BRUNSWICK-GLYNN COUNTY
JOINT WATER AND SEWER COMMISSION

NORTH MAINLAND WATER LOOPS PROJECT

BGJWSC Project No. 2103

Technical Specifications Package
Issued for Bidding

May 2023

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FOUR WATERS
ENGINEERING

BRUNSWICK - GLYNN COUNTY JOINT WATER & SEWER COMMISSION
NORTH MAINLAND WATER LOOPS

TECHNICAL SPECIFICATIONS
(FOUR WATERS ENGINEERING, INC.)

DIVISION 1 – GENERAL REQUIREMENTS

DIVISION 2 – SITE WORK

DIVISION 15 - MECHANICAL

ATTACHMENTS

INDEX TO

SECTION 00808 – BONDING AND INSURANCE

SECTION 00808

BONDING AND INSURANCE

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. This section supplements the front end documents pertaining to bonding and insurance requirements.

B. Related Sections:

1. General Conditions

2. JWSC Standards for Water and Sewer Design and Construction

3. All applicable Federal, State and Municipal standards, codes, and regulations form a part of these Specifications as minimum requirements. Such references include the latest issue and all amendments up to 30 days prior to the Bid due date.

4. Section 01025 – Measurement and Payment

1.02 INSURANCE INDEMNIFICATION

The Contractor shall indemnify and hold harmless the Owner and the Engineer, their elected officials, agents, officers, and employees from and against all claims, demands, losses, expenses, costs, damages, actions, suits, or proceedings by third parties, hereinafter called "claims", directly or indirectly arising or alleged to arise out of the performance of or the failure to perform the Work, provided such claims are:

1. attributable to bodily injury, sickness, disease, or death or to damage to or destruction of tangible property;

2. caused by negligent acts or omissions of the Contractor or anyone for whose acts the Contractor may be liable; and

3. made in writing within a period of 4 years from the date of Substantial Performance of the Work as set out in the Certificate of Substantial Performance of the Work or, where so specified in the Contract Documents, from the date of certification of Final Acceptance.

1.03 INSURANCE COVERAGE

The Owner and Engineer, as well as their officers and employees, assume no responsibility for the adequacy of limits and coverages in the event of any claim(s) against the Contractor, its officers, employees, subcontractors, or any sub-subcontractor or agent of any of them. The types, forms, and amounts of insurance

specified should be considered minimal, and in no way does the Owner or Engineer imply expressly or otherwise that the coverages specified will cover all exposures to loss and are in amounts sufficient to assure the Contractor, any subcontractor, or sub-subcontractor that uncovered losses will not occur or insurance limits will be adequate. The contractors should seek outside insurance counsel to determine adequate insurance protection for their particular operations. Meeting the insurance specifications shall in no way relieve any contractor, subcontractor or sub-subcontractor of any obligations under the contract, and any indemnification obligations shall survive the exhaustion of insurance limits carried, and shall be fully enforceable to the extent allowed by governing law, regardless of whether loss or losses are not covered by insurance.

1.04 MEASUREMENT FOR PAYMENT

Payment methodology for this item shall be as provided in Section 01025 – Measurement and Payments.

PART 2 - PRODUCTS (NOT USED)

PART 3 - EXECUTION (NOT USED)

END OF SECTION

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 North Mainland Water Loops Project as shown on the Construction Drawings and specified in the Contract Documents including the General Conditions, and Technical Specifications. The work consists of furnishing all labor, equipment and materials, including but not limited to, the following:

Project Area 1- Hautala Drive:

- 12" diameter PVC (DR18) watermain installed along Hautala Drive with connection points at Cate Road and Old Jesup Road, including fire hydrants, services and all necessary appurtenances.

Project Area 2-Bailey Road and Old Jesup Road:

- 12" diameter PVC (DR18) watermain constructed along Bailey Road with connection points at Perry Lane Road and Old Jesup Road, including fire hydrants, services and all necessary appurtenances.

- 12" diameter PVC (DR18) watermain installed along Old Jesup Road with connection points near Lillie Way and Tractor Supply Company's entrance along Old Jesup Road, including fire hydrants, services and all necessary appurtenances.

- 16" (OD) diameter HDPE (DR11) watermain installed under two water courses along Old Jesup Road. This watermain is to be installed via horizontal directional drilling at these two locations

Project Area 3- Golden Isles Parkway:

10" (OD) HDPE (DR11) watermain and 24" (OD) diameter HDPE (DR11) casing pipe constructed along Perry Lane Road with connection points near Millennium Boulevard and Venture Drive. This watermain is to be installed via horizontal directional drilling under Golden Isles Parkway.

B. 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 water main systems complete and ready for use.

D. 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.

E. 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.

F. 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.

G. 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 proposed PVC watermain pipe.
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, churches and other facilities as indicated in the contract drawings.
d. Watermain tie-ins can only be performed for the various project areas as provided below:
    i. Project Area 1- Hautala Drive-Construction working hours:
    ii. Project Area 2-Old Jesup Road-Non-school hours, or weekends:

iii. Project Area 2-Bailey Road- Construction working hours
iv. Project Area 3- Golden Isles Parkway-Nighttime (10:00 pm-6:00 am EST):

e. Open cut excavation areas shall be limited to work which can be completed within one work day.

PART 2 – PRODUCTS (NOT USED)

PART 3 – EXECUTION (NOT USED)

END OF SECTION

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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 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; backfill, compaction and grading; testing materials and apparatus; maintenance of drainage systems; appurtenant work; and close-out documentation; cleaning up; operation and maintenance data; 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 Norfolk Southern Railroad Encroachment Agreement and work within Norfolk Southern right-of-way will not 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 50 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 50 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. Traffic and Pedestrian Control

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 (Water Main) – (Varies by Size and Material; by Horizontal Directional Drill)

1. Measurement: Pressure Piping (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 (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 (Water Main) (Varies by Size and Material, by Open Cut)

1. Measurement: Pressure Piping (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 (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.

F. 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.

G. 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.

H. 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.

I. 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.

J. 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.

K. 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.

L. 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 Unit Price for each item. 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, 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.

M. Tree Trimming (within Old Jesup Road and Hautala Drive right-of-way)

1. Measurement: Tree removal is not anticipated within Old Jesup Road, Bailey Road, Golden Isles Parkway or Hautala Drive right-of-way, but limited trimming may be necessary for construction activities. Tree trimming shall be coordinated with Glynn County Tree Advisory Board requirements.

2. Payment: Payment of Tree Trimming or Clearing within the right of way shall be included as part of the watermain installation pay item for which it is required.

N. Disposal and Replacement of Unsuitable Soils with Granular Structural Backfill

1. Measurement: Disposal and Replacement (with Granular Material, less than 25% passing No. 200 Sieve) 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.

O. Dewatering Operations

1. Measurement: Measurement shall be based on satisfactory dewatering operations that allow watermain installation 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 necessary to remove the water that accumulates in the trenches or pits, which would affect the construction of the lines or their appurtenances, by pumping, bailing, well-pointing, or other approved dewatering method and shall perform all work necessary to keep the trenches or pits entirely clear from water while bedding is being placed, the pipe is being laid. All water removed from the trench shall be conveyed in a proper manner to a suitable point of discharge and shall comply with applicable erosion and sediment control laws. Pipe laying and pipe jointing shall be made in the "dry trenches".

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.

B. Permits by Owner: The Owner prior to the advertisement of the project has applied for permits for the following agencies. The following permits have been obtained or are anticipated to be obtained by the Owner prior to construction:

Permit	Permit No.	Issued Date
Georgia Environmental Protection Division, Notice of Intent to Discharge Storm Water Associated with Construction Activity	GAR2490F3-V1	November 3, 2022
Georgia Environmental Protection Division Drinking Water Project	CD23-008	February 24, 2023, revised May 16, 2023
Georgia Department of Transportation Roadway Encroachment Permit	---	TO BE OBTAINED BY BGJWSC WITH INPUT FROM CONTRACTOR

PART 2 - PRODUCTS

PART 3 - EXECUTION

END OF SECTION

INDEX TO

SECTION 01353 – TRAFFIC AND PEDESTRIAN CONTROL

SECTION 01353

TRAFFIC AND PEDESTRIAN CONTROL

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. This section contains specifications for the materials, equipment, construction, measurement, and payment for work zone traffic and pedestrian control conducted within the road right-of-way in conformity with the Plans, the Specifications, or as directed by the Engineer.

B. Related Sections:

1. General Conditions
2. Glynn County Public Works, Traffic Safety and Road Maintenance requirements pertaining to traffic and pedestrian management
3. GA DOT Rule on Work Zone Safety and Mobility publication.
4. Manual of Uniform Traffic Control Devices (MUTCD) publication.
5. Section 01025 – Measurement and Payment

1.02 SHOP DRAWING AND SUBMITTALS

A. Ensure that the Traffic and Pedestrian measures are in conformity with the requirements of these specifications, the Plans, the Georgia Department of Transportation (GA DOT) standards, Glynn County Public Works or other local governing authority, the manufacturer's requirements and specifications, and the Engineer and local Municipality.

B. Traffic control includes provision, installation, maintenance, repair, replacement, relocation, and removal of all traffic control devices used for regulating, warning, or directing traffic and pedestrians. All items remain the property of the Contractor unless otherwise indicated in the Specifications or on the Plans.

C. Meet with the Owner, Engineer, local governing authority, and other affected agencies having right-of-way jurisdiction to discuss encroachment permits. Do not begin construction on any given phase before receiving or obtaining all permits.

D. Administrative Submittals: Copies of permits, licenses, and approvals for construction as required by Laws and Regulations and governing agencies.

E. Product Data: Warning signs and barricades.

1.03 MEASUREMENT FOR PAYMENT

Payment methodology for this item shall be as provided in Section 01025 – Measurement and Payments.

PART 2 - PRODUCTS

2.01 SAFETY DEVICES AND SYSTEMS

The Contractor shall use devices and systems which meet National Cooperative Highway Research Program (NCHRP) Report 350 crash test requirements as defined by the Federal Highway Administration (FHA), unless otherwise stated.

2.02 TRAFFIC CONTROL AND SIGNAGE

All traffic control and signages shall comply with all applicable GA DOT standards.

PART 3 - EXECUTION

3.01 VEHICULAR TRAFFIC

A. The Contractor shall conform to the GA DOT or applicable statutory requirements of authority having jurisdiction and the accepted Traffic Control Plan.

B. The Contractor shall allow emergency vehicles immediate passage.

C. The Contractor shall recognize that local government requirements take precedence over the Manual of Uniform Traffic Control Devices (MUTCD). Operations on or about traffic areas and provisions for regulating traffic shall additionally be subject to the regulation of other governmental agencies having jurisdiction over the affected areas.

D. The Contractor shall keep traffic areas free of excavated material, construction equipment, pipe, and other materials and equipment.

E. The Contractor shall keep fire hydrants and water control valves free from obstruction and available for use at all times.

F. The Contractor shall conduct operations in a manner to avoid unnecessary interference with public and private roads and drives and provide and maintain temporary access for businesses and residences. Provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.

G. When access to residential private driveways must be temporarily denied due to construction operations, notify the property owner or responsible party of such closure not less than 14 days and again 48 hours in advance of closure. Give notification in writing and include the estimated duration of the closure.

H. When business and other publicly available venues shall have must be temporarily denied or altered due to construction operations, notify the business owner or responsible party of such closure not less than 30 days and again 14 days in advance of closure. Give notification in writing and include the estimated duration of the closure.

I. Minimum lane width shall be 10 feet, unless noted otherwise. Where cones are used to separate traffic lane from construction zone, do not use traffic lane for accessing construction zone, and do not store materials or equipment on or near shoulder of traffic lane side of roadway.

J. In making street crossings, do not block more than one-half the street at a time. Maintain one lane of traffic at all times. Ensure access for traffic in both directions.

K. Notify the fire department, police/sheriff department, highway patrol, ambulance service, local school district, and transit 14 days before closing roadway or portion thereof. Notify said departments or agencies when streets are again passable for vehicles.

L. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. The Contractor shall also furnish his night emergency telephone numbers to the police or sheriff's department.

M. Pedestrian and bicycle access along sidewalks and streets will be kept open and safe from construction activities and traffic lanes.

N. Flaggers: May be required to provide for public safety or the regulation of traffic, or by jurisdictional authorities; and if used, shall be properly equipped and trained, including all required certificates in accordance with GA DOT requirements. Install all essential signs, including the "Flagger" sign, in advance of each flagger station. Ensure that flaggers conduct themselves and the operation as directed by the GA DOT specifications, and the MUTCD. Failure by the flaggers to conduct the operation properly or without the flagger signs is considered as failure to provide traffic control as required.

3.02 PROTECTION OF WORK AND PROPERTY

A. Ensure that background color of personal protective apparel is one of the three accepted colors of high visibility apparel are yellow-green, orange-red, and red, as set forth by The American National Standards Institute (ANSI) and the International Safety Equipment Association (ISEA).

B. Provide warning signs and barricades for the following:

1. Open trenches and other excavations.

2. Obstructions, such as material piles, equipment (moving or parked), and piled embankment.

3. Protection of roads and driveways.

C. Warning signs and barricades shall be illuminated by means of warning lights from sunset to sunrise.

3.03 PARKING

The Contractor, with the approval of the Owner, shall designate parking areas for the use of all construction workers and others performing work or furnishing services in connection with the project so as avoid interference with public traffic, Owner/Engineer's operations, or construction activities.

3.04 ROADWAY USAGE BETWEEN OPERATIONS

At all times when work is not actually in progress, the Contractor shall make passable and shall open to traffic such portions of the project and temporary roadways or portions thereof as may be agreed upon between the Contractor and the Owner and all authorities having jurisdiction over any properties involved.

END OF SECTION

INDEX TO

SECTION 01380 – CONSTRUCTION PHOTOGRAPHS AND VIDEO

SECTION 01380

CONSTRUCTION PHOTOGRAPHS AND VIDEO

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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.

1.03 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.

1.04 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 USB Flask Drive. 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 USB Flask Drive 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.

1.05 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.

1.06 USAGE RIGHTS

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

1.07 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

3.01 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 USB Flask Drive 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.

3.02 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 01390 – CONSTRUCTION LAYOUT

SECTION 01390

CONSTRUCTION LAYOUT

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. This section provides for construction layout of linear or site work related construction activities as provided within the Contract Documents.

B. References:
Benchmarks and drawings are prepared using the following geometric control datum for the United State as provided within the Contract Documents:
1. North American Datum of 1983 (NAD 83)
2. North American Vertical Datum of 1988 (NAVD 88)

1.02 MEASUREMENT FOR PAYMENT

A. The lump sum price provided is for the full cost of construction layout to perform the necessary work as required in the Contract Documents.

B. Payment shall include compensation for furnishing all materials, labor, and equipment, necessary to complete the work in accordance with the Contract Documents.

PART 2 – MATERIALS AND EQUIPMENT

2.01 GENERAL PROVISIONS

A. Equipment
All survey equipment shall be kept in good working condition and be calibrated as required by manufacturer. Electronic layout equipment shall be maintained as required by manufacturer in order to provided accuracy necessary for construction staking.

B. Electronic Drawings
Upon receipt of the Electronic Release Form, the Engineer will supply electronic drawings in an AutoCAD format to the Contractor for uploading into a surveying layout program. Such drawings will provide horizontal and vertical Benchmarks which shall be used when layout out construction works.

PART 3 - EXECUTION

3.01 GENERAL PROVISIONS

A. Furnish, set, reference, and maintain stakes and markings necessary to establish the alignment, location, benchmarks, elevations, and continuous profile-grades for road and structure work as needed for bid items. Supervise and coordinate construction staking.

B. Furnish surveying equipment, stakes, flags, pins, lath, whiskers, and other materials necessary to perform this work, subject to the Engineer's approval.

C. Maintain neat, orderly, and complete survey notes, drawings, and computations used in establishing the lines and grades. Make the survey notes and computations available to the engineer within 24 hours, upon request, as the work progresses.

3.02 SURVEY PROCEDURES

A. Before proceeding with the layout of actual work, each Contractor shall verify the layout information shown on the drawings, in relation to the property survey and existing benchmarks. As Work proceeds, the surveyor shall check every major element for line, level and plumb. Maintain a surveyor's log or record book of such checks. Make this log or record book available for the Engineer's reference. The Surveyor shall record deviations from required lines and levels, and shall, upon detection, promptly advise the Engineer of deviations exceeding indicated or recognized tolerances. Each Contractor shall record deviations which are accepted, not corrected, on record drawings.

B. Recheck measurements and dimensions of the Work, as an integral step of starting each installation.

C. Layout: Establish elevations and measurements from the baseline layouts as required. Extend these lines as the work progresses. Each Subcontractor shall lay out his work from these references.

D. Provide construction staking that shall be straight, plumb, level, in line and in accordance with Contract Documents. Layout shall be complete enough to allow Contractor to construct or install work as specified within the Contract Documents.

3.03 RECORD DRAWINGS

Maintain a clean, undamaged set of blue or black line white prints of Contract drawings and shop drawings. Mark the set to show the actual installation where the installation varies substantially from the Work as originally shown. Mark whichever drawing is most capable of showing conditions fully and accurately; where shop drawings are used, record a cross-reference at the corresponding location on the Contract drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

A. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the Work.

B. Mark new information that is important to BGJWSC or the County, but was not shown on Contract drawings or shop drawings.

C. Note related Change Order numbers where applicable.

D. Organize record drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable title, dates and other identification on the cover of each set.

END OF SECTION

INDEX TO

SECTION 01505 – MOBILIZATION AND DEMOBILIZATION

SECTION 01505

MOBILIZATION AND DEMOBILIZATION

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. The work consists of the mobilization and demobilization of the Contractor's forces and equipment necessary for performing the work required under the Contract. It does not include mobilization and demobilization for specific items of work for which payment is provided elsewhere in the contract. Mobilization will not be considered as work in fulfilling the Contract requirements for commencement of work.

B. Mobilization shall include, but not be limited to, these principal items:

1. Obtaining the required permits.

2. Moving the Contractor's field office and equipment required for the first month of operations onto the Site.

3. Installing temporary construction power, wiring, and lighting facilities.

4. Providing dependable onsite communication facilities at the Site, including but not limited to, telephones and internet access. Wireless communication can only be considered after verifying that the Site location signal strength from service providers is sufficient.

5. Providing sanitary facilities and potable water facilities at the Site, and as required by the applicable laws, regulations, and governing agencies.

6. Arranging for, and erection of, the Contractor's work and storage yard.

7. Posting the Occupational Health and Safety Act and required notices in an accessible location at the Site and establishing safety programs and procedures.

C. The Contractor is responsible for identifying suitable premises for establishment of the Site offices, work area and storage yard, and for all necessary arrangements required to secure use of these premises for the duration of the Contract Works.

D. Related Sections:

1. General Conditions

2. JWSC Standards for Water and Sewer Design and Construction

3. Section 01025 – Measurement and Payment

1.02 SHOP DRAWINGS & SUBMITTAL

A. Copies of permits and approvals for construction as required by any applicable laws and regulations and governing agencies. Proof of compliance with relevant requirements including all reports received from approving agencies.

B. Temporary Utility Submittals:

1. Electric Power Supply

2. Temporary Water

C. Temporary Construction Submittals:

1. Parking Area Plan

2. Contractor's field office layout, storage yard, lay-down areas and storage building plans, including gravel surfaced areas.

3. Fencing and protective barrier locations and details.

4. Traffic and Pedestrian Control and Routing Plans: As specified herein, and any proposed revisions thereto.

1.03 MEASUREMENT FOR PAYMENT

Payment methodology for this item shall be as provided in Section 01025 – Measurement and Payments.

PART 2 - PRODUCTS

2.01 TEMPORARY FENCING

A. The Contractor shall supply and install temporary fast fencing, a minimum 6.5 feet high, as shown on the Contract Drawings and/or as directed by the Consultant.

B. Fast fencing material shall be chain link type and erected to the satisfaction of the Consultant.

C. All disturbed areas shall be restored to a condition equal to or better than its original pre-construction conditions upon the removal of the temporary fencing.

PART 3 - EXECUTION

3.01 MOBILIZATION

A. The Contractor shall be responsible to find a site for its construction yard, which is sufficient to contain the construction trailers, materials storage, equipment storage, etc. This location shall be outside of floodplain areas and shall not contain stockpiled excavated earth, garbage or materials not related to this Contract. The Contractor shall obtain written permission from the Governing Municipality, and/or private property owner(s) for each construction yard utilized under this Contract, and the yard shall conform to all current municipal zoning bylaws and other relevant municipal and provincial laws and regulations.

B. The Contractor shall make its own arrangements to bring power and communications lines into the Site, including the costs of any permits and approvals required.

C. The yard(s) shall be properly secured in order to prohibit access to the yard(s), and ensure the safety of the general public as required by local laws or regulations.

D. Posting the required Occupational Safety and Health Administration notices in an accessible location at the Site and establishing safety programs and procedures.

3.02 DEMOBILIZATION

Demobilization shall include the removal of all temporary facilities, driveways and roads, granular surfaces, temporary cables, fencing, barricades, materials, and garbage. All sites used by the Contractor as construction yards, or for temporary construction, shall be reinstated to their pre-construction condition or better, including fine grading, seeding or sodding as agreed with the property owners.

3.03 SITE SECURITY

A. Erect a temporary security fence at the limits of the Site for the protection of the new facilities and to deter public access to the Site. Maintain the fence throughout the duration of the Contract. Obtain the Consultant's written permission before the removal of any temporary security fencing.

B. Provide and maintain additional temporary security fences, as necessary, to protect the Work and any Contractor furnished Products not yet installed. Contractor is responsible for replacing any materials and/or equipment damaged or stolen at no additional cost.

3.04 STORAGE YARDS

A. Construct temporary storage yards for the storage of Products that are not susceptible to damage from weather conditions.

B. Temporary storage yards must not be built over underground process structures without approval of the Consultant.

C. No activities are permitted over underground structures without assessing structure roof slab load bearing capabilities and any potential for fuel, lubricant or other liquid chemical leaks that spill onto the overburden of such structures.

3.05 PARKING AREAS

A. Control vehicular parking to avoid interference with public traffic or parking and access by emergency vehicles, municipal staff, or construction operations.

B. Provide parking facilities for personnel working at the Site. No employee or equipment parking will be permitted on the Site, except in areas specifically designated for the Contractor's use.

C. Use the area designated on the Contract Drawings for the parking of the Contractor's and the Contractor's employees' vehicles.

D. Parking will be permitted on site provided it does not disrupt performance of work or operation of the facility, if applicable.

E. Provide and maintain adequate access to project Site parking areas.

F. Due to space limitations at existing facilities, when necessary, the Contractor shall arrange and pay for any additional parking facilities required for its staff at an off-site location.

END OF SECTION

INDEX TO

SECTION 01700 – PROJECT CLOSEOUT

SECTION 01700

PROJECT CLOSEOUT

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 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.

1.03 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.

1.04 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.

1.05 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.

1.06 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

3.01 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 DATA

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. Measurement and Payment: Section 01025.

2. 01700: 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 ALLOWANCE

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

1.04 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.

1.05 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.

1.06 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.

1.07 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.

1.08 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) 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) 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.

1.09 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 and pay for all permits and licenses related to his work, as relevant to the project, at no additional cost to Owner 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 to Glynn County 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 the Engineer of Record or 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, tree limbs shall be removed from areas outside those areas designated for clearing and grubbing. Tree limbs 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 Engineer of Record or 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. *January 11, 2022, Terracon Geotechnical Engineering Investigation, North Mainland Water Loops, Brunswick - Glynn County Joint Water & Sewer Commission, Glynn County, Georgia, Terracon Project No. ES215271.*

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 water main installed via open cut construction or for Horizontal Directional Drilling operations.

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 lump sum price as noted in Section 01025 Measurement and Payment. 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 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. This work shall be completed at no additional cost to the owner.

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 Conditions and other Division 1 Specification Sections, apply to this Section.

B. January 11, 2022, Terracon Geotechnical Engineering Investigation, North Mainland Water Loops, Brunswick - Glynn County Joint Water & Sewer Commission, Glynn County, Georgia, Terracon Project No. ES215271.

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

1.01 RELATED DOCUMENTS

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

1.02 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.

1.03 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.

1.04 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. Michael R. Klink, P.E.

Address: Four Waters Engineering
324 6th Ave North
Jacksonville Beach, FL 32250

Phone: (843) 298-2369

1.05 SUBMITTALS

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

1.06 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

2.01 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.

2.02 HAY BALES

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

2.03 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%

2.04 CHEMICALS FOR DUST CONTROL

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

2.05 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.

2.06 PRODUCT REVIEW

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

PART 3 – EXECUTION

3.01 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.

3.02 GRASSING

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

3.03 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.

3.04 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 and local regulations.

3.05 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.

3.06 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.

3.07 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

1.01 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 NPDES Permit No. GAR100002 (Infrastructure Construction Projects).

B. Reporting

C. Sampling

1.02 RELATED SECTIONS

A. Section 02110 – Site Clearing

B. Section 02200 – Earthwork

C. Section 02660 – Water Distribution System

1.03 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.

1.04 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.

1.05 SUBMITTALS

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

1.06 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

2.01 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.

2.02 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.

2.03 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

3.01 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

3.02 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.

3.03 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.

3.04 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.

3.05 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.

3.06 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.

3.07 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 02200.

5. January 11, 2022, Terracon Geotechnical Engineering Investigation, North Mainland Water Loops, Brunswick - Glynn County Joint Water & Sewer Commission, Glynn County, Georgia, Terracon Project No. ES215271.

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 of Record and Owner, 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 Engineer of Record and Owner 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 Engineer of Record and Owner 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 to the Engineer of Record and Owner and not additional cost to JWSC.

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. Select Fill: Select fill shall be reasonably well graded course material consisting of sand to gravelly sand. It shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming to AASHTO Class A-3, with particle size limits as follows:

U.S. Sieve Size	Percent Passing by Weight
No. 10	100
No. 40	0-51
No. 200	0-10

Structural fill may be substituted for select backfill.

C. Structural Fill: Structural fill shall consist of manufactured angular, granular material up to 1/2 inches, such as crushed stone or rock. It shall consist of clean mineral aggregate free from clay, loam or organic matter, conforming with ASTM C33 stone size No. 89, 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

D. Unshrinkable Flowable Fill: Concrete strength shall be liquid enough to flow, be self-leveling, excavatable, and have a minimum 28-day compressive strength of 30 psi but not more than 100 psi. Non-excavatable flowable fill concrete shall have a minimum 28-day compressive strength of 125 psi but no more than 200 psi (to be excavatable by machine equipment). Consolidate and level flowable fill with internal vibrators. Excavatable is an application where it may be necessary to remove the flowable fill at a later date. Non-excavatable is an application where it is not necessary to remove or otherwise excavate the flowable fill at a later date.

G. 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/Utilities:

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

a. Excavation for prefabricated pipes and structures shall be carried to an elevation 4 inches lower than the proposed outside bottom of the pipe or structure to provide space for proper bedding unless groundwater, lower strength soils, and unstable conditions are encountered.

b. Prior to placing the bedding and backfill material 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.

c. As fast as bedding material is placed, it shall be cut under haunches of pipe with a shovel and thoroughly compacted with light tamps for full width of trench to provide support for bottom and sides of pipe. Filling shall be carried up evenly on both sides of pipe.

d. Material for fill shall be spread evenly and grading equipment routed over work to obtain uniform compaction. Fills shall be compacted so that future settlement is avoided. Material that is too dry for proper compaction shall be moistened by suitable watering devices, turned and harrowed to distribute moisture and then properly compacted. When material is too wet for proper compaction, operations shall cease until such material has sufficiently dried.

e. Excavation in dewatered trenches shall be carried down to the bottom of the pipe or structure such that a dry excavation bottom is exposed. Naturally occurring material at this elevation shall be leveled and left ready to receive construction. Material disturbed below this dewater elevation shall be replaced with structural material.

f. Where groundwater, lower strength soils, and unstable conditions are encountered, a greater thickness of bedding material shall be

provided. The minimum thickness of the bedding material shall be 12 inches.

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 table. (Proctor Standard shall be ASTM D-698, Modified Proctor Standard shall be ASTM D-1557):

Backfill Usage	Material Name	Material Type	Material Specification	Compaction Requirements
Outside Roadway Pavement	Select	Course Material	AASHTO Class A-3	100% Modified Proctor Method
Under and Along Roadway Pavement	Structural	Granular	ASTM C33 stone size No. 89	100% Standard Proctor Method
Under and Across Roadway Pavement	Unshrinkable	Flowable Fill	FHWA-RD-97-148, Sec. 24 Pg. 45	Vibration

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

C. Unshrinkable flowable fill serving as a cradle for bedding pipe, as indicated on the Contract Documents. Consolidate and level flowable fill with internal vibrators. Place fill simultaneously on both sides of installed pipe to equalize loading and prevent shifting of pipe. The haunching and initial backfill material above the concrete cradle should be crushed stone or a well graded granular material and carefully compacted to 12 inches above the crown of the sewer pipe.

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

1.01 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

2.01 General

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

PART 3 – EXECUTION

3.01 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 02700 – PAVEMENT

SECTION 02700

PAVEMENT

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. This section covers paving and surfacing for roads, drives and parking areas, including cutting and replacing pavement for installation of utilities, as shown on the plans and as specified herein.

B. All work shall conform to GA DOT and Glynn County requirements. It shall be the responsibility of the Contractor to familiarize himself with all requirements of applicable encroachment permits and shall conform to all requirements and stipulations therein.

1.02 RELATED DOCUMENTS

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

B. January 11, 2022, Terracon Geotechnical Engineering Investigation, North Mainland Water Loops, Brunswick - Glynn County Joint Water & Sewer Commission, Glynn County, Georgia, Terracon Project No. ES215271.

C. JWSC Standards for Water and Sewer Design and Construction

D. Related Sections:

1. Traffic and Pedestrian Control: Section 01353.

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

3. Water Distribution: Section 02660.

1.03 SHOP DRAWINGS & SUBMITTAL

A. The Contractor shall provide the Engineer with a proposed Asphalt Mix Design a minimum of 15 calendar days prior to placing any asphalt. The Contractor shall not place any asphalt until the proposed mix design has been approved by the Engineer.

B. The Contractor, at his expense, shall submit to the Engineer for approval, a Job-Mix Design within the limits specified within the Contract Documents, for each class of mix designated by the Contract.

C. A letter stating the location, size, and type of mixing plant, the proposed gradation for the Job-Mix Design, gradations for individual stockpiles with supporting process control information, and the blend ratio of each aggregate stockpile.

1.04 QUALITY CONTROL

Quality Control procedures shall be conducted to ensure hot mix asphalt meets the requirements of the Contract Documents. The Contractor shall be responsible for the interpretation of the QC test results and the determination of any action to be taken to ensure that all materials and work are according to the requirements of the Contract Documents. QC documentation shall be made available to the Engineer upon request. Sampling and testing methods shall be included in the QC documentation.

1.05 MEASUREMENT FOR PAYMENT

Payment for work involved in laying new pavement or cutting and replacing existing pavement shall be measured in the bid schedule and shall include furnishing, mixing, hauling, placing, and compacting all granular and asphaltic courses; furnishing and applying a tack coat; determining the compaction of the course; and all other materials, labor, and equipment, necessary to fulfill the requirements of the pay item in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.01 AGGREGATE SUBBASE

A. Aggregate Subbase shall meet all requirements stated in GA DOT Standard Specifications Section 310.

B. Crushed stone shall be produced from tough, durable parent rock, free from soft, thin, elongated, or laminated pieces, disintegrated particles, vegetable matter, or other deleterious substances. Do not use shale or shale-like aggregates or slag. Use crushed stone meeting the grading requirements of Class A (Section 800.2.01).

C. Gravel shall be composed of hard durable particles of clean stone, free from an excess of thin or elongated pieces, vegetable matter, or other deleterious substances. Use gravel meeting the grading requirements of Class A (Section 800.2.01).

2.02 AGGREGATE BASE COURSE

A. Base Course shall meet all requirements stated in GA DOT Standard Specifications Section 310.

B. Use base course material composed of crushed stone, excluding marine limestone and slag, filled and bound with screenings. Ensure that the aggregate is free from vegetable matter, sand, lumps or balls of clay, or other deleterious matter. Use gravel meeting the grading requirements of Class A (Section 800.2.01).

C. Use coarse aggregate consisting of hard, durable particles of crushed slag or stone, excluding marine limestone and slag. Ensure that the aggregate is free from vegetable matter, sand, lumps or balls of clay, or other deleterious matter. Use gravel meeting the grading requirements of Class A (Section 800.2.01).

D. Use fine aggregate consisting of material produced by crushing operations, excluding marine limestone and slag.

2.03 ASPHALT INTERMEDIATE COURSE

A. Use Hot Mix Asphalt (hot mix asphalt) materials that meet the applicable requirements of GA DOT Standard Specifications Section 400 and supplemental technical specification(s).

B. Combine the mineral aggregates and binder in such proportions that the composition by weight of the finished hot mix asphalt is within the limits set forth in the GA DOT specifications.

2.04 ASPHALT SURFACE COURSE

A. Use materials that meet the applicable requirements of GA DOT Standard Specifications Section 400 and supplemental technical specification(s).

B. Combine the mineral aggregates and binder in such proportions that the composition by weight of the finished hot mix asphalt is within the limits set forth in GA DOT specifications.

2.05 SHOULDERS AND SLOPES

Selected material for shoulders or slopes consists of a friable material such as topsoil, etc. containing grass roots and having the properties of being comparatively porous, capable of growing grass, and of a stable nature in that when compacted resists erosion and is capable of supporting vehicles when relatively wet. Obtain the material used in the construction of shoulders and slopes from the following locations:

1) Stockpiles of material stripped from within the right-of-way in the grading operation,

2) Areas outside of the cut or fill slopes in the right-of-way,

3) Stockpiles of material stripped from borrow pits,

4) Select material pits, or

5) Areas of roadway and drainage excavation.

2.06 TACK COAT

A. Use materials that meet the applicable requirements of GA DOT Standard Specifications Subsection 413 and supplemental technical specification(s).

B. Provide a tack coat consisting of binder or emulsified asphalt from a supplier listed on the most recent edition of GA DOT Qualified Vendor

C. Do not dilute any of the emulsions at either the manufacturer's facility or the point of use, without prior approval by the Engineer.

2.07 EQUIPMENT

A. Ensure that the equipment necessary for the proper construction of the work is on site, in acceptable working condition before the start of work under this section.

Provide sufficient equipment to enable prosecution of the work in accordance with the project schedule and completion of the work in the specified time.

B. Use a steel wheel roller capable of developing a pressure of 250 to 350 pounds per inch of roller width in the compression wheel for compaction. If necessary, use other rollers in conjunction with the steel wheel roller. Acceptable additional rollers are self-propelled or tractor drawn pneumatic tired rollers or vibratory rollers. Use a combination of the above rollers as necessary to produce a finished product that complies with these specifications.

PART 3 - EXECUTION

3.01 GENERAL

Roads, drives and parking areas shall be graded to subgrade, and fills shall be compacted to 100% Standard Proctor. Roads, drives and parking areas shall be finished by fine grading to required grades and sections and by recompacting subgrade with heavy rollers.

3.02 SUBBASE PREPARATION

A. Subbase shall be installed in accordance with GA DOT Standard Specification Section 300.

B. Remove all soft, unstable, or unsuitable material that does not compact readily. Replace this material with satisfactory material as directed by the Engineer. Remove or break off all objectionable loose rock or boulders to a depth of not less than 6 inches below the surface of the subgrade. Fill all holes, ruts, or depressions that develop in the subgrade with approved material, bring the subgrade to line and grade, and properly compact.

C. Compact the subgrade between lines 18 inches outside the area occupied by the pavement structure, including curb and gutter and sidewalk as applicable, to not less than 100% of maximum density. Accomplish the compaction by using suitable construction procedures while the subgrade is at suitable moisture content.

D. When any portion of the subgrade is constructed on an old roadbed that conforms to or approximates the elevation of the subgrade, scarify and grade the existing surface so that the subgrade has a uniform density when compacted.

E. Roll and compact the subgrade for at least 500 feet ahead of the placing of base course materials where feasible. Shape, trim, and compact the shoulders and slopes in proper sequence for the type of base or surfacing being constructed. Perform this work so that the shoulders, adjacent ditches, and slopes are adequately drained at all times.

F. Compact all shoulders on earth-type base courses for a width of 18 inches adjacent to the base or surface course along with the base course.

3.03 BASE COURSE PLACEMENT

A. Base course shall be installed in accordance with GA DOT Standard Specification

Section 300.

B. Place the base course aggregate on the prepared foundation. Perform the spreading so that the finished base course conforms to the lines, grades, dimensions, and the typical cross-sections shown on the Plans.

C. Unless otherwise directed by the Engineer, do not allow the compacted thickness of any single constructed course to exceed the following thicknesses:

1. 6 inches for Aggregate Subbase, or

2. 4½ inches for Aggregate Base Course,

D. If the foundation becomes unstable after the base course has been placed, repair the affected section. Repair the section by removing the base course material and unsatisfactory foundation material and replacing it with approved foundation material. Reconstruct the foundation to the required compaction and shape and then replace the base course at the required cross-section, grade, and compaction.

E. After the base course material is spread, continually machine it with motor graders or other suitable equipment and maintain the required section until the base course is thoroughly compacted.

F. Start rolling the base course at the edge and proceed toward the center, except on superelevated curves where rolling operations proceed from the lower to the upper side. Continue rolling until the layer is satisfactorily compacted for the full width and depth. Wet the base course when necessary. Extend rolling over the edges of each layer of base course materials for a distance of 2 feet on the shoulders. Continue blading and rolling until a dense, smooth, unyielding, and well-bonded base course is obtained.

G. If initial compaction has been performed and the voids are not filled, place fine aggregate on the base course in an amount only sufficient to fill the voids. Broom, wet, and roll the base course until the coarse aggregate is firmly set, bonded, and the base course is thoroughly compacted for the full width and depth.

H. Compact each layer of the base course while near optimum moisture with equipment capable of obtaining the required density for the full depth. Continue the rolling until the entire base course is compacted to not less than 100.0% of maximum laboratory density as determined by Geotechnical Engineer.

I. Determine the in-place density and moisture content of the graded aggregate base course with a nuclear moisture-density gauge or by other approved means. Ensure that the finished surface of the base course varies neither more than ⅜ inch from a straight edge 10 feet long when applied parallel to the centerline of the road, nor more than ½ inch from the typical cross-section shown on the Plans.

J. The thickness of the completed base course is measured at staggered intervals not to exceed 250 feet for two-lane roads. Depth measurements are made by test holes through the base course. Where the base course is less than the specified thickness by more than ½ inch, correct such areas by scarifying, adding base course material, and re-compacting.

K. When hot mix asphalt or an asphalt surface treatment is specified as the subsequent layer on a graded aggregate base course, apply a tack coat to the base course using the methods and requirements prescribed in pertinent portions of GA DOT Standard Specification Section 300. When, in the opinion of the Engineer, the asphalt material used to prime coat the base course may present a hazard to adjacent properties, the Engineer may opt to delete the prime coat from a section of roadway.

3.04 ASPHALT INTERMEDIATE AND SURFACE PAVING

A. Asphalt pavements shall be installed in accordance with GA DOT Standard Specification Section 400. Do not apply hot mix asphalt when the existing surface is wet or frozen.

B. Upon arrival at the point of use, dump the hot mix asphalt into the mechanical spreader and immediately spread and strike off true to the line, grade, and cross-section stipulated and to such appropriate loose depth for each successive course that when the work is completed, the specified thickness or weight per square yard is achieved.

C. Deliver and spread all hot mix asphalt while in a thoroughly workable condition and free from lumps. Handle material in such a manner to reduce segregation. Dump the hot mix asphalt in the center of the hoppers and take care to avoid overloading and spilling material on the base.

D. If during construction it is found that the spreading and finishing equipment leaves tracks or indented areas in the new course that are not satisfactorily corrected by the scheduled operations, or which produce other permanent blemishes, discontinue the use of such equipment and provide other satisfactory spreading and finishing equipment.

E. Immediately after a course is placed and before roller compaction is started, check the surface and adjust any inequalities. Remove all fat spots and irregular areas and replace them with satisfactory material. Correct irregularities in alignment and grade along the outside edge by the addition or removal of hot mix asphalt before the edge is rolled.

F. Unless otherwise directed by the Engineer, do not allow the compacted thickness of any single constructed course to exceed the following thicknesses:

1. 3 inches for hot mix asphalt Intermediate Course, or
2. 2 inches for hot mix asphalt Surface Course.

G. Place each layer to such thickness as instructed by the Engineer. Overlap the joints in the layers a minimum of 12 inches where practical. When multiple lifts are being placed in a single day, ensure that the interior mat temperature of the previous lift is less than 175ºF when measured at the mid-point of the depth of mat with a calibrated thermometer.

H. If desired, in ditch paving, narrow widening, deep or irregular sections, intersections, turnouts, driveways, or at other locations where it is impractical to spread and finish the hot mix asphalt by standard methods, use approved spreading equipment or acceptable hand methods.

I. Locate the finished surface of surface courses placed adjacent to curbs, gutter, manholes, etc., approximately ¼ inch above the edges of these structures.

J. Ensure that compaction is obtained following the requirements stated in GA DOT Specification. In areas such as ditches or along forms, curbs, headers, and walls not accessible for the operation of rollers as specified herein, perform compaction with hand or mechanical tampers, hand-drawn steel wheel rollers, or self-propelled tandem steel wheel rollers.

K. Ensure that the surface of the hot mix asphalt after compaction is smooth and true to the established crown and grade. Remove any mixture that becomes loose and broken, mixed with dirt, or in any way defective and replace it with fresh hot mix asphalt. Immediately compact the fresh hot mix asphalt to conform to the surrounding area.

L. Roll longitudinal joints directly behind the paver. Position the paver so that in spreading, the material overlaps the edge of the lane previously placed by 1 to 2 inches. Leave the loose material high enough to allow for compaction to the depth of the previously rolled lane. Push back the overlapped material by means of lutes or other suitable tools to the edge of the "cold" joint. Perform this work in a manner that provides a uniform joint when rolled.

M. Carefully construct and thoroughly compact transverse joints to provide a smooth riding surface. Straightedge or stringline joints to ensure true alignments. Construct longitudinal and transverse joints in a careful manner and present the same texture, density, and smoothness as other sections of the course. Make joints between old and new pavements, or between successive strips, in a manner that ensures proper bond between the old and new surface for the full depth of the course. Thoroughly coat the joints, transverse and longitudinal, with an approved asphalt tack coat material before placing adjacent material.

3.05 CUTTING AND REPLACING PAVEMENT

A. Where pavement is to be cut for installation of pipe or other utilities, Contractor shall cut it neatly in advance of trenching and shall replace pavement with base and new pavement as specified in these specifications.

B. Mill the existing asphalt pavement to the specified width, depth, and cross slope at locations shown on the Plans. Pavement shall be cut 12 inches wider than excavated area on each side except for drives. Concrete pavement shall be sawed with suitable concrete saw cutting equipment.

C. Monitor the milled surface to ensure smoothness and to reduce excess scarification marks or other damage. Establish the longitudinal profile of the milled surface by using a skid sensor on the side of the cut.

D. Dispose of the milled material. Thoroughly clean the milled surface of all loose particles. Tie milled surfaces to existing drives and intersections. Conduct additional milling in these areas as necessary.

E. Trench backfilling and compaction shall be done in accordance to the specifications provided in Section 02220.

F. Base course and asphalt courses shall be laid in accordance with the

specifications provided in this Section, unless otherwise directed by the Engineer.

G. All pavement shall be repaired within same week that it is cut. If inclement weather delays pavement replacement, Contractor shall not cut additional pavement until he has notified Engineer and received specific permission and instructions.

H. For asphalt pavement or bituminous surfacing, entire areas to be resurfaced (including edges of existing pavement) shall be primed with an acceptable asphalt tack coat just prior to placing new pavement.

END OF SECTION

INDEX TO

SECTION 02770 – CURB GUTTER AND SIDWALK

SECTION 02770

CURB GUTTER AND SIDWALK

PART 1 – GENERAL

1.01 REQUIREMENTS INCLUDED

A. This section covers the requirements for installing concrete curbs, gutters and sidewalks. This section shall also be used when curbs, gutters and sidewalks need to be repaired as a result of installation of underground utilities.

B. All work shall conform to GA DOT and Glynn County requirements. It shall be the responsibility of the Contractor to familiarize himself with all requirements of applicable encroachment permits and shall conform to all requirements and stipulations therein.

1.02 RELATED DOCUMENTS

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

B. JWSC Standards for Water and Sewer Design and Construction

C. Related Sections:

1. Traffic and Pedestrian Control: Section 01353.

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

3. Pavement: Section 02700.

1.03 SHOP DRAWINGS & SUBMITTAL

Provide concrete conforming to the applicable requirements of ASTM C94/C94M except as otherwise specified.

1.04 QUALITY CONTROL

A. Take concrete samples in accordance with ASTM C172/C172M not less than once a day nor less than once for every 250 cubic yards of concrete placed. Mold cylinders in accordance with ASTM C31/C31M for strength testing by an approved laboratory.

B. Each strength test result must be the average of 2 test cylinders from the same concrete sample tested at 28 days, unless otherwise specified or approved. Concrete specified on the basis of compressive strength will be considered satisfactory if the averages of all sets of three consecutive strength test results equal or exceed the specified strength, and no individual strength test result falls below the specified strength by more than 500 psi.

1.05 MEASUREMENT FOR PAYMENT

Payment for work involved in installing curbs, gutters and sidewalks shall be measured and paid as provide within the bid schedule and shall include all materials, labor, and equipment necessary to fulfill the requirements of the pay item in accordance with the Contract Documents.

PART 2 - PRODUCTS

2.01 CONCRETE

A. Concrete must have a minimum compressive strength of 3500 psi at 28 days. Size of aggregate must not exceed 1-1/2 inches. Submit copies of certified delivery tickets for all concrete used in the construction.

B. Use concrete mixtures that have an air content by volume of concrete of 5 to 7 percent, based on measurements made immediately after discharge from the mixer.

C. Use concrete with a slump of 3 inches plus or minus 1 inch for hand placed concrete or 1 inch plus or minus 1/2 inch for slipformed concrete as determined in accordance with ASTM C143/C143M.

D. Use reinforcement bars conforming to ASTM A615/A615M. Use wire mesh reinforcement conforming to ASTM A1064/A1064M.

2.02 CONCRETE CURING MATERIALS

A. Use impervious sheet materials conforming to ASTM C171, type optional, except that polyethylene film, if used, must be white opaque.

B. Use burlap conforming to AASHTO M182.

C. Use white pigmented membrane-forming curing compound conforming to ASTM C309, Type 2.

2.03 CONCRETE PROTECTION MATERIALS

Use concrete protection materials consisting of a linseed oil mixture of equal parts, by volume, of linseed oil and either mineral spirits, naphtha, or turpentine. At the option of the Contractor, commercially prepared linseed oil mixtures, formulated specifically for application to concrete to provide protection against the action of deicing chemicals may be used, except that emulsified mixtures are not acceptable.

2.04 JOINT FILLER STRIPS

Use hard-pressed fiberboard contraction joint filler for curb and gutter.

Unless otherwise indicated, use 1/2-inch-thick premolded expansion joint filler conforming to ASTM D1751 or ASTM D1752.

2.05 JOINT SEALANTS

Use cold-applied joint sealant conforming to ASTM C920 or ASTM D5893/D5893M.

2.06 FORM WORK

A. Design and construct form work to ensure that the finished concrete will conform accurately to the indicated dimensions, lines, and elevations, and within the tolerances specified. Use wood or steel forms that are straight and of sufficient strength to resist springing during depositing and consolidating concrete.

B. Wood Forms: Use forms that are surfaced plank, 2 inches nominal thickness, straight and free from warp, twist, loose knots, splits or other defects. Use forms with a nominal length of 10 feet. Radius bends may be formed with 3/4-inch boards, laminated to the required thickness.

C. Steel Forms: Use channel-formed sections with a flat top surface and welded braces at each end and at not less than two intermediate points. Use forms with interlocking and self-aligning ends. Provide flexible forms for radius forming, corner forms, form spreaders, and fillers as needed. Use forms with a nominal length of 10 feet and that have a minimum of 3 welded stake pockets per form. Use stake pins consisting of solid steel rods with chamfered heads and pointed tips designed for use with steel forms.

D. Sidewalk Forms: Use sidewalk forms that are of a height equal to the full depth of the finished sidewalk.

E. Curb and Gutter Forms: Use curb and gutter outside forms that have a height equal to the full depth of the curb or gutter. Use rigid forms for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

PART 3 - EXECUTION

3.01 SUBGRADE PREPATION

A. Construct subgrade to the specified grade and cross section prior to concrete placement. Place and compact the subgrade in accordance with Section 02315.

B. Test the subgrade for grade and cross section with a template extending the full width of the curb and gutter and/or the sidewalk and supported between side forms. Use subgrade materials equal in bearing quality to the subgrade under the adjacent pavement.

C. Maintain subgrade in a smooth, compacted condition in conformity with the required section and established grade until the concrete is placed. The subgrade must be in a moist condition when concrete is placed. Prepare and protect subgrade so that it is free from frost when the concrete is deposited.

3.02 FORM SETTING

A. Set forms to the indicated alignment, grade and dimensions. Hold forms rigidly in place by a minimum of 3 stakes per form placed at intervals not to exceed 4 feet. Use additional stakes and braces at corners, deep sections, and radius bends, as required. Use clamps, spreaders, and braces where required to ensure rigidity in the forms.

B. Remove forms in a manner that will not injure the concrete. Do not use bars or heavy tools against the concrete when removing the forms. Promptly and satisfactorily repair concrete found to be defective after form removal. Clean forms and coat with form oil each time before concrete is placed. Wood forms may, instead, be thoroughly wetted with water before concrete is placed, except that with probable freezing temperatures, oiling is mandatory.

C. For sidewalks, set forms with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10-foot-long section. After forms are set, grade and alignment must be checked with a 10-foot straightedge. Unless otherwise indicated, construct sidewalks that are located adjacent to curbs with the low side adjacent to the curb. Do not remove side forms less than 12 hours after finishing has been completed.

D. For curbs and gutters, remove forms used along the front of the curb not less than 2 hours nor more than 6 hours after the concrete has been placed. Do not remove forms used along the back of curb until the face and top of the curb have been finished, as specified for concrete finishing. Do not remove gutter forms while the concrete is sufficiently plastic to slump in any direction.

3.03 SIDEWALKE CONCRETE PLACMENT AND FINISHING

A. Formed Sidewalks: Place concrete in the forms in one layer. When consolidated and finished, the sidewalks must be of the thickness indicated. Use a strike-off guided by side forms after concrete has been placed in the forms to bring the surface to proper section to be compacted. Consolidate concrete by tamping and spading or with an approved vibrator. Finish the surface to grade with a strike off.

B. Concrete Finishing: After straightedging, when most of the water sheen has disappeared, and just before the concrete hardens, finish the surface with a wood or magnesium float or darby to a smooth and uniformly fine granular or sandy texture free of waves, irregularities, or tool marks. Produce a scored surface by brooming with a fiber-bristle brush in a direction transverse to that of the traffic, followed by edging.

C. Edge and Joint Finishing: Finish all slab edges, including those at formed joints, with an edger having a radius of 1/8 inch. Edge transverse joints before brooming. Eliminate the flat surface left by the surface face of the edger with brooming. Clean and solidly fill corners and edges which have crumbled and areas which lack sufficient mortar for proper finishing with a properly proportioned mortar mixture and then finish.

D. Finished surfaces must not vary more than 5/16 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.04 CURB AND GUTTER CONCRETE PLACEMENT AND FINISHING

A. Formed Curb and Gutter: Place concrete to the required section in a single lift. Consolidate concrete using approved mechanical vibrators. Curve shaped gutters must be finished with a standard curb "mule".

B. Curb and Gutter Finishing: Approved slipformed curb and gutter machines may be used in lieu of hand placement.

C. Concrete Finishing: Float and finish exposed surfaces with a smooth wood float until true to grade and section and uniform in texture. Brush floated surfaces with a fine-hair brush using longitudinal strokes. Round the edges of the gutter and top of the curb with an edging tool to a radius of 1/2 inch. Immediately after removing the front curb form, rub the face of the curb with a wood or concrete rubbing block and water until blemishes, form marks, and tool marks have been removed. Brush the front curb surface, while still wet, in the same manner as the gutter and curb top. Finish the top surface of gutter to grade with a wood float.

D. Joint Finishing: Finish curb edges at formed joints as indicated.

E. Finished surfaces must not vary more than 1/4 inch from the testing edge of a 10-foot straightedge. Permissible deficiency in section thickness will be up to 1/4 inch.

3.05 SIDEWALK JOINTS

A. Construct sidewalk joints to divide the surface into rectangular areas. Space transverse contraction joints at a distance equal to the sidewalk width or 5 feet on centers, whichever is less, and continuous across the slab.

B. Construct longitudinal contraction joints along the centerline of all sidewalks 10 feet or more in width.

C. Construct transverse expansion joints at sidewalk returns and opposite expansion joints in adjoining curbs.

D. Where the sidewalk is not in contact with the curb, install transverse expansion joints as indicated. Form expansion joints around structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.

E. Sidewalk Contraction Joints: Form contraction joints in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness. Unless otherwise approved or indicated, either use a jointer to cut the groove or saw a groove in the hardened concrete with a power-driven saw. Construct sawed joints by sawing a groove in the concrete with a 1/8-inch blade. Provide an ample supply of saw blades on the jobsite before concrete placement is started. Provide at least one standby sawing unit in good working order at the jobsite at all times during the sawing operations.

F. Sidewalk Expansion Joints: Form expansion joints using 1/2-inch joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D1752 or building paper. Hold joint filler in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, round joint edges using an edging tool having a radius of 1/8 inch. Remove any concrete over the joint filler. At the end of the curing period, clean the top of expansion joints and fill with cold-applied joint sealant. Use joint sealant that is gray or stone in color. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Apply joint sealing material only when the concrete at the joint is surface dry and atmospheric and concrete temperatures are above 50 degrees F. Immediately remove any excess material on exposed surfaces of the concrete and clean the concrete surfaces.

3.06 CURB AND GUTTER JOINTS

A. Construct curb and gutter joints at right angles to the line of curb and gutter.

B. Contraction Joints: Construct contraction joints directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length.

1) Construct contraction joints (except for slip forming) by means of 1/8-inch-thick separators and of a section conforming to the cross section of the curb and

gutter. Remove separators as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

2) When slip forming is used, cut the contraction joints in the top portion of the gutter/curb hardened concrete in a continuous cut across the curb and gutter, using a power-driven saw. Cut the contraction joint to a depth of at least one-fourth of the gutter/curb depth using a 1/8 inch saw blade.

C. Expansion Joints: Form expansion joints by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Construct expansion joints in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement using the same type and thickness of joints as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, provide expansion joints at least 1/2 inch in width at intervals not less than 30 feet nor greater than 120 feet. Seal expansion joints immediately following curing of the concrete or as soon thereafter as weather conditions permit. Seal expansion joints and the top 1 inch depth of curb and gutter contraction-joints with joint sealant. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Concrete at the joint must be surface dry and atmospheric and concrete temperatures must be above 50 degrees F at the time of application of joint sealing material. Immediately remove excess material on exposed surfaces of the concrete and clean concrete surfaces.

3.07 CURING AND PROTECTION

A. Protect concrete against loss of moisture and rapid temperature changes for at least 7 days from the beginning of the curing operation. Protect unhardened concrete from rain and flowing water. All equipment needed for adequate curing and protection of the concrete must be on hand and ready for use before actual concrete placement begins. Protect concrete as necessary to prevent cracking of the pavement due to temperature changes during the curing period.

B. After curing, remove debris and backfill, grade, and compact the area adjoining the concrete to conform to the surrounding area in accordance with lines and grades indicated.

C. Protect completed concrete from damage until accepted. Repair damaged concrete and clean concrete discolored during construction. Remove and reconstruct concrete that is damaged for the entire length between regularly scheduled joints. Refinishing the damaged portion will not be acceptable. Dispose of removed material as directed.

D. Apply a protective coating of linseed oil mixture to the exposed-to-view concrete surface after the curing period, if concrete will be exposed to de-icing chemicals within 6 weeks after placement. Moist cure concrete to receive a protective coating. Protect coated surfaces from vehicular and pedestrian traffic until dry.

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 General 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 indicated in the Erosion Control drawings and notes.

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 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 10 inches and larger outside diameter (OD), 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 BGJWSC 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 BGJWSC). 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 BGJWSC'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 the Engineer of Record and Owner, 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 the Engineer of Record or Owner, 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 BGJWSC systems, BGJWSC 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 BGJWSC 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 BGJWSC.

1.05 WARRANTY:

The Contractor shall supply to BGJWSC 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 BGJWSC 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 BGJWSC.

The contractor shall warrant to BGJWSC 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 BGJWSC 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 BGJWSC 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 SHOP DRAWING AND SUBMITTALS

A. Work Plan: Prior to beginning work, the Contractor must submit to the BGJWSC 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 BGJWSC.

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 BGJWSC'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 BGJWSC.

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 BGJWSC 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 BGJWSC or BGJWSC'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 BGJWSC 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

Payment methodology for this item shall be as provided in Section 01025 – Measurement and Payments.

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 BGJWSC 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 BGJWSC 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 BGJWSC 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 BGJWSC 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.

E. Disposal site for disposal of drilling fluids is the responsibility of the contractor or subcontractor involved with horizontal directional drilling. It shall be a state approved facility, permitted to accepted drilling fluids and waste.

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, BGJWSC shall, at the contractor's expense, require a third party to verify the drill path profile and location of the installed line to BGJWSC 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 BGJWSC. 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 the Engineer of Record and Owner. The Engineer of Record, Owner 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 the Engineer of Record and Owner 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 the Engineer of Record and Owner.

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 Engineer of Record and Owner 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 Engineer of Record and Owner, upon request. Unless approved otherwise by the Engineer of Record and Owner, a written or downloaded report for each fusion weld process shall be required and submitted to the Engineer of Record and Owner after the fusion weld process for review and approval prior to initiating pullback operations. If a potential defect fusion weld is suspected by the Engineer of Record, Owner or the Contractor, the work shall stop and a mutually acceptable (between the Contractor, Engineer of Record and Owner) corrective action plan shall be executed.

2. Data logger:

Equipment shall be Mc Elroy Datalogger Model no. DL6303 DL 6304 or the Engineer of Record and Owner 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 Engineer of Record and Owner 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 the Engineer of Record and Owner, 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 the Engineer of Record and Owner.

4. Entry Point Location:

The exact pilot hole entry point shall be within ±5 feet of the location shown on the drawings without prior the Engineer of Record and Owner 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 the Engineer of Record and Owner written permission for deviation.

6. Limitations on Depth:

Pipe larger than bore hole path shall be specifically designed by the engineer and approved by the Engineer of Record and Owner. 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 BGJWSC.

4. Buoyancy modification shall be at the discretion of the Contractor and shall be approved by the Engineer of Record and Owner. 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 the Engineer of Record and Owner. The Engineer of Record, Owner 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 the Engineer of Record and Owner, 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 BGJWSC 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 BGJWSC. 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 Engineer of Record and Owner. 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 Engineer of Record and Owner of the results of these investigations so that the necessary modifications may be determined.

Refer to BGJWSC 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 watermains 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 BGJWSC 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 BGJWSC 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 BGJWSC 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 BGJWSC 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.

1. Contractor shall test HDPE pipelines installed under this Contract in accordance with these specifications prior to acceptance of the pipeline by the BGJWSC. All field tests shall be made in the presence of the BGJWSC Representative. Except as otherwise directed, all pipelines shall be tested. Unless approved otherwise by BGJWSC, 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. BGJWSC 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 BGJWSC Representative. The pump, pipe connection and all necessary apparatus shall be furnished by the Contractor and shall be subject to the approval of the BGJWSC 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 BGJWSC 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 the Engineer of Record and Owner, 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 10 AWG high strength copper-clad carbon steel with 30 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.

D. TRACER WIRE AND DETECTION TAPE:

Contractor shall furnish and install locate wiring on all non-metallic watermains in accordance with JWSC Standard Details. Locate wire shall be brought to grade outside a valve box or locating station box, as required, at four hundred and seventy five (475') foot intervals (maximum). In addition, all watermains shall have deflection tape installed two (2') feet above the pipe. Tracer wire and detection tape shall be as specified in paragraphs above.

Installed locate wiring shall be tested by the contractor as part of the inspection process, using a qualified tester and suitable testing equipment. The contractor shall notify the JWSC Inspector at least 48 hours in advance of the locate sire field testing schedule.

BGBGJWSC RECORD of PRESSURE and LEAKAGE TEST (HDPE PIPE)

Project:_____

TEST SECION:_____

BGJWSC 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 BGJWSC 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.

BGJWSC 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