional make-up water/pressure shall be applied to the test section during this 3 hour stabilization period unless the line pressure drops below 140 psi. In this case, make-up water/pressure shall only be applied to the test section to maintain a minimum of 140 psi (during the 3 hour stabilization period).

7. Final Phase of Pressure Testing:

   The final phase of the pressure test shall involve applying make-up water/pressure to achieve an "initial test pressure" of 150 psi (minimum)/155 psi (maximum). The test section is then allowed to be idle (no make-up water/pressure is added) for a period of 2 hours. After this 2 hour period, make-up water/pressure is applied and measured to re-establish the "initial test pressure". The quantity of water utilized to re-pump the line shall be measured and compared to the allowable quantities as determined by the table below. If the actual make-up water quantity is equal or less than the allowable amount, the pressure test passes. If the actual make-up water quantities are greater than the allowable amount, the pressure test fails (see enclosed JWSC test form).

Table 1: Allowable Make Up Amount

Nominal Pipe Size (inches)	Make-up Water Allowance (Gallons/Linear feet of Pipe) 2-hour test
6	0.0030
8	0.0050
10	0.0065
12	0.0115
14	0.0140
16	0.0165
18	0.0215
20	0.0275
22	0.0350
24	0.0440
26	0.0500
28	0.0555
30	0.0635
32	0.0715
34	0.0810
36	0.0900
42	0.1155
48	0.1350
54	0.1570

8. In the event a section fails to pass the tests, the Contractor shall do everything necessary to locate, uncover (even to the extent of uncovering the entire section), and replace the defective pipe, valve, fitting or joint. Visible leaks shall be corrected regardless of total leakage. Lines which fail to meet these tests shall be retested as necessary until test requirements are complied with. All testing shall be performed at the Contractor's expense.

9. If, in the judgment of JWSC, it is impracticable to follow the foregoing procedures exactly for any reason, modifications in the procedure shall be made with approval; but, in any event, the Contractor shall be responsible for the ultimate tightness of the piping within the above requirement. Re-disinfection of water mains shall be required if the line is de-pressurized for repairs prior to tying.

C. LOCATE WIRE:

Two locate wires shall be provided on all HDPE and FPVC installations. For HDD projects, locate wire shall be 12 AWG high strength copper-clad carbon steel with 45 mils (min) insulation. For open-cut portions of the project, the locate wire construction and testing shall meet the requirements as listed in the General Notes and Construction Details in the Construction Drawings. The external color shall be blue for water and green for wastewater. Locate wire shall be brought to grade within a valve box or locate station box at all "entry point locations" and all "exit point locations". For HDD projects, there is no maximum length or interval between locate wire stations. The testing and report requirements within the

General Notes of the Construction Drawings shall be required except as modified herein. If both locate wires break or are not continuous (from end to end), the Contractor shall, at the Contractor's expense, provide soft-digs for the portions of the main with 12-feet or less cover (every 25 LF along main) to confirm as-built data. This soft-dig data shall be recorded on the as-built record drawings.

BGJWSC RECORD of PRESSURE and LEAKAGE TEST (HDPE PIPE)

Project:_____

TEST SECION:_____

JWSC REPRESENTATIVE:_____SIGNATURE_____

TEST DATE:____/_____/_____ TEST TIME:_____ BEGIN_____ END_____

OTHER TEST PHASE ATTENDEE'S:

_____ _____

_____ _____

PRESSURE AND LEAKAGE TEST CALCULATIONS:

_____WATER MAIN __ WASTEWATER FORCE MAIN _____RECLAIMED WATER MAIN

Line Pressure Test:

Start:_____ PSI (Minimum of 150 PSI or 2x operating pressure) End:_____PSI

PSI Difference: _____PSI (IF GREATER THAN 5 PLI, THE TEST FAILS)

TYPE OF HDPE PIPE (DR RATING) (1)	**DIAMTER OF PIPE (INCHES) (2)**	**LINEAR FEET (3)**	**2-HOUR TEST FACTOR (see JWSC TABLE) (4)**	**TOTAL ALLOWABLE LEAKAGE (3X4) (5)**
			Total Allowable Leakage Amount (Gallons):	

Allowable Leakage Amount _____ Gal _____Oz. (32 oz per qt; 120 of per gal)

Actual Leakage Amount _____Gal _____Oz.

Pressure and Leakage Test Results (Pass or Fail) _____

The above is based on the average pressure test of 150 PSI, 2 hour test period. If the actual leakage amount is equal or less than the allowable leakage amount, the leakage test is acceptable.

JWSC 2 HOUR TEST FACTORS NOMINAL PIPE SIZE (inches) – ALLOWABLE LEAKAGE AMOUNT (Gallons/Linear Feet of Pipe)						
4" – 0.0020	6" – 0.0030	8" – 0.0050	10" – 0.0065	12" – 0.0115	14"- 0.0140	16" – 0.0165
18" – 0.0215	20" – 0.0275	22" – 0.0350	24" – 0.0440	26" – 0.0500	28" – 0.0500	30" – 0.0635
32" – 0.0715	34" – 0.0810	36" – 0.0900	42" – 0.1155	48"- 0.1350	54" – 0.1570	

File No. _____

END OF SECTION